Los Angeles Department of Water & Power

RESOLUTION NO. ________________

BOARD LETTER APPROVAL

RICHARD F. HARASICK
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Water System

MARTIN L. ADAMS
Chief Operating Officer

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General Manager

DATE: May 15, 2017

SUBJECT: Adoption of the Interim Remedial Action Decision, North Hollywood West Well Field

SUMMARY

This Resolution is to fulfill LADWP's responsibilities under the National Contingency Plan (NCP) for adoption of the Interim Remedial Action Decision (IRAD), North Hollywood West Well Field (Project). The NCP is a federal regulation that provides a roadmap for conducting a response action under Comprehensive Environmental Response, Compensation & Liability Act (CERCLA). The NCP is the process for determining the extent of cleanup including scoping, evaluation of alternatives based on environmental, economic and engineering criteria, and selection of the remedy based on balancing environmental factors and costs.

The Project proposes to implement an interim response action (implementation of remediation facilities) to address releases of 1,4-dioxane in groundwater that are migrating to the North Hollywood West (NHW) Well Field.

As required under the NCP, LADWP prepared the attached IRAD that selects the Preferred Alternative (PA) for the Project following the completion of the public comment period, review of public comments, and consideration of applicable NCP remedy selection criteria. By approving the IRAD for purposes of CERCLA, LADWP will be able to proceed with design and construction of this interim remedy.

City Council approval is not required.

RECOMMENDATION

It is recommended that the Board of Water and Power Commissioners (Board) adopt the attached Resolution, approved as to form and legality by the City Attorney, formally adopting the IRAD.

ALTERNATIVES CONSIDERED

The Proposed Plan (Plan) identified three possible Interim Remedial Alternatives (IRA) to achieve the preliminary cleanup goals for the North Hollywood West Well Field:

- Alternative 1, "No Action": LADWP operates according to pumping plan, with no containment or treatment action in place.
- Alternative 2, "Alternate Water Supply": LADWP implements institutional and engineering actions to protect human health, including blending, alternate pumping plans, alternate water supplies, monitoring, and groundwater use restrictions.
- Alternative 3, "Groundwater Pump and Treat for Domestic Use": LADWP implements containment and treatment actions to remove contamination and restore beneficial use of NHW groundwater.

Alternative 3 was proposed as the PA in the Plan according to the seven Environmental Protection Agency (EPA) evaluation criteria:

1. Protection of Human Health and the Environment
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARAR)
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility, or Volume through Treatment
5. Short-Term Effectiveness
6. Implementability
7. Cost

The PA consists of aboveground treatment of the groundwater impacted by 1,4-dioxane in three remediation wells using an advanced oxidation process (AOP) to transform the contaminants into innocuous byproducts. AOP consists of adding hydrogen peroxide to the water and irradiating it with ultraviolet light.

Following completion of the public comment period, LADWP reviewed, evaluated and considered the comments received and the two additional NCP remedy selection criteria to be evaluated following the public comment period (community acceptance and state acceptance). A response to comments is included in the IRAD. As explained in IRAD, the consideration of these NCP criteria further support selection of the PA.

BACKGROUND

Local groundwater provides approximately 11 percent of the City of Los Angeles' (City) total water supply and has provided up to 20 percent of the City's total supply in drought years. Unfortunately, over 70 percent of the LADWP groundwater production wells in the San Fernando Basin (SFB) are impacted by contamination caused by various commercial and industrial activities that impair the beneficial use of the groundwater. The SFB is an aquifer which provides drinking water to over 800,000 residents within the City.

Cleaning up contamination in the SFB is essential to restoring the beneficial use of groundwater and protecting public health and the environment. Restoring the beneficial use of groundwater will also facilitate the ability of LADWP to maximize the amount of water recharged into the SFB. Restoring the beneficial use of groundwater is also an important step in developing local water supplies and reducing the City's reliance on imported water. In early 2015, in order to perform the necessary cleanup work, the LADWP completed the SFB Groundwater System Improvement Study (GSIS). The GSIS was a 6-year study characterizing the groundwater basin contamination in the SFB. Twenty-five new monitoring wells were drilled in support of the groundwater study. These new wells, along with a network of more than 70 existing wells, are being used to characterize the basin's groundwater quality and to assist in developing a NCP-consistent method for removing contamination from the City's major well fields in the SFB.

A Remedial Investigation/Feasibility Study was prepared in order to develop and evaluate IRAs that mitigate risks to human health and the environment from the presence of the synthetic chemical 1,4-dioxane dissolved in groundwater in the NHW Well Field and to meet other remedial action objectives. The preferred IRA was then presented in the Plan which along with other documents was circulated during a Public Comment Period where various stakeholders and members of the public submitted feedback on the Project.

Responses to comments received during the Public Comment Period are included in the attached IRAD. The IRAD was prepared for adoption of the interim remedial action.

LADWP proposes to implement a response action to address releases of 1,4-dioxane in groundwater that are migrating to the NHW Well Field.

This would be achieved by installing water treatment equipment at the well field capable of removing the 1,4-dioxane (and other contamination present in water sent to the plant) to below identified cleanup levels, and connecting that treatment system to three remediation wells. It would also minimize the spread of contaminant mass, limit further degradation of the groundwater basin directly downgradient of the NHW wells, remove contaminant mass from the aquifer, assist in the restoration of beneficial uses of the groundwater basin, prevent the ingestion of groundwater that exceeds health-protective cleanup levels, and help to restore LADWP's capability to operate its existing NHW Well Field in a flexible manner consistent with historic and planned use.

ENVIRONMENTAL DETERMINATION

In compliance with California Environmental Quality Act Guideline sections 15070-15075 (MND prepared.) In accordance with the California Environmental Quality Act (CEQA), a Mitigated Negative Declaration (MND) was prepared to analyze the impacts associated with the construction and operation of the North Hollywood West Well Field Water Treatment Project. The MND concluded that with the implementation of certain mitigation measures, any environmental impacts of the proposed Project would be reduced to a level of less than significant. The MND was presented to the Board for consideration on June 6, 2017.

CITY ATTORNEY

The Office of the City Attorney reviewed and approved the Resolution as to form and legality.

ATTACHMENTS

- Resolution
- Interim Remedial Action Decision

RESOLUTION NO. ____________________

WHEREAS, local groundwater had provided as much as 20 percent of the total supply during extended dry periods when imported water has been less reliable; and

WHEREAS, however, over the last five years which includes a severe dry period that would normally be a time of increased reliance on groundwater, local groundwater only provided approximately 12 percent of the total water supply for Los Angeles; and

WHEREAS, this observed reduction in the groundwater component of total supply is the result of the beneficial use of groundwater having been impaired; and

WHEREAS, the City plans to obtain 50 percent of water locally by 2035. (City of Los Angeles Sustainable LA Plan 2015). The primary source of local water is groundwater, and the primary source of local groundwater, is the San Fernando Groundwater Basin (SFB); and

WHEREAS, cleaning up contamination in the SFB is essential to protecting public health and the environment and restoring the beneficial use of the groundwater; and

WHEREAS, restoring the beneficial use of groundwater will also facilitate the ability of LADWP to recover its ability to maximize the amount of water LADWP can recharge into the SFB; and

WHEREAS, restoring the beneficial use of groundwater through cleaning up contamination in the SFB is an important step in developing local water supplies and reducing LADWP's reliance on imported water; and

WHEREAS, in order to perform the necessary environmental cleanup work, in early 2015, the LADWP completed the San Fernando Basin Groundwater System Improvement Study (GSIS), which was a 6-year study characterizing the groundwater basin contamination in the SFB; and

WHEREAS, LADWP prepared a baseline risk assessment that evaluated risks posed by the release of hazardous substances affecting the North Hollywood West (NHW) Well Field, which lies within the SFB; and

WHEREAS, the baseline risk assessment indicates that hazardous substances, including, but not limited to, the synthetic chemical 1,4-dioxane, pose a risk that requires the implementation of one or more response actions to address the release of hazardous substances; and

WHEREAS, LADWP prepared a Remedial Investigation/Feasibility Study (RI/FS) to develop and evaluate interim remedial alternatives that mitigate risks to human health and the environment from the presence of a plume of the synthetic chemical 1,4-

dioxane in groundwater in the NHW Well Field. The RI/FS evaluated an interim action because additional remedial actions may be required to address releases of hazardous substances other than the 1,4-dioxane at the well field and upgradient source areas, and those potential additional actions are not part of this action; and

WHEREAS, the RI/FS provided site characterization information, and identified and screened remedial technologies, and developed and analyzed alternatives for responding to releases of 1,4-dioxane; and

WHEREAS, based on the RI/FS, LADWP prepared a Proposed Plan that identified a preferred remediation alternative of groundwater pump and treat for direct domestic use of three remediation wells affected by 1,4-dioxane; and

WHEREAS, LADWP published the RI/FS, Proposed Plan and related documents for public comment for a period of 110 days, and held two public meetings to receive public comment; and

WHEREAS, LADWP received public comment and fully considered and evaluated those comments, and prepared responses to the public comments received, which are included as part of the Interim Remedial Action Decision, North Hollywood West Well Field; and

WHEREAS, an Initial Study and Mitigated Negative Declaration (IS/MND) were prepared to assess the potential environmental impacts of the preferred alternative identified in the Proposed Plan.

NOW, THEREFORE, BE IT RESOLVED that the Board of Water and Power Commissioners of the City of Los Angeles (Board) recognizes that a RI/FS was conducted and the preferred alternative is described in the Interim Remedial Action Decision, North Hollywood West Well Field.

BE IT FURTHER RESOLVED that this Board concludes that the IS/MND has been prepared in compliance with CEQA and constitutes a complete, accurate, adequate and good faith effort at full disclosure under CEQA.

BE IT FURTHER RESOLVED that this Board adopts the Project described in the Interim Remedial Action Decision, North Hollywood West Well Field, authorizes its design, construction, and approves the payment for permits and mitigation costs associated with the Project.

I HEREBY CERTIFY that the foregoing is a full, true, and correct copy of a Resolution adopted by the Board of Water and Power Commissioners of the City of Los Angeles at its meeting held on

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Secretary

APPROVED AS TO FORM AND LEGALITY
MICHAEL N. FEUER, CITY ATTORNEY

MAY 15 2017

BY [signature]
MICHELLE LYMAN
DEPUTY CITY ATTORNEY

Los Angeles Department of Water & Power

Interim Remedial Action Decision

North Hollywood West Well Field

Prepared for:

City of Los Angeles
Department of Water and Power
111 North Hope Street
Los Angeles, California 90012

July, 2017

Submitted by:
Hazen and Sawyer (Hazen) under Agreement No. 47329-5 (Owner's Agent for the SFB Remediation)

Prepared by:
Hazen and WorleyParsons

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LIST OF ABBREVIATIONS AND ACRONYMS

Acronym/Abbreviation	Term
%	Percent
AFY	Acre-feet per year
AOP	Advanced Oxidation Process
ARAR	Applicable Relevant and Appropriate Requirements
Bgs	Below ground surface
CAA	Clean Air Act
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Chemical of Concern
CWA	Clean Water Act
DCE	Dichloroethylene
DDW	Division of Drinking Water
DFA	Division of Financial Assistance
EPA	Environmental Protection Agency
GAC	Granular Activated Carbon
HA	Health Advisory
HHRA	Human Health Risk Assessment
H&S Code	Health and Safety Code
IRA	Interim Remedial Action
IRAD	Interim Remedial Action Decision
LA	Los Angeles
LADWP	Los Angeles Department of Water and Power
LARWQCB	Los Angeles Regional Water Quality Control Board
MCL	Maximum Contaminant Level
MWD	Metropolitan Water District of Southern California

Acronym/Abbreviation	Term
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NHW	North Hollywood West
NL	Notification Level
NPDES	National Pollutant Discharge Elimination System
NPV	Net Present Value
O&M	Operation and Maintenance
OEHHA	Office of Environmental Health Hazard Assessments
OMB	Office of Management and Budget
OU	Operable Unit
PCE	Perchloroethylene (also known as Tetrachloroethylene)
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RL	Response Level
SFB	San Fernando Basin
SFV	San Fernando Valley
SWRCB	State Water Resources Control Board
SCAQMD	South Coast Air Quality Management District
TAC	Technical Advisory Committee
TBC	To Be Considered
TCE	Trichloroethylene
ULARA	Upper Los Angeles River Area
UV	Ultraviolet
VOC	Volatile Organic Compounds

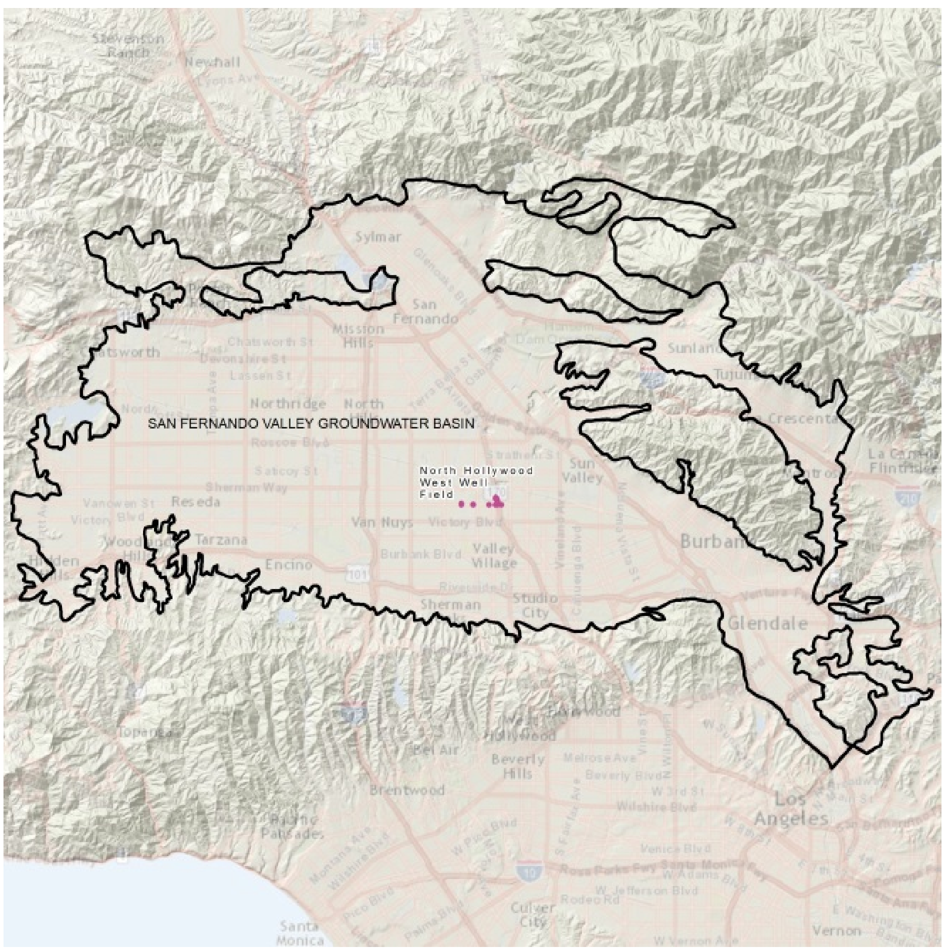
1. PART 1 DECLARATION

1.1 Site Information

The North Hollywood West (NHW) Well Field (the "Site") is a groundwater production well field located within the San Fernando Valley (SFV) in Los Angeles (LA) County, California (Figure 1-1). The NHW Well Field extracts groundwater from the San Fernando Basin (SFB) and the well field is operated by the Los Angeles Department of Water and Power (LADWP). There are 14 production wells that make up the NHW Well Field. The wells are generally located in an L-shaped pattern, with eight wells in an east–west orientation along Vanowen Street and six wells located in the general vicinity of Whitsett Sports Field Park in a north–south orientation parallel to SR-170.

The 14 groundwater production wells were installed over a 60-year period between 1924 and 1984. Individual production wells extract groundwater from depths ranging from 130 to 910 feet below ground surface (bgs) at production rates ranging from 290 to 5,433 acre-feet per year (AFY). The combined maximum production capacity of the 14 production wells is approximately 38,178 AFY.

Figure 1-1 – The San Fernando Valley Groundwater Basin



1.2 Statement of Basis and Purpose

This Interim Remedial Action Decision (IRAD) documents LADWP's selection of the interim remedy for the NHW Operable Unit (OU) that addresses the plume of 1,4-dioxane emanating from CalMat's Hewitt Pit landfill and migrating to LADWP's NHW production wells. The 1,4-dioxane plume has caused the groundwater extracted by the individual production wells to have an effluent concentration exceeding 10 times its State of California, State Water Resources Control Board (SWRCB), Division of Drinking Water (DDW) notification level (NL) of 1 µg/L based on chronic health effects, which is prohibited by DDW unless removal treatment is provided. A separate interim remedial action is being developed to address the broader detection of volatile organic compounds (VOCs; e.g., tetrachloroethylene [PCE] and trichloroethylene [TCE]) in groundwater in the vicinity of the NHW and Rinaldi-Toluca Well Fields.

The NHW OU remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on information and analysis provided in the Interim Remedial Investigation (RI)/Feasibility Study (FS) Report for the NHW Well Field (Hazen 2016a), the public comments of the Proposed Plan (Hazen 2016c), and related documents.

1.3 Assessment of the Site

It is LADWP's judgment that the Interim Remedial Action (IRA) selected in this IRAD is necessary to protect human health and the environment and, to help to restore and maintain the beneficial uses of groundwater in the SFB. The IRA is necessary to limit the migration of 1,4-dioxane in groundwater at concentrations that prevent beneficial uses of the groundwater, remove 1,4-dioxane from the groundwater at and downgradient of the NHW Well Field area, and restore the capability to operate the well field consistent with its historical and planned use.

1.4 Description of the Selected Remedy

LADWP's selected IRA is a groundwater pump and treatment system intended to reduce the toxicity, mobility, and volume of contaminated groundwater through treatment. Human health will be protected by capturing and removing 1,4-dioxane contaminated groundwater from the NHW Well Field area through hydraulic control, and treating the contaminated groundwater aboveground to permanently remove 1,4-dioxane, as well as other contaminants from groundwater. The beneficial use of groundwater will be restored in accordance with the Los Angeles Regional Water Quality Control Board Basin Plan (LARWQCB Basin Plan), which conforms with the State of California Antidegradation Policy (i.e., SWRCB Resolution 68-16 and 92-49), an Applicable Relevant and Appropriate Requirement (ARAR) for this IRA.

Hydraulic control will be implemented in a manner that draws contaminated groundwater toward three designated remediation wells, and away from the other 11 groundwater production wells within the NHW Well Field and down-gradient groundwater resources. Hydraulic control will reduce the likelihood for these other groundwater production wells within the NHW Well Field and down-gradient groundwater resources to be impacted by 1,4-dioxane.

The contaminated groundwater captured by the NHW remediation wells will be managed aboveground by implementing a combination of institutional and treatment actions. Institutional actions will include implementation of the bypass, blending, alternative pumping plans, monitoring and groundwater use restrictions; which are described in Section 3 of the Interim RI/FS Report for the NHW Well Field.

Treatment actions will include aboveground treatment of the groundwater impacted by 1,4-dioxane, which will be implemented in compliance with ARARs and To Be Considered (TBC) criteria to protect human health. Treatment will include advanced oxidation process (AOP) technology to transform 1,4-dioxane, as well as TCE, PCE, and 1,1-dichlorotheylene (1,1-DCE), into innocuous byproducts. Carbon quenching will be implemented to remove remaining hydrogen peroxide from water downstream of an AOP.

The proposed treatment facility is located in the northeast corner of the Whitsett Fields Park property, located near the intersection of Whitsett and Rhodes Avenues. The blended and treated groundwater will be conveyed to the LADWP potable water distribution system for direct domestic use.

The land and much of the infrastructure required for the selected remedy is already in-place, which will reduce the time and cost required to implement the remedy.

1.5 Statutory Determinations

The IRA is protective of human health and the environment, complies with federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes semi-permanent solutions and alternative treatment technologies to the maximum extent practicable. Although as an interim remedy this IRA is not intended to address fully the statutory mandate for permanence and treatment to the maximum extent practicable, this IRA does utilize treatment and thus supports that statutory mandate. The IRA also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants through treatment), in accordance with CERCLA § 121.

1.6 IRA Decision Certification Checklist

The following information is outlined in the Decision Summary (Section 2 of this IRAD) and covered in detail in the NHW RI/FS (Hazen 2016a) and the Full Characterization of Raw Water Quality Characterization, NHW Well Field (Hazen 2017, DRAFT).

- Chemicals of concern (COCs) and their respective concentrations (Hazen 2017, DRAFT).
- Baseline human health risk represented by the COCs (Hazen 2016b, Section 5).
- Cleanup levels established for COCs and the basis for these levels (Hazen 2016a Section 2).
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline human health risk assessment and Interim Remedial Action Decision (Hazen 2016a, Section 4.1.3).
- Potential land and groundwater use that will be available at the site as a result of the Selected Remedy (Hazen 2016a, Section 1.8).

- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Hazen 2016a, Appendix B).
- Key factor(s) that led to selecting the remedy (Hazen 2016a, Section 5).

Additional information can be found in information repositories for the NHW Well Field IRA. LADWP maintains site information at the following repositories. These repositories contain the NHW Community Involvement Plan, project documents, fact sheets, and reference materials. LADWP also has a site information web page at www.ladwp.com/remediation.

Information Repositories

City of Los Angeles Central Library
Science and Technical Department
630 West 5th Street
Los Angeles, CA 90071
(213) 228-7216

City of Burbank Public Library
110 North Glenoaks Street
Burbank, CA 91502
(818) 238-5880

City of Glendale Public Library
222 East Harvard Street
Glendale, CA 91205
(818) 548-2021

Panorama City Public Library
14345 Roscoe Boulevard
Panorama City, CA 91402
(818) 894-4071

2. PART 2 DECISION SUMMARY

2.1 Site Background

The City of Los Angeles (the “City”) encompasses an area of 456 square miles with a population of nearly 4 million residents and a current water demand of more than 500,000 AFY. Local groundwater is a key resource that the City has relied upon as a major component of its local water supply portfolio. Over the last five years, local groundwater has provided approximately 12 percent (%) of the total water supply for Los Angeles, and since 1970 has provided up to 23% of total supply during extended dry periods when imported supplies become less reliable. The City plans to obtain 50% of water locally by 2035 (LADWP 2015). The primary source of local water is groundwater, and the primary source of local groundwater is the SFB.

The SFB underlies most of the SFV and is approximately 175 square miles (112,000 acres) in area (Figure 1-1). It serves as the primary source of groundwater for the City, providing more than 90% of the City’s local groundwater supply. There are 11 well fields in the SFB that have been used or are currently being used to produce groundwater for the cities of Los Angeles, Burbank, and Glendale. The NHW Well Field is operated in accordance with the Domestic Water Supply Permit (the “Permit”) issued by the State of California, SWRCB, DDW to LADWP.

Elevated concentrations of 1,4-dioxane have been detected in groundwater, cannot be managed by LADWP through its existing Permit and Well Blending Operations Plan (Blending Plan), as described below, and therefore this IRA is necessary to address 1,4-dioxane in the NHW Well Field.

Under the current Permit, “if any constituent is present at the well effluent at a concentration exceeding 10 times its Maximum Contaminant Level (MCL) or NL based on chronic health effects, then the constituent may not be treated by blending alone.” The DDW establishes MCLs and NLs for drinking water contaminants in California. NLs are established for chemicals that do not have MCLs. NLs are health-based advisory levels. The NL for 1,4-dioxane is 1 µg/L.

Well field operations are carried out in accordance with the DDW-approved Blending Plan to manage groundwater contaminants entering the NHW Well Field. DDW reviews this plan each year and intends that LADWP reduce its reliance on blending over time, particularly for synthetic or emerging contaminants such as 1,4-dioxane. Under the Blending Plan, operational changes, such as removing production wells from service, are required when the well significantly contributes to a contaminant concentration exceeding 80% of the MCL or NL at the LADWP blend point down-stream of the NHW Well Field. The aforementioned blend point is an entry point to the LADWP distribution system, which provides a mixture of water from multiple wells in the NHW Well Field. The DDW response level (RL) is the level prompting a recommendation for a production well being removed from service. For 1,4-dioxane, this recommendation occurs at 35 times the NL or 35 µg/L (or 35 ppb). The result of the Blending Plan requirement at the LADWP blend point is that production wells may be removed from service at 1,4-dioxane concentrations less than the DDW RL of 35 µg/L.

LADWP has implemented a DDW-approved Interim Sampling Plan (LADWP 2015c) to collect contaminant concentration and other water quality data from the NHW production wells to support the implementation of the Blending Plan. Substances detected in production wells at concentrations exceeding MCLs (TCE, PCE, 1,1-DCE) and NLs (1,4-dioxane) were identified as primary contaminants of concern in the Blending Plan. TCE, PCE, 1,1-DCE have been detected at concentrations that currently can be managed by LADWP through its existing Permit and Blending Plan. However, 1,4-dioxane cannot be managed in this way.

The results of the implementation of the Interim Sampling Plan show 1,4-dioxane was detected in water pumped from production wells at concentrations exceeding both the NL of 1 µg/L and the DDW Permit limit of 10 times the NL (e.g., 10 µg/L). As a result of 1,4-dioxane concentrations at the NHW productions wells and the requirements of the Permit and Blending Plan, seven NHW production wells (i.e., NH-23, NH-34, NH 36, NH-37, NH-43A, NH-44 and NH-45) were removed from service between November 2014 and March 2015, which impaired the beneficial use of groundwater.

The production wells were removed from service to prevent 1,4-dioxane concentrations from exceeding the NL at the LADWP blend point down-stream of the NHW Well Field. During this time, other groundwater contaminant concentrations in the NHW Well Field, such as TCE and PCE, were able to be effectively managed by blending water from select production wells. The production wells removed from service were subsequently operated for temporary testing and other limited use.

The removal from service of the seven production wells resulted in a combined loss of more than 24,700 AFY, or 65% of the total production capacity of the NHW Well Field. The value of this volume of replacement water for the seven production wells at a current wholesale water price of $942 per AF is in excess of $23 million per year.

1,4-dioxane concentrations exceeding 10 times the DDW NL detected in monitoring wells located up-gradient of the seven production wells with respect to groundwater flow indicate that use of the seven production wells would result in elevated concentrations of 1,4-dioxane being detected in the groundwater pumped from these production wells. The 1,4-dioxane groundwater plume also threatens to impact other wells in the NHW Well Field. Other groundwater contaminants are detected in monitoring wells located up-gradient of the seven production wells; however, none of the contaminants have caused the water extracted by the individual production wells to have an effluent concentration exceeding 10 times its DDW NL or MCL.

LADWP acknowledges that other groundwater contaminants such as VOCs exist and pose a risk that will be addressed separately, however, this IRA focuses on 1,4-dioxane as a risk management strategy because this constituent is impacting the beneficial use of groundwater in accordance with the LARWQCB Basin Plan, which conforms with the State of California Antidegradation Policy (i.e., SWRCB Resolution 68-16 and 92-49), an ARAR for this IRA.

In summary, it is appropriate and reasonable to address 1,4-dioxane plume threatening the NHW Well Field separately from the more widespread VOC contamination for several reasons. First, 1,4-dioxane has exceeded the levels that would allow for blending under the Permit, while VOCs are present at levels that can be managed through blending. Second, the 1,4-dioxane plume is more limited in its spatial distribution than the widespread VOC plume in the area and it is important to limit that migration as soon as possible. This need is made more urgent because 1,4-dioxane requires treatment that is different than the treatment to be used to manage VOCs alone. The further migration of the 1,4-dioxane plume will therefore increase the cost and difficulty of further addressing the plume and further impair the beneficial uses of the basin. Third, 1,4-dioxane is fully miscible in water and therefore travels quickly, posing a continued risk to human health and the environment.

2.2 Site Characteristics

The Environmental Protection Agency (EPA) collects groundwater quality data from various stakeholders for sites in the vicinity of the NHW Well Field to support its characterization of the SFB. The groundwater quality data collected in the vicinity of the NHW Well Field between January 1, 2010, and September 30, 2014, was used to produce distribution maps of 1,4-dioxane, PCE and TCE in groundwater (also called plume maps). The 1,4-dioxane distribution map produced by EPA, dated February 2015, is presented as Figure 2-1. In particular, the 1,4-dioxane plume map illustrates that 1,4-dioxane concentrations in groundwater greater than 10 times the NL are located in the general area bounded by Saticoy Street to the North, Vanowen Street to the South, Highway 170 to the West, and Laurel Canyon Boulevard to the East, and data collected by LADWP from its production wells in the NHW Well Field show that the portion of the plume in excess of 10 µg/L now extends into the NHW Well Field. This distribution of 1,4-dioxane concentrations in groundwater greater than 10 times the NL (i.e., >10 µg/L) and groundwater modeling presented in the Interim RI/FS Report indicates that continued use of the seven production wells would result in elevated concentrations of 1,4-dioxane in the production wells.

Additional data confirms the information presented by the EPA as described above, including data used for the preparation of the RI/FS (as described in Section 1 of the RI/FS) as well as additional data made available during the public comment period on the RI/FS (“new data”). This data confirms that the Hewitt Pit remains a significant source of 1,4-dioxane to groundwater and that 1,4-dioxane continues to migrate towards the NHW Well Field (as explained in Appendix A, Specific Comments, Item 6). Review of the new data indicates that many monitoring wells and lysimeter data do not show a distinct decreasing trend in recently observed concentrations. Moreover, a number of monitoring wells and lysimeters show a recent increase and/or significant fluctuation in observed 1,4-dioxane concentrations based on recent sampling events. It is also evident that some monitoring wells and lysimeters which have been sampled historically recorded higher concentrations between Q3 2016 and Q2 2017 than were observed between Q1 2011 and Q2 2016. Review of monitoring data as part of the RI/FS, and more recent data presented in Appendix E of the IRAD, indicates that measured concentration fluctuations of one order of magnitude are not unusual within or near the Hewitt Site. Importantly, this new data does not change the need for the 1,4-dioxane NHW IRA, as described herein.

2.2.1 Groundwater

The groundwater basin is comprised predominantly of permeable sands and gravels interbedded with laterally discontinuous lenses of less permeable finer-grained silts and clays. The unconsolidated sediments in the eastern SFB, which is where the NHW Well Field is located, are generally coarser-grained and extend to at least 1,200 feet bgs in the central area. Groundwater is generally encountered at approximately 240 to 250 feet bgs, although it may be deeper in areas where groundwater is actively pumped, or shallower in proximity to active groundwater recharge projects such as spreading grounds. Groundwater entering the NHW Well Field generally flows south to south-east.

Locally, groundwater hydraulic gradients can vary in magnitude and direction depending on various stresses (e.g. production well pumping for water supply, SFB recharge, changes in water table elevations). Several shallow and deeper hydrostratigraphic zones have been used to describe the aquifer system within the groundwater basin, which collectively extend to over 1,000 feet bgs. These various zones are defined based on interpreted geologic and hydraulic characteristics. Further details relating to the geologic and hydrologic characteristics of the SFB and the NHW Well Field are provided in a range of sources including the Report of Referee - Los Angeles v. San Fernando (SWRCB 1962), the San Fernando Valley Remedial Investigation (James M. Montgomery, Inc.[JMM] 1992), the Focused Feasibility Study (EPA 2009a), North Hollywood OU, San Fernando Valley Area 1 Superfund Site, LA County, California, and the Interim Action Record of Decision for the North Hollywood OU (EPA 2009b), the Groundwater System Improvement Study Remedial Investigation Update Report (Brown & Caldwell [BC] 2015a), and the Interim RI/FS Report (Hazen 2016a).

2.2.2 Extent of 1,4-Dioxane Contamination

Based on previous investigations and analysis of the groundwater basin, EPA plume mapping has provided evidence of widespread 1,4-dioxane contamination within the vicinity of the NHW Well Field, as shown in Figure 2-1, which is based on data collected from 2010 through 2014. The area of highest concentration of 1,4-dioxane is located up-gradient, north east of the NHW Well Field. Given the elevated concentrations of 1,4-dioxane detected in monitoring wells located up-gradient of the seven production wells, the continued use of the seven production wells threatens to result in elevated concentrations of 1,4-dioxane being detected in the groundwater pumped from these production wells.

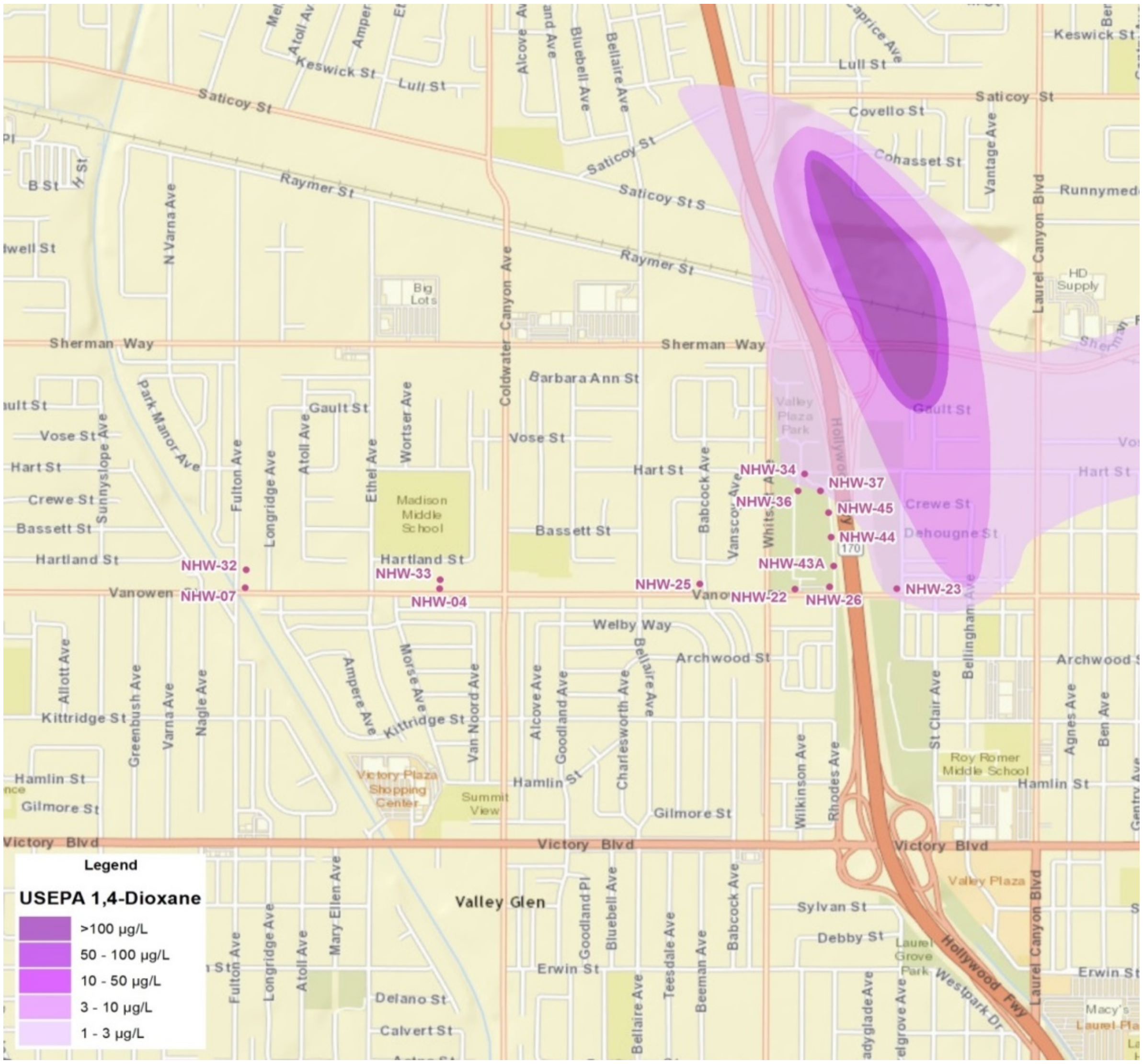
The physical and chemical properties and behavior of 1,4-dioxane in groundwater creates challenges for its characterization and treatment. It is miscible in water, which renders it highly mobile, and it has not been shown to readily biodegrade in the environment. It is weakly retarded by sorption to aquifer materials and may migrate rapidly in groundwater, ahead of other contaminants.

As 1,4-dioxane is highly mobile within groundwater, it has migrated from an area of higher concentrations (e.g., greater than 10 times the NL) in a southerly direction, following the natural groundwater flow paths. Furthermore, historical pumping at the NHW Well Field has changed the natural groundwater flow field, creating a radial cone of depression around the well field, thereby increasing the groundwater flow gradient towards the production wells. The combination of natural southerly groundwater flow and the radial cone of depression has resulted in 1,4-dioxane contaminated groundwater being pulled toward or captured by the production wells. Thus, a number of the NHW production wells have pumped 1,4-dioxane impacted groundwater from the SFB.

Given the proximity of the 1,4-dioxane plume relative to the NHW Well Field and the groundwater flow pattern across the general area as a result of pumping, it is anticipated that 1,4-dioxane contamination would continue to be captured by the NHW production wells. In the absence of groundwater pumping in the general area, there is also a potential for 1,4-dioxane impacted groundwater to migrate farther south, leading to further migration of 1,4-dioxane in groundwater and potential to impact other groundwater production wells.

Additional data confirms the information presented by EPA as described above, including data used for the preparation of the RI/FS (as described in Section 1 of the RI/FS) as well as additional data made available during the public comment period on the RI/FS. This data confirms that the Hewitt Pit remains a significant source of 1,4-dioxane to groundwater and that 1,4-dioxane continues to migrate towards the NHW Well Field (as explained in Part 3).

Figure 2-1 – EPA 1,4-Dioxane Plume Map



2.3 Operable Unit and Study Area

For the NHW Well Field, the OU is defined as the groundwater entering the NHW production wells under active pumping conditions. The source of groundwater entering the NHW production wells can be delineated by developing a pumping plan and using this pumping plan to delineate a potential capture zone. A potential capture zone can then be used to delineate the area of water captured by production wells within a given period of time (e.g., 10- or 30-year capture zones). The area of water captured by production wells within a given period of time is dependent on the volume of water extracted from the production wells during that period, and other factors such as the volume of water extracted from other nearby pumping wells, the volume of water recharged at various local spreading grounds, and hydraulic characteristics of the geologic formations.

The capture zones can be used to delineate the Study Area. The Study Area represents the lateral extent of the NHW OU based on the LADWP pumping plan. In this case, the 10-year capture zone was used for shorter-term planning and remedial design while the 30-year capture zone was used for longer-term planning including risk evaluation, fate and transport modeling, and groundwater recharge. The LADWP pumping plan is subject to change based on a number of factors such as supply and demand, climatic conditions, and maintenance activities. The goals of the pumping plan are described in the Sustainable City plan (City 2015) and the Urban Water Management Plan (LADWP 2015).

2.4 Summary of Risks

An initial baseline human health risk assessment (HHRA) was conducted as part of the RI/FS to assess whether the contaminated groundwater poses a risk to human health if human receptors (e.g., local residents, commercial and construction workers, under future potential scenarios) were exposed to untreated groundwater. Based on the results of the HHRA, it was concluded that concentrations of 1,4-dioxane and VOCs in production wells resulted in potential ingestion risks from cancer and non-cancer endpoints within the Study Area, which further supports the evaluation of IRAs.

1,4-Dioxane has been measured in groundwater at concentrations exceeding 10 times the NL, both at the NHW production wells and at numerous locations up-gradient of the NHW production wells. This magnitude of exceedance falls outside the levels that permit the water to be served even with blending pursuant to the current Blending Plan and the Permit issued by DDW to LADWP. These levels also exceed the cleanup goal set by EPA at nearby areas in the SFB (EPA 2009a). While contaminants other than 1,4-dioxane are present in the NHW Well Field, that contamination is part of a larger groundwater plume that will be addressed as part of a separate response action at a later date. In the interim, wells containing those contaminants that are not connected to the treatment plant will only be used if the contaminants are present at levels that are low enough that they can be safely addressed through the current Blending Plan and the Permit issued by DDW to LADWP.

In contrast, 1,4-dioxane cannot be managed by LADWP through its existing Permit and Blending Plan, and therefore this IRA is necessary to mitigate human health risks posed by the ingestion of 1,4-dioxane in groundwater extracted from the NHW Well Field.

The concentrations of 1,4-dioxane detected in groundwater exceeding health-based levels (i.e., EPA Health Advisory [HA] Level of 0.35 µg/L; Office of Environmental Health Hazard Assessments (OEHHA) Public Health Protective Concentration of 3 µg/L, and DDW NL of 1 µg/L) impacts the beneficial use of groundwater, as addressed in the LARWQCB Basin Plan, which conforms to the State of California Antidegradation Policy (i.e., SWRCB Resolution 68-16 [SWRCB 1968]). The impact to the beneficial use of groundwater by 1,4-dioxane in the vicinity of the NHW Well Field justifies the IRA.

2.5 Community Participation

LADWP conducted community outreach to invite the participation of residents, community leaders, property owners, regulatory agencies, potentially responsible parties, and all interested members of the public at large.

LADWP mailed over 500 letters to residents, community groups, stakeholders, and regulatory agencies. LADWP published notices of the public comment period and public meetings in newspapers. LADWP also sent email notifications to 88 Neighborhood Councils about the project, comment period and public meetings. Neighborhood Councils are city-certified local groups made up of people who live, work, own property, or have some other connection to a neighborhood. Two email notifications were made to Neighborhood Councils and posted information was made on LADWP's Facebook page. LADWP also posted the documents (the Proposed Plan, RI/FS, HHRA and related documents) on the LADWP website www.ladwp.com/remediation. Printed copies and electronic copies of the documents were maintained at the following four public repositories for public viewing.

Information Repositories

City of Los Angeles Central Library
Science and Technical Department
630 West 5th Street
Los Angeles, CA 90071
(213) 228-7216

City of Burbank Public Library
110 North Glenoaks Street
Burbank, CA 91502
(818) 238-5880

City of Glendale Public Library
222 East Harvard Street
Glendale, CA 91205
(818) 548-2021

Panorama City Public Library
14345 Roscoe Boulevard
Panorama City, CA 91402
(818) 894-4071

Two email notifications were sent to 88 Neighborhood Councils, and a posting was made on LADWP's Facebook page. The documents were posted on the LADWP website www.ladwp.com/remediation. Printed copies and electronic copies of the documents were maintained at public repositories for public viewing:

- City of Los Angeles Central Library;
- City of Glendale Public Library;
- City of Burbank Public Library; and
- Panorama City Public Library.

Key dates for the public comment process include the following.

- On December 7, 2016, LADWP advertised the Public Comment period in multiple newspapers of widespread circulation in the area.

- On January 4, 2017, LADWP held a public meeting at the Valley Plaza Library, which was attended by more than 21 members of the public. LADWP made a presentation about the RI/FS, Proposed Plan and related documents and answered questions from the public.
- On January 11, 2017, LADWP made a presentation to the Valley Alliance of Neighborhood Councils. Over 40 people representing 22 Neighborhood Councils attended the meeting. LADWP staff engaged the attendees in discussion of their questions and comments.
- On January 24, 2017, LADWP extended the Public Comment Period for an additional 30+ days to February 27, 2017.
- On February 8, 2017, LADWP held a second public meeting at the Valley Plaza Library. LADWP made a presentation about the Proposed Plan, RI/FS and related information, and answered questions from the public.
- On February 27, 2017, LADWP extended the public comment period to March 29, 2017.

LADWP received comments on the RI/FS and Proposed Plan in the form of letters, comments at the public meeting, and via its website. Comments that expressed an opinion on the project were supportive, including more than 10 letters. The lone exception is the comment letter from CalMat, which has been identified as a liable party for the release of 1,4-dioxane from Hewitt Pit. CalMat objects to the Proposed Plan and does not support the IRA.

Moving forward, LADWP plans to work with the SWRCB Division of Financial Assistance (DFA), DDW and the LARWQCB to develop a Technical Advisory Committee (TAC) for groundwater remediation planning and implementation projects in the SFB that are receiving Proposition 1 funding through the Groundwater Grant Program.

LADWP recognizes the importance of its remediation efforts being closely coordinated with nearby cleanup efforts of third parties to optimize mass removal, minimize spreading of contaminant plumes in the North Hollywood area of the basin, and reduce overall costs and the timeframe for remediation. LADWP intends to enter into a Memorandum of Understanding (MOU) with the State Water Resources Control Board and the Los Angeles Regional Water Quality Control Board to assure such coordination occurs. The MOU will identify the forum and processes for discussion and resolution of issues related to monitoring, modeling, design, construction, and operation of the Project and potential future nearby third-party cleanup efforts.

2.6 Scope and Role of the Response Action

LADWP intends for this IRA to protect human health and the environment, and to help restore and maintain the beneficial uses of the SFB. The IRA is intended to limit the migration of 1,4-dioxane in groundwater at concentrations that impair beneficial uses of the groundwater, remove 1,4-dioxane from the groundwater at and downgradient of the NHW Well Field area, and restore the capability to operate the well field consistent with its historic and planned use.

1,4-Dioxane has been measured in groundwater at concentrations exceeding 10 times the NL, both at the NHW production wells and at numerous locations up-gradient of the NHW production wells. This magnitude of exceedance falls outside the levels that permit the water to be served even with blending pursuant to the current Blending Plan and the Permit issued by DDW to LADWP. These levels also exceed the cleanup goal set by EPA at nearby areas in the SFB (EPA 2009a).

LADWP acknowledges that other groundwater contaminants such as VOCs exist and pose a risk that will be addressed separately, however, this IRA focuses on 1,4-dioxane as a risk management strategy because this constituent is posing the most significant impact on the beneficial use of groundwater in accordance with the LARWQCB Basin Plan, which conforms with the State of California Antidegradation Policy (i.e., SWRCB Resolution 68-16 and 92-49), an Applicable Relevant and Appropriate Requirement (ARAR) for this IRA.

It is LADWP's judgment that the IRA identified in the Proposed Plan is necessary to protect human health and the environment from actual or threatened releases of 1,4-dioxane into the environment.

2.7 Remedial Action Objectives and Cleanup Goals

The Remedial Action Objectives (RAOs) for this IRA include the following.

- Protect human health and the environment by reducing the potential for exposure to 1,4-dioxane in groundwater at concentrations exceeding regulatory values or risk-based cleanup goals.
- Limit the migration of 1,4-dioxane in groundwater in the vicinity of the NHW Well Field at concentrations that prevent the beneficial use of the SFB.
- Remove 1,4-dioxane from groundwater in the vicinity of the NHW Well Field to maintain the beneficial uses of the SFB and restore the aquifer to the extent practicable.
- Restore LADWP's capability to operate its existing NHW Well Field consistent with historic and planned use of the NHW Well Field.

These RAOs were developed to address the groundwater entering the NHW groundwater production wells, 1,4-dioxane in the groundwater, the use of the groundwater for domestic and other purposes, and the potential exposure routes including ingestion, inhalation, and dermal contact with groundwater containing contaminant concentrations exceeding regulatory values (e.g., MCLs, NLs, etc.).

These RAOs do not address CalMat's Hewitt Pit Landfill (source of 1,4-dioxane in groundwater) and the 1,4-dioxane plume emanating from the Hewitt Pit Landfill. A response action to address the source and the associated 1,4-dioxane plume is the subject of separate and discrete programs by the LARWQCB and the EPA.

Releases of contaminants from CalMat's Hewitt Plan Landfill to groundwater were first documented in the 1980s, approximately 30 years ago. The characterization of one of the contaminants released to groundwater, 1,4-dioxane, did not begin until 2014 after this contaminant was detected in the water extracted by LADWP from its NHW Well Field. At the time of the RI/FS in December 2016, there were no plans approved by the LARWQCB or EPA to remediate the releases.

2.7.1 Cleanup Goals

Based on the RAOs, LADWP has developed cleanup goals for 1,4-dioxane, TCE, and PCE in SFB groundwater. The cleanup goal for the IRA to address the 1,4-dioxane plume was set equal to the

California NL, which is the same criteria identified by EPA for the North Hollywood OU (EPA 2009a). For groundwater that would be served for domestic use, additional cleanup goals were developed based on applicable California MCLs. The cleanup goals are presented in Tables 2-1 and 2-2.

Table 2-1 – Cleanup Goals for 1,4-Dioxane Plume Interim Remedial Action

COC	Units	EPA MCL	CA MCL	CA NL	Preliminary Cleanup Goal	Basis of Goal
1-4-Dioxane	µg/L	-	-	1	1	CA NL

Table 2-2 –Cleanup Goals for COCs if Water Served for Potable Use

COC	Units	EPA MCL	CA MCL	CA NL	Preliminary Cleanup Goal	Basis of Goal
1-4-Dioxane	µg/L	-	-	1	1	CA NL
PCE	µg/L	5	5	-	5	CA MCL
TCE	µg/L	5	5	-	5	CA MCL
1,1-DCE	µg/L	7	6	-	6	CA MCL

California established the NL of 1 µg/L for 1-4,dioxane, which is based on a USEPA risk analysis of ECR of approximately 10^{-6}. This value is based on the ingestion of drinking water, which is appropriate for the domestic use end use contemplated for the beneficial use of groundwater in this area. While USEPA calculated an ECR of 10^{-6} at 0.35 µg/L, the NL of 1 µg/L is within a factor of 3 and is therefore within an acceptable ECR risk range comparable to a typical MCL and acceptable risk range for a CERCLA response action. LADWP also identified the NL for 1,4-dioxane as a TBC, which further supports its use in the creation of cleanup levels. NLs are health based advisory levels for chemicals in drinking water that are established for chemicals for which there are no formal regulatory standards (Maximum Contaminant Levels, or MCLs). NLs set for drinking water in the 10^{-6} range are an appropriate metric for cleanup levels for water intended for domestic use.

In addition, during the public comment period, the DDW submitted a comment letter dated February 23, 2017, which confirmed that DDW may require evaluation in accordance with the DDW Policy Memo 97-005 for Direct Domestic Use of Extremely Impaired Sources. That directive includes additional monitoring requirements, design evaluation, and treatment goals. DDW noted that this evaluation may result in treatment goals that are lower than the goals listed in Tables 2-1 and 2-2 of the RI/FS. To ensure that the potable water end use can be utilized as part of this IRA, the LADWP expressly includes as cleanup goals for treated water to be served by the IRA to be the values identified in Table 2-2 above or then-existing standards that apply by virtue of the LADWP permit for the serving of such water from DDW, whichever is more stringent.

In summary, LADWP adopts the preliminary cleanup goals identified above as the cleanup goals, with the additional requirement that treated water must also meet any then-applicable requirements of DDW for use of such treated water for a potable water end use. These values will meet the ARARs and TBC of the MCL or NL, will be protective of public health and the environment and will assure that the remedy (which involves the serving of treated water to the public) can be implemented. This approach is comparable to the one employed by EPA for other response actions being implemented by EPA (such as the North Hollywood OU) in this area that involve direct domestic use of treated water.

2.8 Summary of Remedial Alternatives

Based on the available information about the current nature and extent of 1,4-dioxane groundwater contamination in the vicinity of the NHW Well Field and projections for future water withdrawals, LADWP developed a range of IRA alternatives for achieving the RAOs described above. Three IRA alternatives (Alternatives 1 through 3) that incorporate different combinations of technologies and process options (described in detail in the Interim RI/FS) were developed.

2.8.1 Alternative 1 – No Action

EPA regulations require that a No Action alternative be considered and compared to the action alternatives. In the No Action alternative, LADWP would implement its pumping plan for the NHW Well Field in accordance with its long-term water rights and historical use. The LADWP pumping plan includes the extraction of up to 38,178 AFY of groundwater from the 14 existing groundwater production wells in accordance with the Permit issued by DDW to LADWP and the Blending Plan. However, no containment or treatment actions would be implemented to protect human health and the environment in compliance with any federal or state environmental standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate or other criteria to be considered. These applicable or relevant and appropriate requirements are referred to as ARARs and the to-be-considered criteria as TBCs. As a result, seven groundwater production wells would be removed from service due to 1,4-dioxane concentrations in groundwater exceeding the DDW NL. Removing these wells from service would result in a significant loss of potable water for the City, allow 1,4-dioxane to migrate to down-gradient groundwater resources and other groundwater production wells, and would not achieve the RAOs. No incremental cost is associated with this alternative.

2.8.2 Alternative 2 – Alternate Water Supply

For Alternative 2, LADWP would implement institutional actions, including engineering and administrative controls to mitigate direct exposure pathways to protect human health in compliance with ARARs and TBCs. Institutional actions would include blending, alternate pumping plans, alternate water supply, monitoring, and groundwater use restrictions.

Blending would be implemented in accordance with the existing Blending Plan to prevent drinking water contaminants regulated by the DDW from exceeding the MCLs and NLs within the LADWP system at the blend point down-stream of the NHW Well Field.

An alternate pumping plan would be implemented to support the Blending Plan by providing a mixture of water from multiple wells within the NHW Well Field as needed to prevent contaminants from exceeding MCLs and NLs at the LADWP blend points. The alternate pumping plan would involve pumping production wells in accordance with the operational priority presented in the Blending Plan. The operational priority would minimize pumping from the more contaminated production wells.

An alternate water supply would be secured from the Metropolitan Water District of Sothern California (MWD) to replace water lost from removing seven groundwater production wells from service. Replacement water would be secured in the amount of 22,800 AFY or 60% of the total capacity of the NHW Well Field. The replacement water would be secured for a period of at least 13 years, based on groundwater modeling for Alternative 3 provided in the Interim RI/FS.

Monitoring would be implemented for a period of at least 13 years to provide data to support the blending, alternate pumping plan, and alternate water supply institutional actions, and to monitor the fate and transport of 1,4-dioxane from the NHW Well Field capture zone to the NHW Well Field production wells.

Groundwater use restrictions would be implemented to prevent human exposure to contaminated groundwater and maintain the integrity of the remedial alternative. Groundwater use restrictions would be primarily overseen by the Upper Los Angeles River Area (ULARA) Watermaster, which provides centralized control over groundwater use in the NHW Well Field capture zone.

2.8.3 Alternative 3 – Groundwater Pump and Treat for Direct Domestic Use

Alternative 3 differs from Alternative 2 in that containment and treatment actions would be taken to reduce the toxicity, mobility, and volume of contaminated groundwater through treatment. Human health would be protected by capturing and removing 1,4-dioxane contaminated groundwater from the NHW Well Field area through hydraulic control, and treating the contaminated groundwater aboveground to permanently remove 1,4-dioxane, as well as PCE, TCE, and 1,1-DCE from groundwater. The beneficial use of groundwater would be restored in accordance with the LARWQCB Basin Plan, which conforms with the State of California Antidegradation Policy (i.e., SWRCB Resolution 68-16 and 92-49); an ARAR for this IRA.

Hydraulic control would be implemented in a manner that draws contaminated groundwater toward designated remediation wells, and away from other groundwater production wells within the NHW Well Field and down-gradient groundwater resources. Hydraulic control would reduce the likelihood for these other groundwater production wells within the NHW Well Field and down-gradient groundwater resources to be impacted by 1,4-dioxane.

The contaminated groundwater captured by the NHW remediation wells would be managed aboveground by implementing a combination of institutional and treatment actions. Institutional actions would include implementation of the bypass, blending, alternative pumping plans, monitoring and groundwater use restrictions; which are described in Alternative 2.

Treatment actions would include aboveground treatment of the groundwater impacted by 1,4-dioxane, which would be implemented in compliance with ARARs and TBCs to protect human health. Treatment would include AOP technology to transform 1,4-dioxane, as well as TCE, PCE, and 1,1-DCE, into innocuous byproducts. Carbon quenching would be implemented to remove the remaining hydrogen peroxide from water downstream of an AOP.

The blended and treated groundwater would be conveyed to the LADWP potable water distribution system for direct domestic use.

2.9 Evaluation of Remedial Alternatives

To determine which alternative to select, LADWP evaluated and compared the remedial alternatives using EPA's nine evaluation criteria. The nine criteria are summarized in the Interim RI/FS Report (Hazen 2016a). EPA categorizes the nine criteria into three groups: (1) threshold criteria, (2) balancing criteria, and (3) modifying criteria. The seven threshold and balancing criteria were evaluated in the RI/FS and Proposed Plan, while this document evaluates all nine criteria, based on the RI/FS and related documents, as well as information received during the public comment period.

The alternatives were evaluated in relation to the threshold criteria and the balancing criteria. A more detailed description of this evaluation is provided in the RI/FS report. LADWP considered the modifying criteria (i.e., State and Community Acceptance) after review of public comments. The alternatives were evaluated and assigned qualitative ratings of poor, fair, and good for performance in relation to each other and the criteria. Table 2-3 summarizes LADWP's ranking of the alternatives in relation to EPA's threshold and balancing evaluation criteria.

Table 2-3 - Alternatives Compared to EPA's Evaluation Criteria in RI/FS and Proposed Plan

Evaluation Criteria	Alternative 1 No Action	Alternative 2 Institutional Actions	Alternative 3 Groundwater Pump and Treat for Direct Domestic Use
Protection of Human Health and the Environment	NA	Poor	Good
Compliance with ARARs	NA	Poor	Good
Long-term Effectiveness and Permanence	Poor	Poor	Good
Reduction of Toxicity, Mobility, or Volume through Treatment	Poor	Poor	Good
Short-Term Effectiveness	NA	Fair	Good
Implementability	NA	Fair	Good
Cost (Net Present Value)	$0	$249,200,000	$100,400,000

2.9.1 Overall Protection of Human Health and the Environment

Alternative 1 does not take action to prevent the migration of 1,4-dioxane in groundwater and is not protective of human health and the environment. This alternative does not include remedial action, does not monitor the condition of the groundwater basin, and would not meet the RAOs. Alternative 1 was eliminated from further consideration on this basis.

Alternative 2 is similar to Alternative 1 in that remedial action is not take action to prevent the migration of 1,4-dioxane in groundwater, however, Alternative 2 includes the institutional action of securing an alternate water supply to mitigate exposure to 1,4-dioxane contaminated groundwater. Alternative 2 would not maintain the beneficial use of the SFB as LADWP would not be able to extract its current and future groundwater rights from any combination of production wells in the NHW Well Field and SFB. Alternative 2 would not protect the environment because the contamination would remain in the aquifer and not be remediated. Alternative 2 was assigned a Protection of Human Health and the Environment rating of ‘poor’.

Alternative 3 provides the best overall protection of the environment and meets the RAOs. This alternative eliminates direct exposure pathways, reduces the migration of contaminated groundwater, and reduces the toxicity, mobility and volume of contaminated groundwater through treatment. This alternative remediates and removes mass from the groundwater entering the NHW production wells, limits the migration of 1,4-dioxane in groundwater, and restores LADWP’s capability to operate its existing NHW Well Field consistent with historic and planned use in a flexible manner. LADWP would be able to extract groundwater from wells affected or threatened by 1,4-dioxane from the NHW Well Field and the mass of 1,4-dioxane in the groundwater would be reduced. Alternative 3 was assigned an Overall Protection of Human Health and the Environment rating of ‘good’.

2.9.2 Compliance with ARARs

No chemical-, location-, or action-specific ARARs apply to Alternative 1. Therefore, Alternative 1 was not assigned a Compliance with ARARs rating.

Alternative 2 would comply with some of the ARARs and TBCs identified in the RI/FS but would not effectively remove or abate 1,4-dioxane in groundwater, and would not comply with SWRCB Resolution No. 92-49. Alternative 2 was assigned a Compliance with ARARs rating of ‘poor’.

Alternative 3 would comply with the action-specific ARARs and TBCs identified in the RI/FS. Alternative 3 was assigned a Compliance with ARARs rating of ‘good’.

As discussed above, DDW noted that two TBCs from the RI/FS should be considered ARARs, but since the RI/FS analysis identified those guidelines as TBCs, that minor change does not affect the analysis of ARAR compliance.

2.9.3 Long-Term Effectiveness and Permanence

Alternatives 1 and 2 would not provide long-term effectiveness and permanence as neither alternative reduces the migration of contaminated groundwater to groundwater production wells and down-gradient water resources. Potential risks to human health and the environment would remain. Alternatives 1 and 2 were assigned a Long-Term Effectiveness and Permanence rating of ‘poor’.

Alternative 3 would provide effective and reliable control of 1,4-dioxane migration in the vicinity of the NHW Well Field and would be the most effective and robust alternative for reducing residual risk since it would result in significant reduction in 1,4-dioxane concentrations in groundwater and can function over a range of hydrologic conditions.

Alternative 3 would also prevent further downgradient migration of the 1,4-dioxane plume to other groundwater production wells and down-gradient water resources. The remediation facility in Alternative 3 would provide a long-term, effective treatment solution for contaminated groundwater.

Compared to Alternatives 1 and 2, Alternative 3 also provides the highest degree of certainty that the NHW wells, a critical source of potable water, could operate over its 13-year duration or longer under a wide range of conditions. Alternative 3 was assigned a Long-Term Effectiveness and Permanence rating of 'good'.

2.9.4 Reduction of Toxicity, Mobility or Volume through Treatment

Alternatives 1 and 2 do not include treatment; therefore, the alternatives would not reduce the toxicity, mobility, or volume of contaminated groundwater. These alternatives do not meet this criterion and were therefore assigned a Reduction of Toxicity, Mobility, or Volume through Treatment rating of 'poor'.

Alternative 3 would reduce the volume and mass of 1,4-dioxane in groundwater, and would reduce the migration of the 1,4-dioxane plume. Alternative 3 was assigned a Reduction of Toxicity, Mobility, or Volume through Treatment rating of 'good'.

2.9.5 Short-Term Effectiveness

Alternative 1 does not involve the implementation of a remedial action. Therefore, the alternative was not assigned a Short-Term Effectiveness rating. However, it does not achieve any RAOs and therefore is not effective over the short-term.

Implementation of Alternative 2 would not involve remedial actions other than blending operations and the removal of production wells from service. Therefore, the implementation of the alternative does not pose additional potential hazards to the community, workers, or the environment. Alternative 2 would not achieve the RAOs in the short-term, with the exception of preventing exposure to 1,4-dioxane in groundwater through institutional actions. Otherwise, the alternative is not effective over the short-term. Alternative 2 was assigned a Short-Term Effectiveness rating of 'fair'.

Implementation of Alternative 3 would involve the construction of a remediation facility, which has the potential to create short-term impacts typical of construction projects, including potential hazards to the community, workers, and the environment. However, environmental impacts during construction and operation of the facility can be mitigated. The land and much of the infrastructure required is already in place, which will reduce the time and cost required to implement the remedy. Alternative 3 does not pose any un-mitigatable risks to the community during construction and implementation, nor do any of the alternatives pose un-mitigatable risks to workers beyond the typical risks associated with a construction project. No un-mitigatable negative environmental impacts are anticipated in the area in which the facilities would be built. Alternative 3 will be effective over the short-term in achieving RAOs by capturing the 1,4-dioxane contamination at the NHW wells, limiting the migration of 1,4-dioxane (and other contaminants), removing contaminant mass, restoring the beneficial use of the water served from the treatment system and restoring the capability of LADWP to operate the NHW Well Field. Alternative 3 was assigned a Short-Term Effectiveness rating of 'good'.

2.9.6 Implementability

Alternative 1 does not involve the implementation of a remedial response. Therefore, the alternative was not assigned an Implementability rating.

Alternative 2 is implementable from a technical and institutional standpoint; however, the water the City imports is a decreasingly reliable source due to increasing uncertainties in seasonal availability, environmental conditions, and political influences (LADWP 2015). In addition, there is the risk that DDW could restrict blending in the future, which would further limit the options for this alternative. The long-term implementability of this alternative thus faces greater risks. Alternative 2 was therefore assigned an Implementability rating of ‘fair’.

Alternative 3 involves implementation steps typical of projects of this nature, from both a technical and institutional standpoint. The land and much of the infrastructure required is already in place, which will reduce the time and cost required to implement the remedy. Permitting would involve completing the California Environmental Quality Act (CEQA) and DDW permit processes, which could take over a year. The process options of AOP for 1,4-dioxane removal and granular activated carbon (GAC) for hydrogen peroxide removal are effective and reliable treatment technologies. Design and construction could take longer than two years to complete. O&M of the facility would require monitoring of operational performance for 13 years. While this alternative assumes that non-remediation wells could rely on blending, no blending is used for the remediation wells that will capture the 1,4-dioxane plume. Thus, the risk that blending might be more restricted in the future should not adversely affect ability to implement Alternative 3 to capture the 1,4-dioxane plume. Alternative 3 was assigned an Implementability rating of ‘good’.

2.9.7 Cost

Alternative 1 would not involve the implementation of a remedial action. Therefore, there are no incremental costs associated with this alternative.

Alternative 2 involves institutional actions including the purchase of an alternate water supply of 22,800 AFY for a period of approximately 13 years for comparison, and therefore has a comparatively higher cost than Alternative 3.

Alternative 3 involves containment and treatment actions for a period of approximately 13 years, and has a comparatively lower cost than Alternative 2. The direct, recurring and total NPV costs estimated for each alternative are summarized in Table 2-4 and described in detail in the RI/FS.

If 1,4-dioxane persists in the groundwater in the vicinity of the NHW production wells for more than 13 years, the cost of Alternative 3 will increase; however, the relative cost of Alternative 3 compared to Alternative 2 will decrease as the annual cost of treatment operations is estimated to be significantly less than the cost of replacement water.

For projects to be implemented by the federal government, EPA guidance recommends the use of the discount rate issued by the federal Office of Management and Budget (OMB), which is currently 1.5% (net of inflation) for a 30-year project (OMB 2015). For similar reasons, the updated OMB discount rate of 1.5% provides an appropriate discount rate for projects to be implemented by public agencies, which have lower costs of capital than private sector entities. Given the many pressures on water in the area, it is likely that the costs of water will increase at a greater rate than inflation, such that a lower real discount rate could be appropriate for Alternative 2. The effect of a lower real discount rate would be to increase the cost of Alternative 2 relative to Alternative 3. The cost estimate accuracy range is expected to be within a -30% to +50% guideline range (EPA 1988).

Table 2-4 Cost Summary for Remedial Alternatives

Remedial Alternative	Capital Cost	Recurring Cost	NPV
1 – No Action	$0	$0	$0
2 – Alternate Water Supply	$0	$22,000,000	$249,200,000
3 – Pump and Treat and Direct Domestic Use	$77,700,000	$2,010,000	$100,400,000

Notes:

NPV = Net Present Value

NPV is calculated based on a 1.5% rate (net of inflation) and 13 year project life. For Alternative 2, the NPV includes cost for 2020 through 2032. For Alternative 3, the NPV includes capital and O&M costs for 2020 through 2032.

2.10 State and Community Acceptance

Now that the public comment period is closed, LADWP is in a position to evaluate the two modifying criteria, state acceptance and community acceptance, based on information received during the public comment period. The State Water Resources Control Board sent letters of support for LADWP's preferred alternative, Alternative 3, from both the DDW and the Division of Financial Assistance (DFA). The LARWQCB offered coordination during implementation. LADWP received comments and letters of support from numerous community groups for Alternative 3.

No members of the general public, regulatory agencies or public entities expressed opposition to the IRA or support for Alternatives 1 or 2. One commenter (CalMat) objected to LADWP's proposed cleanup plan and does not support the proposed IRA.

Based on this information, LADWP concludes that the modifying criteria support selection of Alternative 3.

2.11 Selected Remedy

2.11.1 Summary of the Rationale for the Selected Remedy

Based on the information currently available, LADWP has concluded that the selected remedy meets the EPA threshold criteria and provides the best balance of trade-offs among the remedial alternatives on the basis of all nine EPA criteria.

LADWP expects the preferred IRA to satisfy the following statutory requirements of the CERCLA of 1980 as amended: 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; 5) satisfy the preference for treatment as a principal element, and 6) otherwise best satisfy the NCP remedy selection criteria.

LADWP's selected IRA is a groundwater pump and treatment system intended to reduce the toxicity, mobility, and volume of contaminated groundwater through treatment. Human health would be protected by capturing and removing 1,4-dioxane contaminated groundwater from the NHW Well Field area through hydraulic control, and treating the contaminated groundwater aboveground to permanently remove 1,4-dioxane, as well as PCE, TCE, and 1,1-DCE from groundwater. The beneficial use of groundwater would be restored in accordance with the LARWQCB Basin Plan, which conforms with the State of California Antidegradation Policy (i.e., SWRCB Resolution 68-16 and 92-49); an ARAR for this IRA.

The most decisive considerations that affected the selection of the remedy were as follows.

- The high likelihood and certainty that the groundwater pump and treatment system reduces risk to human health from potential exposure to contaminants in groundwater, and the high level of protection provided to downgradient aquifers through hydraulic capture of releases from the source area.
- The high likelihood that the remedy will achieve compliance with ARARs and TBCs.
- The demonstrated long-term effectiveness and permanence of groundwater pump and treatment to remove 1,4-dioxane from other groundwater production well fields in Southern California.
- The high likelihood that the pump and treatment process reduces the toxicity, mobility and volume of 1,4-dioxane in groundwater and therefore addresses the principal threat to human health and the environment. The anticipated pumping volumes develop a large capture zone, which further increases the probability that the plume in the area will be effectively captured.
- The relative short time required to achieve protection against the principal threats to human health and the environment, address the remaining threats, and achieve the RAOs.
- The high implementability and reliability of groundwater pumping using existing groundwater production wells (the land and much of the infrastructure required is already in place, which will reduce the time and cost required to implement the remedy), and treatment for direct domestic use from the perspective of technical and administrative feasibility (e.g., DDW permitting).
- The relatively lower NPV cost of groundwater pump and treatment compared to the purchase of replacement water from the Metropolitan Water District.

Comments were largely supportive of LADWP’s preferred alternative, including those from the California SWRCB. As explained in the response to comments, a liable party for the CalMat Hewitt Pit Landfill objects to the proposed IRA on a number of grounds and indicates that actions that it intends to implement sometime in the future will limit the need for this response action. However, releases of contaminants from CalMat’s Hewitt Plan Landfill to groundwater were first documented in the 1980s, approximately 30 years ago. The characterization of one of the contaminants released to groundwater, 1,4-dioxane, did not begin until 2014 after this contaminant was detected in the water extracted by LADWP from its NHW Well Field. At the time of the RI/FS in December 2016 and the time of this decision, there were no plans approved by the LARWQCB or EPA to remediate the releases.

2.11.2 Description of the Selected Remedy

LADWP’s preferred IRA is Alternative 3, which includes the implementation of institutional controls, containment and treatment actions. The preferred IRA would be designed to hydraulically capture 1,4-dioxane groundwater within the NHW Well Field area, provide aboveground treatment and management of the 1,4-dioxane, PCE, TCE and 1,1-DCE contaminated groundwater and then provide the treated water to LADWP for direct domestic use.

Key components of Alternative 3 depicted in Figures 2-2 and 2-3 include groundwater production wells, conveyance piping, treatment facilities, distribution piping and monitoring wells.

Figure 2-2- Alternative 3 Wells, Pipelines, Treatment Facility, Distribution System

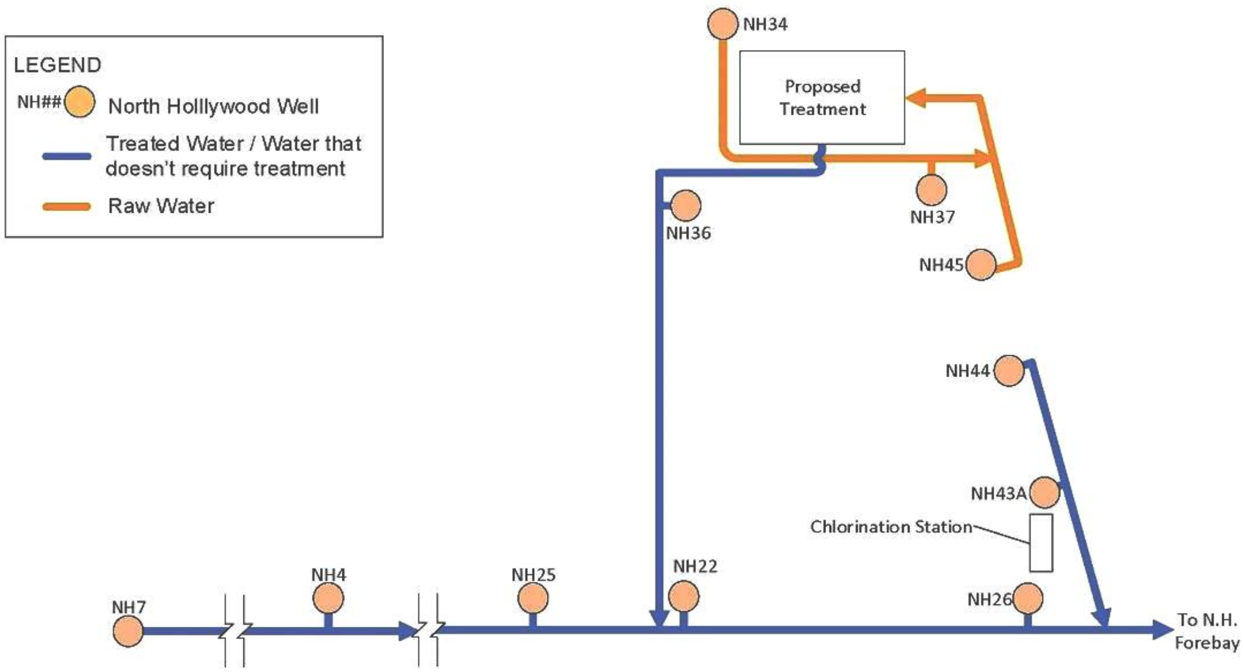
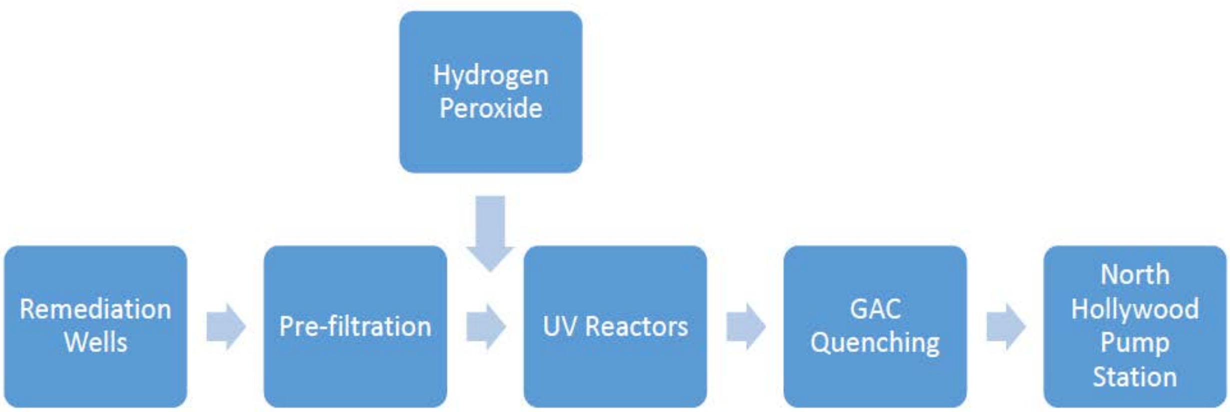


Figure 2-3- Alternative 3 Simplified Process Flow Diagram



The IRA will include containment and treatment actions to reduce the toxicity, mobility, and volume of contaminated groundwater through treatment. Human health will be protected by capturing and removing 1,4-dioxane from the NHW Well Field area through hydraulic control, and treating the contaminated groundwater aboveground to remove 1,4-dioxane and other VOCs from the treated groundwater. The beneficial use of the treated groundwater would be restored in accordance with the LARWQCB Basin Plan (LARWQCB 1994), which conforms to the State of California Antidegradation Policy (i.e., SWRCB Resolution 68-16 [SWRCB 1968]) and SWRCB 92-49.

Hydraulic control will be implemented in a manner that draws 1,4-dioxane impacted groundwater toward three designated Remediation wells (i.e., NH-34, NH-37, NH-45), and away from other groundwater production wells within the NHW Well Field and downgradient groundwater resources. Hydraulic control will reduce the likelihood for these other groundwater production wells within the NHW Well Field and downgradient groundwater resources to be impacted by 1,4-dioxane. The three designated Remediation wells will be removed and replaced in their current locations.

The contaminated groundwater captured by the NHW Remediation wells will be managed aboveground by implementing a combination of institutional and treatment actions. Institutional actions will include bypass, blending, alternate pumping plans, monitoring, and groundwater use restrictions. Bypass will be implemented to separate water flowing from Remediation wells and Preferred wells to prevent exposure to 1,4-dioxane and reduce the volume of contaminated groundwater requiring treatment. Blending will be implemented in accordance with the existing LADWP Blending Plan and DDW requirements. Alternate pumping plans will be implemented to provide a mixture of water from multiple wells, as needed, to prevent contaminants from exceeding MCLs and NLs at individual wells and the down-stream blend point. Monitoring will be implemented to provide data to support the optimization of blending and treatment actions, and to monitor the fate and transport of 1,4-dioxane within the NHW Well Field area. Groundwater use restrictions will be implemented to prevent human exposure to contaminated groundwater and maintain the integrity of the remedial alternative.

Treatment actions will include aboveground treatment, which will be implemented in compliance with ARARs and TBCs to protect human health. Treatment will include pre-filtration, AOP, carbon quenching, and disinfection. Pre-filtration will be implemented to remove solids from groundwater, which have the potential to interfere with downstream treatment processes. AOP technology will be implemented to oxidize 1,4-dioxane, TCE, PCE, and 1,1-DCE. Carbon quenching will be implemented to remove the remaining hydrogen peroxide from water downstream of an AOP. Disinfection will be implemented downstream of the carbon quenching to treat the groundwater for direct domestic use. The blended and treated groundwater will be conveyed to the LADWP potable water distribution system for direct domestic use.

In the treatment process, hydrogen peroxide is injected into the raw water, and this water flows through ultraviolet (UV) reactors, where UV light will be passed through the water. Exposure to UV light will cause the release of hydroxyl radicals from the hydrogen peroxide, and the COCs will be oxidized. Once the water exits the UV reactor, excess hydrogen peroxide will be removed by passing the water through liquid phase GAC vessels. After passing through the GAC vessels, the water will enter the existing well collector pipeline and be disinfected. The GAC vessels will be periodically flushed and backwash water will be recycled to the head of the treatment facility or disposed of in the local sewer system or storm drain system.

Based on information currently available, LADWP believes the IRA meets the threshold criteria and provides the best balance of trade-offs among the other alternatives with respect to the balancing and modifying criteria. LADWP expects the IRA to satisfy the following statutory requirements of the CERCLA of 1980, as amended: 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; 5) satisfy the preference for treatment as a principal element, and 6) otherwise best satisfy the NCP remedy selection criteria. LADWP will continue to monitor developments and data as they become available and can adjust the remedy as appropriate in response to this information during the remedial design or implementation phase.

2.11.3 Expected Outcomes of the Selected Remedy

The selected remedy will limit the migration of 1,4-dioxane in groundwater at concentrations that prevent beneficial uses of the groundwater. Hydraulic control will be implemented in a manner that draws groundwater contaminated with 1,4-dioxane toward three designated Remediation wells, and away from the other 11 groundwater production wells within the NHW Well Field and downgradient groundwater resources. Hydraulic control will reduce the likelihood for these other groundwater production wells within the NHW Well Field and downgradient groundwater resources to be impacted by 1,4-dioxane.

The selected remedy will remove 1,4-dioxane from the groundwater at and downgradient of the NHW Well Field area, and help to restore the capability to operate the well field consistent with its historical and planned use. The SFB serves as the primary source of groundwater for the City, providing more than 90% of the City's local groundwater supply.

2.12 Statutory Determinations

Under CERCLA § 121, LADWP must select remedies that are protective of human health and the environment, comply with ARARs, consider the reasonableness of cost for the selected remedy, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ, as a principal element, treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes and a bias against off-site disposal of untreated wastes. This section provides a brief, site-specific description of how the selected remedy satisfies the statutory requirements of CERCLA §121 (as required by NCP §300.430(f)(5)(ii); Hazen 2016a, Section 5) and are summarized herein.

2.12.1 Overall Protection of Human Health and the Environment

The selected IRA provides the overall protection of the environment and meets the RAOs listed in Hazen (2016a) and Section 2.7. This alternative eliminates direct exposure pathways, reduces the migration of contaminated groundwater with higher certainty than shallow extraction wells, and reduces the toxicity, mobility and volume of contaminated groundwater through treatment. This alternative remediates and removes 1,4-dioxane mass from the groundwater that is currently entering the NHW production wells, limits the migration of 1,4-dioxane in groundwater, and restores LADWP's capability to operate its existing NHW Well Field consistent with historic and planned use in a flexible manner. The LADWP will be able to extract groundwater from wells affected or threatened by 1,4-dioxane from the NHW Well Field and the mass of 1,4-dioxane in the groundwater will be reduced. The selected IRA is protective of human health and the environment, and is addressed in detail in Hazen (2016a), Section 5.4.1.

2.12.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected IRA will comply with the action-specific ARARs and TBCs identified in the RI/FS (Hazen 2016a, Section 5.2.2). The IRA will attain the following ARARs and TBCs: National Primary Drinking Water Standards (40 CFR Part 141), Primary Drinking Water Standards (22 CCR §64431 and 64444; Health and Safety Code [H&S Code] §4010 et seq.), Secondary Drinking Water Standards (22 CCR §64471), Federal Underground Injection Control Plan (40 CFR 144, including 40 CFR 144.12, 40 CFR 144.13 and 40 CFR 146.10), Resource Conservation and Recovery Act (RCRA; Sections 3020 (a) and (b)), Water Quality Control Plan for Los Angeles Region (Basin Plan, Chapters 2 and 3), SWRCB Resolution No. 9249 Policy and Procedures for Investigation and Cleanup and Abatement of Discharges (Water Code Section 13304), California Hazardous Waste Regulations, Federal Clean Water Act (CWA) National Pollutant Discharge Elimination System (NPDES; CWA §402 et seq.), Clean Air Act (CAA) South Coast Air Quality Management District (SCAQMD), California NLs, DDW Policy Memo 97-005, and California Well Standards Bulletins 74-81 and 74-90 (while the California Well Standards Bulletins were identified as TBC in the RI/FS, they are ARARs due to their incorporation by reference in the California Code of Regulations, Title 22; this update does not affect the IRA which will comply with both ARARs and the identified TBCs; DDW 2017).

2.12.3 Long-Term Effectiveness and Permanence

The selected IRA will provide effective and reliable control of 1,4-dioxane migration in the vicinity of the NHW Well Field and will be the most effective alternative for reducing residual risk since it will result in significant reduction in 1,4-dioxane concentrations in groundwater and can function over a range of hydrologic conditions.

The selected IRA will also prevent further downgradient migration of the 1,4-dioxane plume to other groundwater production wells and downgradient water resources. The remediation facility in the selected IRA will provide a long-term, effective treatment solution for contaminated groundwater. The selected IRA also provides the highest degree of certainty that the NHW wells, a critical source of potable water, could operate over its 13-year duration or longer under a wide range of conditions, as compared to other alternatives considered in the RI/FS as outlined in Hazen (2016a), Section 5.4.3.

2.12.4 Reduction of Toxicity, Mobility or Volume through Treatment

The selected IRA will reduce the volume and mass of 1,4-dioxane in groundwater, and will reduce the migration of the 1,4-dioxane plume. The selected IRA is effective for the reduction of toxicity, mobility, or volume through treatment as discussed in Hazen (2016a), Section 5.4.5.

2.12.5 Short-Term Effectiveness

Implementation of the selected IRA will involve the construction of a remediation facility, which has the potential to create short-term impacts typical of construction projects, including potential hazards to the community, workers, and the environment. However, environmental impacts during construction and operation of the facility can be mitigated. The selected IRA does not pose any un-mitigatable risks to the community during construction and implementation, nor does the selected IRA pose any un-mitigatable risks to workers beyond the typical risks associated with a construction project. No un-mitigatable negative environmental impacts are anticipated in the area in which the facilities will be built. The selected IRA will be effective over the short-term in achieving RAOs by capturing the 1,4-dioxane contamination at the NHW wells, limiting the migration of 1,4-dioxane (and other contaminants), removing contaminant mass, restoring the beneficial use of the water served from the treatment system and restoring the capability of LADWP to operate the NHW Well Field. The selected IRA is effective for short-term actions as discussed in Hazen (2016a), Section 5.4.5.

2.12.6 Implementability

The selected IRA involves implementation steps typical of projects of this nature, from both a technical and institutional standpoint, including the permitting processes that could take over a year. The process options of AOP for 1,4-dioxane removal and GAC for hydrogen peroxide removal are effective and reliable treatment technologies. Design and construction could take longer than two years to complete. Operations and management of the facility will require monitoring of operational performance for 13 years. The selected IRA is implementable and typical of project of this nature (Hazen 2016a, Section 5.4.6).

2.12.7 Cost

The selected IRA involves containment and treatment actions for a period of approximately 13 years, and costs less than the equivalent replacement value of sourcing an alternate water supply (approximately $249,200,000) for the project duration. The total net present value cost is estimated to be $100,400,000, and a detailed cost estimate is included in the RI/FS (Hazen 2016a, Appendix B).

2.13 State Acceptance

The State has expressed its support for the selected remedy. The DFA has issued a preliminary award letter, indicating its intent to fund up to 50% of project capital costs under Proposition 1. DFA reports in its preliminary award letter that the technical experts from DDW, LARWQCB, DFA and DTSC have reviewed the project and "concur that [it] should achieve its stated objectives." The State Water Resources Control Board letter also concludes that the remedy proposed by LADWP "would cleanup and prevent the spread of contamination…" (DFA 2017).

Separately, DDW submitted a comment letter in which it concurs with the finding that the groundwater treatment process will be capable of removing 1,4-dioxane as well as VOCs from the NHW wells (DDW 2017). LARWQCB submitted comments in which it observed that this action will be complementary of other actions in the area through appropriate coordination, which LADWP intends to engage in on an ongoing basis. LARWQCB also suggests ongoing monitoring and modeling as the response action is implemented, which is already planned by LADWP (LARWQCB 2017). Both DDW and LARWQCB indicated they look forward to continuing to work with LADWP on remedies in the SFB.

No regulatory agencies or public entities expressed opposition to the IRA or support for Alternatives 1 or 2.

2.14 Community Acceptance

During the public comment period, numerous community groups expressed support for LADWP's preferred alternative. No members of the general public expressed opposition to the IRA and none expressed support for any other alternatives. One commenter (CalMat) objected to LADWP's proposed cleanup plan and does not support the proposed IRA.

2.15 Documentation of Changes

During the public comment period, LADWP received comments on the RI/FS, Proposed Plan and related documents. In response to those comments, LADWP is making the following changes to the RI/FS and proposed IRA.

- While the California Well Standards Bulletins were identified as TBC in the RI/FS, DDW commented that they are ARARs due to their incorporation by reference in the California Code of Regulations, Title 22. This update does not affect the IRA, which will comply with both ARARs and the identified TBCs.
- DDW may require evaluation in accordance with the DDW Policy Memo 97-005 for Direct Domestic Use of Extremely Impaired Sources, which includes additional monitoring requirements, design evaluation, and treatment goals. DDW noted that this evaluation may result in treatment goals that are lower than the Cleanup Goals.
- It is acknowledged that the AMEC model version citation was incorrect. The third sentence of RI/FS Appendix A p. 2, paragraph 1 should state "The model version used was named 2IR_2015-2045_CCC-Option1_v10.gwv 2015SFV_1981-2014_Cal_v11.gwv[TB1] ".

3. PART 3 RESPONSIVENESS SUMMARY

The purpose of this Responsiveness Summary is to provide a summary of the LADWP's responses to comments received from stakeholders and the public on the LADWP's Proposed Plan (Hazen 2016c) during the public comment period described in Section 2.5 herein. Detailed responses to comments are included in Appendix A.

3.1 Summary of Responses to Community Comments

Community comments were received in a variety of formats, including the following:

- nine comment cards from the community meeting on January 4, 2017;
- three comment cards from the community meeting on February 8, 2017;
- four emails sent to Remediation@LADWP.com;
- three emails sent directly to LADWP staff;
- seven letters from community groups and municipalities; and
- a letter sent from Norton Rose Fulbright on behalf of CalMat Co. d/b/a Vulcan Materials Company, Western Division to LADWP staff (3/29/17), including comments provided by CalMat's consultant, Golder Associates (collectively referred to as "CalMat comments").

Community members raised questions about the source of 1,4-dioxane in the aquifer, how the remediation project fits into the City's master plan for the SFV including indirect potable reuse and stormwater capture, impacts of the IRA on Whitsett Park usage, and the impact of no remedial action. Several comments received expressed concern with exposure to the contamination and obtaining cost recovery from responsible parties. In general, the community comments were supportive of remediation.

Community groups and municipalities provided letters of support for the IRA. Copies of the support letters are provided in Appendix A.

CalMat comments provided to LADWP stated that the Proposed Plan was not prepared in accordance with CERCLA or the NCP. CalMat requested that LADWP address perceived deficiencies in the Proposed Plan prior to proceeding with the Interim Remedial Action Plan. Appendix A contains the detailed responses to CalMat's comments.

3.2 Summary of Reponses to Other Stakeholders

Comments were received from the LARWQCB on March 28, 2017. The LARWQCB provided a discussion of remedial actions planned in the vicinity of the NHW Well Field, including the CalMat and EPA remedial actions that may have potential impacts on this project. Suggestions were provided by the LARWQCB included the following.

- Updating the groundwater modeling as more information becomes available about other remedial systems, water quality, and hydrogeological data.

- Developing and implementing a groundwater monitoring plan for 1,4-dioxane, with input from the TAC, for the purpose of adjusting operations or plans for SFB projects as needed and ensuring long term sustainability of the groundwater aquifer.
- Coordinating efforts with other remedial actions in the basin to cost-effectively maximize plume containment.

Comments were received from the DDW on February 23, 2017. DDW noted the following:

- DDW may require evaluation in accordance with the DDW Policy Memo 97-005 for Direct Domestic Use of Extremely Impaired Sources, which includes additional monitoring requirements, design evaluation, and treatment goals. DDW notes that this evaluation may result in treatment goals that are lower than the preliminary goals listed in Tables 2A and 2B of the RI/FS.
- DDW would also like to clarify the status of the California Well Standards Bulletins 74-81 and 74-90, which were discussed in Section 2.2.3 of the RI/FS Report. The California Well Standards Bulletins 74-81 and 74-90 were incorporated by reference in the California Code of Regulations, Title 22, California Waterworks Standards Section 64560(c)(1) and are required in the construction of all new public water supply wells in the state.
- If Alternative 3 is selected, DDW looks forward to working with LADWP in the permitting process for this facility.

Detailed responses to each of these items are provided in Appendix A.

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Los Angeles Department of Water & Power

NHW IRAD
Appendix A
Detailed Responses to Comments
State Comments

Owners Agent San Fernando Basin Groundwater Remediation

Prepared for:

City of Los Angeles
Department of Water and Power
111 North Hope Street
Los Angeles, California 90012

July 2017

Submitted by:

Hazen and Sawyer (Hazen) under Agreement No. 47329-5 (Owner's Agent for the SFB Remediation)

Prepared by:

WorleyParsons and Hazen

RESPONSES TO:

COMMENTS RE: "DECEMBER 2016 INTERIM REMEDIAL INVESTIGATION/ FEASIBILITY STUDY REPORT FOR NORTH HOLLYWOOD WEST WELL FIELD"

BY STATE WATER RESOURCES QUALITY CONTROL BOARD DIVISION OF DRINKING WATER RECEIVED FEBRUARY 23, 2017

COMMENT 1: ***The RI/FS Report evaluates three remedial alternatives to address the 1,4-dioxane contamination found in the North Hollywood West wellfield, and selects groundwater pumping and treatment for direct domestic use (Alternative 3) as the most effective alternative to meet the stated remedial action objectives (RAOs). Alternative 3 proposes ex situ treatment of three North Hollywood West wells, which were chosen on the basis of their past water quality data and groundwater modeling of future contaminant levels. The treatment process includes advanced oxidation processes (AOP) for 1,4-dioxane removal and quenching with granular activated carbon (GAC).***

DDW concurs with the finding that the groundwater treatment process proposed in Alternative 3 would be capable of removing 1,4-dioxane, as well as volatile organic chemicals (VOCs), from the North Hollywood West wells. With appropriate design and operating conditions, DDW anticipates that the proposed facility would meet DDW requirements for permitting as a potable water treatment facility. As discussed in the RI/FS Report, DDW may require evaluation in accordance with the DDW Policy Memo 97-005 for Direct Domestic Use of Extremely Impaired Sources, which include additional monitoring requirements, design evaluation, and treatment goals. DDW notes that this evaluation may result in treatment goals that are lower than the preliminary goals listed in Tables 2A and 2B.

LADWP RESPONSE:

Los Angeles Department of Water and Power (LADWP) appreciates the Division of Drinking Water's (DDW's) support of Alternative 3 as being capable of removing 1,4-dioxane and volatile organic compounds (VOCs) from North Hollywood West (NHW) wells. LADWP is committed to designing a treatment facility that meets the anticipated DDW requirements that will achieve the proposed end use of direct domestic use. The proposed remedial concepts and estimated costs for Alternative 3 have flexibility and capability to meet more stringent treatment goals if required by DDW, following the equivalent maximum contaminant level (MCL) approach for treatment of multiple contaminants and laid out on the policy memo. LADWP will include reference to the 97-005 policy in the Interim Remedial Action Decision (IRAD) in connection with the potable water end use.

COMMENT 2: ***DDW would also like to clarify the status of the California Well Standards Bulletins 74-81 and 74-90, which were discussed in Section 2.2.3 of the RI/FS Report. The California Well Standards Bulletins 74-81 and 74-90 were incorporated by reference in the California Code of Regulations, Title 22, California Waterworks Standards Section 64560(c)(1) and are required in the construction of all new public water supply wells in the state.***

LADWP RESPONSE:

Comment noted. LADWP will clarify in the IRAD that these Bulletins are Applicable Relevant and Appropriate Requirements (ARARs) since they are incorporated by reference in the California Code of Regulations. The minor change does not affect the analysis in the Feasibility Study (FS) because the bulletins were identified as TBCs that would have to be met by the alternatives.

COMMENT 3: ***If Alternative 3 is selected, DDW looks forward to working with LADWP in the permitting process for this facility.***

LADWP RESPONSE:

LADWP appreciates DDW's feedback on the RI/FS and their willingness to engage in the permitting process for the proposed plan.

RESPONSES TO:

COMMENTS RE: "DECEMBER 2016 INTERIM REMEDIAL INVESTIGATION/ FEASIBILITY STUDY REPORT FOR NORTH HOLLYWOOD WEST WELL FIELD"

BY LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD RECEIVED MARCH 28, 2017

COMMENT 1: ***Modelling***

The Regional Board understands that the modeling conducted was based on the best available information at the time the RI/FS and subsequent documents were prepared. We understand that assumptions had to be made about the third party remedial actions that have yet to be implemented and that there are uncertainties associated with those assumptions. As the interim RI/FS stated, "additional data collection and analysis are anticipated during remedial design to further refine project details" We recommend that the model be updated as more information becomes available about the design of CalMat's onsite remediation system and the interception wells between Hewitt and the NHW Well Field. Likewise, the model should be updates as additional water quality and hydrogeological data becomes available from monitoring wells in the vicinity of the NHW Well Field, such as those recently installed by CalMat.

LADWP RESPONSE:

Consistent with the interim Remedial Investigation/Feasibility Study (RI/FS) and in response to the Regional Board's modelling recommendation, LADWP will update the model as material new data and information become available. We expect to make the materiality determination on a case-by-case basis, in consultation with the Regional Board, to ensure optimal remedy implementation. Depending on the data that become available, different types of analysis may be appropriate and prudent, ranging (for example) from modeling to temporal trend analysis.

To the extent that CalMat and Environmental Protection Agency (EPA) move forward, respectively, with the remedial design and implementation of source control and plume interceptor wells, LADWP will factor relevant new information into its modeling/analysis efforts. This would be in addition to the groundwater modeling sensitivity analyses that LADWP performed in the RI/FS, including for various pumping scenarios that included the potential CalMat remediation system and interceptor wells between Hewitt Pit Landfill and the NHW well field. Similarly, LADWP plans to routinely incorporate new water quality and hydrogeological data into its analysis of the plume.

COMMENT 2: ***Monitoring***

Prior to operation of the NHW Well Field, the Regional Board recommends that an effective groundwater monitoring plan be developed and implemented to track the movement of 1,4-dioxane both laterally and vertically in the groundwater within the vicinity of the NHW Well

Field. While LADWP has stated that it will have a monitoring plan to comply with the Division of Drinking Water's requirements, additional monitoring will likely be necessary to track the progress of remediation. The Regional Board suggests that the monitoring plan be developed with the guidance of a Technical Advisory Committee (TAC) consisting of representatives of the relevant regulatory agencies. During operation of the NHW Well Field, LADWP would assess whether adjustments to their operations and plans for the NHW Well Field and other projects need to be considered.

In addition the modelling results show that the NHW Project will lower the groundwater table. Section A4.4.2.3 of the Groundwater Modeling Summary attached to the RI/FS states, "For simulation years 15 and 20, the simulated distributions are presented for layer 7 due to dry cells in the upper model layers.", indicating that the NHW Project may result in dewatering of the upper zones of the aquifer. The Regional Board recommends that LADWP track the groundwater levels in the vicinity of the NHW Project to ensure their pumping operations will preserve the long-term sustainability of the aquifer.

LADWP RESPONSE:

LADWP recognizes the importance of its remediation efforts being closely coordinated with nearby cleanup efforts of third parties to optimize mass removal, minimize spreading of contaminant plumes in the North Hollywood area of the basin, and reduce overall costs and the timeframe for remediation. LADWP intends to enter into a Memorandum of Understanding (MOU) with the State Water Resources Control Board and the Los Angeles Regional Water Quality Control Board to assure such coordination occurs. The MOU will identify the forum and processes for discussion and resolution of issues related to monitoring, modeling, design, construction, and operation of the Project and potential future nearby third-party cleanup efforts.

LADWP is currently developing a framework for a Technical Advisory Committee (TAC) that includes relevant regulatory agencies. LADWP is developing a groundwater monitoring plan for the 1,4-dioxane plume and will share that plan with the TAC for its consideration.

COMMENT 3: ***Mitigation***

The fate and transport modeling results demonstrate that planned remedial actions by CalMat and US-EPA could have impacts on LADWP's wells, and vice versa. In order to mitigate any potential unforeseen impacts to remedial progress in the vicinity of the NHW Project, the Regional Board suggests that LADWP coordinate their efforts through the Technical Advisory Committee to achieve the maximal plume containment and the most cost-effective remediation. These projects can be complementary to each other through strategic collaboration and a proper monitoring program.

LADWP RESPONSE:

LADWP intends to work collaboratively with the TAC (upon its formation) and will factor 3rd party response actions (*e.g.*, by CalMat) into its remedy implementation efforts.

Los Angeles Department of Water & Power

NHW IRAD
Appendix A (cont'd)
Detailed Responses to Comments
Community Comments

Owners Agent San Fernando Basin Groundwater Remediation

Prepared for:

City of Los Angeles
Department of Water and Power
111 North Hope Street
Los Angeles, California 90012

July 2017

Submitted by:

Hazen and Sawyer (Hazen) under Agreement No. 47329-5 (Owner's Agent for the SFB Remediation)

Prepared by:

WorleyParsons and Hazen

RESPONSES TO:

COMMENTS RE: “DECEMBER 2016 INTERIM REMEDIAL INVESTIGATION/ FEASIBILITY STUDY REPORT FOR NORTH HOLLYWOOD WEST WELL FIELD”

AT THE COMMUNITY MEETING, JANUARY 4, 2017

COMMENTS:

- ***If costs are not recovered from the responsible parties that created the contamination, would rate payers be responsible for covering the costs of the contamination clean up?***
- ***If the groundwater does not pour into our homes and businesses, what/how is the threat of it reaching people? How exactly would the contaminated groundwater spread to people and what is the timeline?***
- ***How did the water come to be contaminated with 1,4-dioxane?***
- ***If no action is taken, how quickly does it take for side effects to appear?***

Name: Michael Monsivar (Menjivar?)
Organization/Affiliation: Neighborhood

LADWP RESPONSE:

Rate payers may be asked to contribute some of the costs for cleanup, although LADWP is seeking other sources of funding as well. There are a number of sources of 1,4-dioxane contamination in the San Fernando Basin (SFB) related to historical industrial activity and former landfills in the area. The contamination is already impacting LADWP groundwater supply wells, which provides drinking water to the community. This is the pathway through which the threat can reach people. Seven NHW production wells were removed from service between November 2014 and March 2015. Refer to the document titled “Interim Remedial Investigation/Feasibility Study Report” (1.12.4 Risk Characterization, page 16) for the health risks of 1,4-dioxane. The document is available online at www.ladwp.com/remediation webpage. LADWP’s Proposed Plan is to conduct an interim remedial action (IRA) to address the 1,4-dioxane dissolved in groundwater at the NHW Well Field. One of the alternatives would involve treatment that would be located in the fenced LADWP property at Whitsett Park, near the intersection of Vanowen Street and the 170 Freeway, in the San Fernando Valley.

COMMENTS:

- ***Is there a groundwater remediation master plan for the SF valley? If not, why not?***
- ***How will this and other remediation projects support increased reliance on indirect potable recycling as a water source?***
- ***Has the City integrated the remediation plans with other plans for expanded use of recycled water?***

Name: Arthur Pugsley
Organization/Affiliation: Los Angeles Waterkeeper

LADWP RESPONSE:

The documents regarding LADWP's remediation effort (including a document titled "Interim Remedial Investigation/Feasibility Study Report) can be found online at: www.ladwp.com/remediation. The remediation effort is not anticipated to affect the use of indirect potable recycling as a water source. More information regarding LADWP's indirect potable reuse efforts can be found in the following documents.

- Los Angeles Groundwater Replenishment Project Fact Sheet is available online at: www.ladwp.com/GWR.
- The Final Los Angeles Groundwater Replenishment Project EIR is available online at: www.ladwp.com/envnotices.
- The Recycled Water Annual Report is available online at: http://www.ladwp.com/recycledwaterreport.
- The 2012 Recycled Water Master Plan is available online at: 2012 Recycled Water Master Plan.

COMMENTS:

- ***Thank you for this important information. Ms. Evelyn Cortez-Davis does a great job of explaining a very technical process.***
- ***Will the 1,4-dioxane plume travel? If it does, will further action be required later? If not, will it ever go away?***
- ***Will this process affect the park use in any way?***

Name: Veronica Padilla-Campos
Organization/Affiliation: Pacoima Beautiful

LADWP RESPONSE:

There are a number of sources of 1,4-dioxane contamination in the SFB related to historical industrial activity and the presence of a former landfill in the area and the 1,4-dioxane plume has travelled (and is expected to continue to travel in the absence of further action) in the groundwater to LADWP groundwater supply wells which provide drinking water to the community. LADWP's Proposed Plan is to conduct an IRA to address the 1,4-dioxane dissolved in groundwater at the NHW Well Field. This plan is not expected to impact park use. Construction of the treatment facility may temporarily disturb the park; however, the facility will be located within LADWP's fenced property.

COMMENTS:

- ***Are there any other locations in the San Fernando Basin that are contaminated by 1,4-Dioxane?***
- ***Where exactly is the North Hollywood treatment plant?***

Name: Susan MacAdams
Organization/Affiliation: Citizen

LADWP RESPONSE:
1,4-Dioxane contamination in the SFB exists in other locations in addition to NHW Well Field, which is related to historical industrial activity and the presence of former landfills and industrial activities in the area. LADWP plans to conduct RI/FSs for other impacted well fields to identify the contaminants found there and determine the remedial alternatives. LADWP's Proposed Plan at NHW is to conduct an IRA to address the 1,4-dioxane dissolved in groundwater at the NHW Well Field. One of the alternatives would

involve treatment that would be located in the fenced LADWP property at Whitsett Park, near the intersection of Vanowen Street and the 170 Freeway, in the San Fernando Valley.

COMMENTS:

- ***How will this project interface with the stormwater capture project going on at the Tujunga Spreading Grounds?***
- ***Will the stormwater captured require further treatment before it can be used for indirect or direct potable use?***

Name: Charles Savinar
Organization/Affiliation: North Hollywood West NC

LADWP RESPONSE:

The planned remediation project has considered the stormwater capture project at the Tujunga Spreading Grounds as a potential source of recharge into the basin. The stormwater capture is not expected to require treatment. The 2015 Urban Water Management Plan is available online at: http://www.ladwp.com/uwmp

COMMENTS:

- ***Of the 52 active well, how many were polluted with industrial waste and how many wells still providing drinking water to residents, etc.?***
- ***In 2010 we had some 12,000 homes still on the septic system and there was a program to mandate a sewer connection if the drainage was too close to a well. What is the current status?***

Name: Sarah Ramsawack
Organization/Affiliation: -

LADWP RESPONSE:

LADWP serves drinking water to residents that meets all regulatory requirements. Seven NHW production wells (i.e., NH-23, NH-34, NH-36, NH-37, NH-43A, NH-44 and NH-45) were removed from service between November 2014 and March 2015 due to elevated 1,4-dioxane concentrations. However, blending with other less impacted water sources ensured that 1,4-dioxane and VOCs below the regulatory limits. Other wells are impacted at the other San Fernando well fields and analysis is underway to determine contaminants and remedial alternatives. Additional information is provided at www.ladwp.com/remediation.

The comment about septic systems is appreciated, but is not relevant to NHW IRA.

COMMENTS:

- ***What is footprint of water plant?***

Name: Jim Kompare
Organization/Affiliation: NoHo West NC

LADWP RESPONSE:

The footprint of the water plant is planned to be approximately 89,000 square feet, located within the fenced LADWP property at Whitsett Park, near the intersection of Vanowen Street and the 170 Freeway, in the San Fernando Valley.

COMMENTS:

- ***What actions/events lead to the discovery of this and the other VOC contamination?***
- ***What do you test for?***

Name: Julianna Colwell
Organization/Affiliation: -

LADWP RESPONSE: Previous investigations of the SFB including the NHW Well Field Area are described in the Interim RI/FS Report. The documents regarding this effort can be found online at: www.ladwp.com/remediation. The related environmental documents can be found at www.ladwp.con/envnotices.

LADWP maintains close watch on the water quality, collecting nearly 40,000 water samples throughout the city in a calendar year and conducting more than 140,000 water quality tests for compliance, research, and operational improvements. In the 1980s, groundwater monitoring in the SFB detected concentrations of VOCs in excess of state and federal drinking water standards. Shortly thereafter, the EPA and other agencies began coordinating efforts to address the contamination in the SFB. EPA identified five operable units to focus remediation efforts and to accelerate regional cleanup.

COMMENTS:

- ***What is the reason for the contamination of water?***

Name: Felipe Escobar
Organization/Affiliation: Pacoima Beautiful

LADWP RESPONSE: There are a number of sources of 1,4-dioxane contamination in the SFB related to historical industrial activity and the presence of a former landfill in the North Hollywood area. Previous Investigations of the SFB including the NHW Well Field Area are described in the Interim RI/FS Report. The documents regarding this effort can be found online at: www.ladwp.com/remediation. The related environmental documents can be found at www.ladwp.con/envnotices.

RESPONSES TO:

COMMENTS RE: "DECEMBER 2016 INTERIM REMEDIAL INVESTIGATION/ FEASIBILITY STUDY REPORT FOR NORTH HOLLYWOOD WEST WELL FIELD"

AT THE COMMUNITY MEETING, FEBRUARY 8, 2017

COMMENTS:

- ***How deep are the wells in the well field? What are they made out of?***
- ***What is the size of the fenced property?***

Name: Steve Twining
Organization/Affiliation: BABCNC Hillside Federation

LADWP RESPONSE: The wells extract water from a depth range of 130 to 910 feet below ground surface (bgs), and are constructed with steel casings. The footprint of the water plant is planned to be approximately 89,000 square feet, located within the fenced LADWP property at Whitsett Park, near the intersection of Vanowen Street and the 170 Freeway, in the San Fernando Valley.

COMMENTS:

- ***What is the density of the plume increasing, same, decreasing?***
- ***If increasing, why?***
- ***If increasing, what can be done to stop?***

Name: Bob Peppermuller
Organization/Affiliation: MidTwn NoHo NC, DWP MOV

LADWP RESPONSE: Available data indicates that a former landfill, located up-gradient of the NHW Well Field, is likely one of the sources for the 1,4-dioxane plume. 1,4-dioxane potentially continues to be discharged from this former landfill. Response actions to control both the potential discharge of the 1,4-dioxane from the former landfill are being planned, and the plume directly downgradient of that source is planned for treatment with the NHW treatment facility. The documents regarding the remediation effort can be found online at: www.ladwp.com/remediation. The related environmental documents can be found at www.ladwp.con/envnotices.

COMMENTS:

- ***If plume is concentrated over landfill between Saticoy and Sherman Way and Fulton to Laurel Canyon – my question is: there were many landfills in SF Valley, what contaminants have been identified in groundwater under other areas of landfill in the east SF Valley?***
- ***Could you explain the treatment process?***

Name: Sarah Ramsawack
Organization/Affiliation: -

LADWP RESPONSE: LADWP plans to conduct RI/FSs in other areas to identify the contaminants found there. The documents regarding this effort can be found online at: www.ladwp.com/remediation. The related environmental documents can be found at www.ladwp.con/envnotices.

The treatment process involves the introduction of hydrogen peroxide to the water, which is then exposed to ultraviolet (UV) light to remove the contaminants. The water is then treated with granular activated carbon to remove residual hydrogen peroxide in the water, and disinfected prior to delivery to customers.

RESPONSES TO:

COMMENTS RE: "DECEMBER 2016 INTERIM REMEDIAL INVESTIGATION/ FEASIBILITY STUDY REPORT FOR NORTH HOLLYWOOD WEST WELL FIELD"

PROVIDED BY EMAIL TO LADWP DURING THE COMMENT PERIOD

COMMENTS:

Subject: Where can we read more details on this treatment methodology?

Has this been tested for an extended period of time? Where can we see the details prior to our definitive decision input?

Many thanks for an expedient response.

UNNC member

Author: Tori Bailey
Date: 01/06/17
Recipient: Nadia Parker
Response Date: 1/17/17 on behalf of <Remediation@ladwp.com>

LADWP RESPONSE: LADWP staff responded to this comment by email:

LADWP's Proposed Plan mentioned in the email you received is to conduct an interim remedial action to address the synthetic contaminant 1,4-dioxane dissolved in groundwater at the North Hollywood West Well Field. One of the alternatives would involve treatment that would be located in the fenced LADWP property at Whitsett Park, near the intersection of Vanowen Street and the 170 Freeway, in the San Fernando Valley.

The documents regarding this effort can be found online at: www.ladwp.com/remediation. The related environmental documents can be found at www.ladwp.con/envnotices.

Paper copies of the documents related to this remedial action are also available for review at the following locations:

City of LA Technical Central Library
630 West 5th Street
Los Angeles, CA 90071

Panorama City Public Library
14345 Roscoe Boulevard
Panorama City, CA 91402

City of Burbank Public Library
110 North Glenoaks Street
Burbank, CA 91502

City of Glendale Public Library
222 East Harvard Street
Glendale, CA 91205

For your question about treatment methodology, commercially available advanced oxidation processes using hydrogen peroxide and ultraviolet light or ozone have been demonstrated to destroy 1,4-dioxane. This treatment technology is recognized by USEPA and the California State Water Resources Control Board. For your reference, this is a link to the USEPA's Fact Sheet on 1,4-dioxane: www.epa.gov/sites/production/files/2014-03/documents/ffrro_factsheet_contaminant_14-dioxane_january2014_final.pdf

For additional information, including a summary of the treatment technologies that were screened by LADWP, please refer to Section 3 (Table 3-1) of the document titled "Interim Remedial Investigation/Feasibility Study Report", available at the www.ladwp.com/remediation link. The remedial alternatives evaluated by LADWP are described in Section 5 of the same document.

Thank you for providing your question.

COMMENTS:

Subject: VANC mtg/presentation

Hi Evelyn:

I hope you are doing well to begin this year.

I understand you are doing a presentation re the N. Hollywood Well field (west branch) thur nite.

Unfortunately, I will not be able to attend due to a bad cold. Is it possible for you to e-mail (or postal mail) me a copy of you presentation?

The VANC members know my history with the DWP and typically ask me for clarifications on any DWP project, including issues like the project necessary? (People still believe that DWP builds stuff to get kickbacks, etc)

Thanks, Scott

Author: Scott Munson
Date: 01/11/17
Recipient: To: Evelyn Cortez-Davis <Evelyn.Cortez-Davis@ladwp.com>, Cc: Richard Harasick
Response Date: 01/19/17

LADWP RESPONSE:

Attachment(s):

- NHW Public Meeting-from Website.pdf
- NHW VANC 20170112 DRAFT1.pdf

Scott,

My apologies for not getting back to you sooner. I hope you're feeling much better.

Since we only had 10 minutes on the VANC agenda last week, we gave a condensed version of the presentation we gave at our public meeting on January 4th. This was about out Friday groundwater basin remediation project to address 1,4-dioxane found at some of our North Hollywood West Wells. The preferred alternative would involve groundwater treatment facilities for 3 wells within the fenced LADWP property at Whitsett Park on Vanowen Street, next to the 170 freeway.

I'm attaching a PDF of the longer PowerPoint here, as well as the shortened version we used last week.

The longer presentation is also available on our website www.ladwp.com/remediation. Some of the other documents that you can find online: remedial investigation, feasibility study, and proposed plan for the proposed treatment of 1,4-dioxane.

Also, the mitigated negative declaration/CEQA document for the proposed alternative is available at www.ladwp.com/envnotices

The group received the information well, just a few general questions.

Please see the ending slides in the presentation for the library locations where you can find hard copies of all of these documents.

If you have questions, please let me know. You can also always contact Jason Stinnet from our community relations office who attends the VANC meetings regularly.

Thank you,
Evelyn Cortez-Davis
213-367-3564

<u>COMMENTS:</u>

Hello, My name is Judy Harris and I live in the 6900 block of Morella Avenue in North Hollywood. I am requesting that "Each" resident be notified of what LADWP is doing within our area. We will need notification in spanish and English. Notification via postal mail is sufficient (everyone cannot afford a computer, especially in my residential area). I received this email today, but comment closing day is January 23rd. Two weeks is not sufficient time, it's not fair. We should have been notified of DWP's findings sooner. I am requesting a full page report the regarding the discovered contamination, and how it has or will affect my family and Community if untreated. Thank you in advance, I hope to hear from you soon.

Author: Judy Harris
Date: 1/16/17
Recipient: Remediation Remediation@ladwp.com
Response Date: 1/10/17

<u>LADWP RESPONSE:</u> LADWP staff responded in an email:

Attachments:

- SFB Exec Summary_1-3-2017.pdf NHW_Proposed_Plan_Dec_2016_Compressed.pdf

Good afternoon Ms. Harris,

Thank you very much for your comment. As you requested, we are attaching a general "Program Summary" about LADWP's groundwater remediation program in the San Fernando Groundwater Basin.

LADWP's Proposed Plan mentioned in the email you received is to conduct an interim remedial action to address the synthetic contaminant 1,4-dioxane dissolved in groundwater at the North Hollywood West Well Field. One of the alternatives would involve treatment that would be located in the fenced LADWP property at Whitsett Park, near the intersection of Vanowen Street and the 170 Freeway.

Paper copies of the documents related to this remedial action are available for review at the following locations:

Panorama City Public Library
14345 Roscoe Boulevard
Panorama City, CA 91402

City of Burbank Public Library
110 North Glenoaks Street
Burbank, CA 91502

City of LA Technical Central Library
630 West 5th Street
Los Angeles, CA 90071

City of Glendale Public Library
222 East Harvard Street
Glendale, CA 91205

The documents regarding this effort can also be found online at: www.ladwp.com/remediation. The related environmental documents can be found at www.ladwp.con/envnotices.

For your question about the extent of the contamination at the North Hollywood West Well Field and risks if left untreated, relevant information can be found in the “Background” and “Site Characteristics” sections of the document titled “Proposed Plan” (attached). For additional information about the contamination, see the document titled “Interim Remedial Investigation/Feasibility Study Report” (Summary and conclusions, page 17). Both of these documents are available at the library locations listed above or online at the www.ladwp.com/remediation webpage.

For your reference, our annual “Drinking Water Quality Report” about the water we currently serve to customers is also available online at www.ladwp.com/waterqualityreport.

Community outreach and informing our customers is important to us. Our community outreach for this project included mailing notices about the public comment period to the North Hollywood North East Neighborhood Council, along with other NCs on December 7, 2016. A follow-up email reminder was sent to those Neighborhood Councils on December 22, 2016 and again last week. We also ran newspaper ads in the LA Times, Daily News, Metropolitan News and La Opinión (Spanish) in early December. In addition, we placed ads on Facebook in December.

Thank you again for your providing your comment.

Sincerely,

Evelyn Cortez-Davis, P.E.
Community Involvement Coordinator
Proposed for Interim Remedial Action at North Hollywood West Well Field Los Angeles Department of Water and Power
111 North Hope Street Room 1345
Los Angeles CA 90012
www.ladwp.com/remediation

<u>COMMENTS:</u>

Subject: Public Records Act request

Attachment(s):

- ***2017-01-17 PRA to LADWP.PDF***

Under the California Public Records Act, Government Code section 6250 et seq., I write to request electronic copies of any and all documents specified in the attached Public Records Act Request to the Los Angeles Department of Water and Power.

Once there is an accurate assessment of the number of documents to be copied, please contact me to arrange payment for duplication costs under Government Code section 6253(b).

In the event that access to any portion of the records request is denied, please state in writing the specific statutory basis for the denial and its applicability to this Request. See Government Code § 6255. In addition, please state the reasons for not exercising your discretion to release such materials in the public interest. See id.

Thank you,

Joseph Drapalski

cc: Evelyn Cortez-Davis, LADWP

Elizabeth Weaver, Norton Rose Fulbright

Mark Reardon, CalMat Co. d/b/a/ Vulcan Materials Company

Timothy Seeno, CalMat Co. d/b/a/ Vulcan Materials Company

Kelly Manheimer, EPA

Jeff Brooks, RWQCB

Joseph Drapalski | Associate
Norton Rose Fulbright US LLP
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joseph.drapalski@nortonrosefulbright.com

Author: Joseph Drapalki
Date: 01/17/2017
Recipient: To: Remediation Remediation@ladwp.com
Cc: Remediation <Remediation@ladwp.com>; Weaver, Elizabeth M. <elizabeth.weaver@nortonrosefulbright.com>; Reardon, Mark <reardonm@vmcmail.com> (reardonm@vmcmail.com); seenot@vmcmail.com; Manheimer, Kelly (manheimer.kelly@epa.gov); 'Jeff.Brooks@waterboards.ca.gov'
Response Date: 1/27/17

<u>LADWP RESPONSE:</u> LADWP responded in writing to Norton Rose Fulbright.

COMMENT:

Subject: Public Comment Period on LADWP's Proposed Plan

Attachment(s):

- ***2017-01-18 Ltr to LADWP re Public Comment Period.pdf***

Dear Ms. Evelyn Cortez-Davis,

Attached please find a letter sent on behalf of our client, CalMat Co. d/b/a Vulcan Materials Company, requesting that the Los Angeles Department of Water and Power extend the public comment period on its Proposed Plan for Interim Remedial Action at the North Hollywood Well Field.

Thank you,

Joe

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Author: Joseph Drapalski
Date: 01/18/2017
Recipient: To: Remediation Remediation@ladwp.com
Cc: Weaver, Elizabeth M. <elizabeth.weaver@nortonrosefulbright.com>; Lewis, Edward <eddie.lewis@nortonrosefulbright.com>; Reardon, Mark <reardonm@vmcmail.com> (reardonm@vmcmail.com); seenot@vmcmail.com; Manheimer, Kelly (manheimer.kelly@epa.gov); Jeff.Brooks@waterboards.ca.gov; Liu, Paul <Paul.Liu@ladwp.com>; Thomas Bloomfield <tbloomfield@thegallaghergroup.com>
Response Date: 01/19/17

LADWP RESPONSE: LADWP extended the public comment period to February 27, 2017 then to March 29, 2017.

COMMENT:

Subject: public comment on water remediation

- ***Attachment(s): Memorandum.docx***

Attached please find my public comment on the San Fernando Groundwater Basin Remediation Program. Thank you.

Susan Gorman-Chang

Contents of the Attachment "Memorandum":

Thank you for taking public comment in regards to the San Fernando Groundwater Basin Remediation Program. Thank you for testing our groundwater, for being so diligent and staying on top of this issue.

I understand Los Angeles plans to obtain 50% of its water "locally" by 2035 and the primary source of this "local" water is groundwater, and that the primary source of local groundwater is the SFB (San Fernando Basin).

In regards to the San Fernando Groundwater Basin Remediation Program,

I suggest that LADWP support a California statewide ban on fracking and wastewater injection.

With the enactment of the Energy Policy Act of 2005, the petroleum industry became exempt from meeting the Safe Drinking Water Act rules of underground injections of fluid. Thus, if fracking continues in California, our underground aquifers will become more and more polluted by chemicals from the re-injection of fracking wastewater, and we, the LADWP rate payers, will pay for the clean- up. I can think of no other example in the history of any democracy where one set of businesses (fracking companies) garner huge profits, yet actually create expenses that must be borne by another entity, in this case the LADWP.

It makes little sense to allow one industry to pollute our water, and for us, LADWP and ratepayers, to pay for their toxic waste by having to spend hundreds of millions to take those contaminants back out of the water via expensive remediation measures. This is akin to constantly mopping up water off the floor and never considering turning off the faucet. To give this and any water remediation plan a chance to work in the long run, LADWP must support a statewide ban on fracking to prevent waste water injection into this, our future water supply.

Author: Susan Gorman-Chang
Date: 01/23/17
Recipient: Remediation <Remediation@ladwp.com>

LADWP RESPONSE: The comment about fracking is appreciated, but is not relevant to NHW IRA.

Additional information on the groundwater replenishment and recycled water efforts are available online at:

- Los Angeles Groundwater Replenishment Project Fact Sheet: www.ladwp.com/GWR;
- The Recycled Water Annual Report is available online at: http://www.ladwp.com/recycledwaterreport; and
- The 2012 Recycled Water Master Plan is available online at: 2012 Recycled Water Master Plan.

COMMENTS:

Subject: North Hollywood Well Field Treatment Project MND

I received the notice for the second meeting regarding the North Hollywood Project, and the extension of the comment period. I previously submitted comments and attended the first meeting on January 4. I am wondering if there are new materials for review, or if responses to comments already received will be part of the second meeting. If you could let me know, I would appreciate it. Thank you.

Author: Arthur S. Pugsley
Date: 02/06/17
Recipient: Evelyn Cortez-Davis <Evelyn.Cortez-Davis@ladwp.com>
Response Date: 02/06/17

LADWP RESPONSE:

Attachment(s): 13424 DWP-COR%282%29 Condensed Index.pdf

Mr. Pugsley, thank you for your question and for your previously submitted comments dated January 20, 2017.

The Proposed Plan, RI/FS and related documents are unchanged since the prior public meeting. A copy of the transcript from the initial meeting is available, and it is attached here for your reference. The information that will be covered at this Wednesday's public meeting will be the same as the first public meeting. Responses to comments already received are still in progress and will not be part of the second meeting.

We appreciate your input. Thank you.

Evelyn Cortez-Davis, P.E., BCEE
Manager of Special Projects and Groundwater Planning LADWP Water Engineering & Technical Services Division evelyn.cortez-davis@ladwp.com www.ladwp.com/remediation

Response (Date: 02/07/17): Thank you for the update. We probably will not be attending the second meeting, our previous comments are still relevant.

-arthur

COMMENTS:

Subject: Public Comment Period on LADWP's Proposed Plan

Attachments: 2017-03-24 Ltr to LADWP re Public Comment Period.PDF

Dear Ms. Evelyn Cortez-Davis,

Attached please find a letter sent on behalf of our client, CalMat Co. d/b/a Vulcan Materials Company, requesting that the Los Angeles Department of Water and Power extend the public comment period on its Proposed Plan and RI/FS for Interim Remedial Action at the North Hollywood Well Field.

Thank you,

Joe

Joseph Drapalski | Associate
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joseph.drapalski@nortonrosefulbright.com

Author: Joseph Drapalski
Date: 03/24/17
Recipient: Evelyn Cortez-Davis <Evelyn.Cortez-Davis@ladwp.com>, Remediation <Remediation@ladwp.com>

LADWP RESPONSE: The comment period for the Proposed Plan and RI/FS for IRA at the NHW Well Field was extended twice, from January 23, 2017 to February 27, 2017 then March 29, 2017.

RESPONSES TO: ***Burbank Water and Power***
RECEIVED NOVEMBER 22, 2016

COMMENT 1: ***Burbank Water and Power wishes to express support for the Los Angeles Department of Water and Power's (LADWP) San Fernando Groundwater Basin Remediation (Project) and its grant funding application to the State Water Resources Control Board. The Project will benefit the public by effectively removing contamination from the San Fernando Groundwater Basin (SFB) thereby preserving local groundwater supplies for the region.***

A reliable water supply is critical for the region's economic development and well-being. Local groundwater has been a key water resource for Southern California, and has provided about 12 percent of total water supplied to the communities of the Upper Los Angeles River Area (ULARA) watershed. As our imported water supplies become constrained by climate impacts and environmental obligations, local groundwater becomes increasingly critical to maintaining a reliable water supply.

Burbank Water and Power appreciates Los Angeles' commitment to water conservation, water recycling, stormwater capture, local groundwater development, and basin remediation. These efforts help ensure the long term sustainability of our watershed and its natural resources. We also recognize the importance of addressing historic industrial contamination that is restricting our ability to utilize local groundwater more effectively.

As a member of the ULARA Administrative Committee, Burbank Water and Power supports the San Fernando Groundwater Basin Remediation Project and LADWP's application for funding through the Proposition 1 Groundwater Grant Program. State funding is essential to ensuring that the Project will move forward in a timely manner and to promote sustainable, reliable water resources.

Signatory:

William O. Mace, Jr., P.E.
Assistant General Manager - Water Systems
Burbank Water and Power

LADWP RESPONSE: LADWP acknowledges the response from Burbank Water and Power, and appreciates the support for this important remediation project.

RESPONSES TO: *City of Glendale*
RECEIVED FEBRUARY 8, 2017

COMMENT 1: ***Glendale Water and Power wishes to express support for the Los Angeles Department of Water and Power's (LADWP) San Fernando Groundwater Basin Remediation (Project) and its grant funding application to the State Water Resources Control Board. The Project will benefit the public by effectively removing contamination from the San Fernando Groundwater Basin (SFB) thereby preserving local groundwater supplies for the region.***

The City of Glendale relies on local groundwater in the San Fernando Basin to serve its citizens, and Glendale Water and Power has been implementing groundwater clean-up efforts in the basin for many years, including conducting nationally sponsored research on the removal of Chromium VI. Remediation efforts by agencies like LADWP are an important step in improving the health of the entire basin.

A reliable water supply is critical for the region's economic development and well-being. Local groundwater has been a key water resource for Southern California, and has provided about 12 percent of total water supplied to the communities of the Upper Los Angeles River Area (ULARA) watershed. As our imported water supplies become constrained by climate impacts and environmental obligations, local groundwater becomes increasingly critical to maintaining a reliable water supply.

Glendale Water and Power appreciates Los Angeles' commitment to water conservation, water recycling, stormwater capture, local groundwater development, and basin remediation. These efforts help ensure the long term sustainability of our watershed and its natural resources. We also recognize the importance of addressing historic industrial contamination that is restricting our ability to utilize local groundwater more effectively.

As a member of the ULARA Administrative Committee, Glendale Water and Power supports the San Fernando Groundwater Basin Remediation Project and LADWP's application for funding through the Proposition 1 Groundwater Grant Program. State funding is essential to ensuring that the Project will move forward in a timely manner and to promote sustainable, reliable water resources.

Signatory:

Michael E. De Ghetto
Chief Assistant General Manager

LADWP RESPONSE: LADWP acknowledges the response from the City of Glendale, and appreciates the support for this important remediation project.

RESPONSES TO: *City of Los Angeles*
RECEIVED DECEMBER 9, 2016

COMMENTS: ***I am writing to express my strong commitment to the Los Angeles Department of Water and Power's (LADWP) San Fernando Groundwater Basin Remediation (Project) and my support for the attached grant proposal. The Project will clean up and remove contamination from the San Fernando Groundwater Basin (SFB) in order to restore and preserve local groundwater supplies, which provide drinking water to the over 4 million residents of the City of Los Angeles.***

As you know, Los Angeles has developed a strategy to maximize our local water supply by integrating priority groundwater, recycled water, and stormwater projects. Local groundwater has been a key water resource for the City, providing about 12 percent of total supply for Los Angeles over the last five years and up to 23 percent of supply during periods of drought. Local groundwater can also be one of the City's most affordable sources of supply, especially as imported water becomes increasingly constrained due to climate change and environmental protection. However, historical industrial contamination is increasingly restricting the ability of the City to utilize its primary source of groundwater, the SFB. The Project is a critical step on our transformational path toward local water supply.

This Project will construct state-of-the-art remediation facilities to address contamination impacting pumping wells in the SFB. Even with the cost of these remediation facilities, local groundwater will be more affordable than purchased, imported supplies, thereby allowing LADWP to provide lower rates to customers who use less water. LADWP's ability to maintain these lower rates significantly benefits the many disadvantaged residents of the City of Los Angeles.

LA has committed to reduce its reliance on purchased imported water by 50% by 2025, and locally source 50% of its water by 2035. This project will support this effort by significantly increasing the City's ability to utilize its groundwater while improving the long-term health and sustainability of the San Fernando Groundwater Basin, which is the keystone of our local water supply·

Signatory:

Eric Garcetti
Mayor

LADWP RESPONSE: LADWP acknowledges the response from the City of Los Angeles, and appreciates the support for this important remediation project.

RESPONSES TO: *City of San Fernando*
RECEIVED NOVEMBER 21, 2016

COMMENT 1: ***The City of San Fernando wishes to express support for the Los Angeles Department of Water and Power's (LADWP) San Fernando Groundwater Basin Remediation (Project) and its grant funding application to the State Water Resources Control Board. The Project will benefit the public by effectively removing contamination from the San Fernando Groundwater Basin (SFB) thereby preserving local groundwater supplies for the region.***

A reliable water supply is critical for the region's economic development and wellbeing. Local groundwater has been a key water resource for Southern California, and has provided about 12 percent of total water supplied to the communities of the Upper Los Angeles River Area (ULARA) watershed. As our imported water supplies become constrained by climate impacts and environmental obligations, local groundwater becomes increasingly critical to maintaining a reliable water supply.

The City of San Fernando appreciates Los Angeles' commitment to water conservation, water recycling, stormwater capture, local groundwater development, and basin remediation. These efforts help ensure the long term sustainability of our watershed and its natural resources. We also recognize the importance of addressing historic industrial contamination that is restricting our ability to utilize local groundwater more effectively.

As a member of the ULARA Administrative Committee, The City of San Fernando supports the San Fernando Groundwater Basin Remediation Project and LADWP's application for funding through the Proposition 1 Groundwater Grant Program. State funding is essential to ensuring that the Project will move forward in a timely manner and to promote sustainable, reliable water resources.

Signatory:

Tony Salazar
Public Works Superintendent

LADWP RESPONSE: LADWP acknowledges the response from the City of San Fernando, and appreciates the support for this important remediation project.

RESPONSES TO: ***Crescenta Valley Water District***
RECEIVED JANUARY 30, 2017

COMMENT 1: ***Crescenta Valley Water District (CVWD) wishes to express support for the Los Angeles Department of Water and Power's (LADWP) San Fernando Groundwater Basin Remediation (Project) and its grant funding application to the State Water Resources Control Board. The Project will benefit the public by effectively removing contamination from the San Fernando Groundwater Basin (SFB) thereby preserving local groundwater supplies for the region.***

CVWD is one of five parties to the 1979 judgment that created the Upper Los Angeles River Area. As a local water purveyor, CVWD has a vested interest in LADWP's groundwater cleanup efforts as it relates to removing contaminates such as nitrates and MTBE from the groundwater basin.

A reliable water supply is critical for the region's economic development and well-being. Local groundwater has been a key water resource for Southern California, and has provided about 12 percent of total water supplied to the communities of the Upper Los Angeles River Area (ULARA) watershed. As our imported water supplies become constrained by climate impacts and environmental obligations, local groundwater becomes increasingly critical to maintaining a reliable water supply.

CVWD appreciates Los Angeles' commitment to water conservation, water recycling, stormwater capture, local groundwater development, and basin remediation. These efforts help ensure the long term sustainability of our watershed and its natural resources. We also recognize the importance of addressing historic industrial contamination that is restricting our ability to utilize local groundwater more effectively.

As a member of the ULARA Administrative Committee, CVWD supports the San Fernando Groundwater Basin Remediation Project and LADWP's application for funding through the Proposition 1 Groundwater Grant Program. State funding is essential to ensuring that the Project will move forward in a timely manner and to promote sustainable, reliable water resources.

Signatory:

Thomas A. Love
General Manager

LADWP RESPONSE: LADWP acknowledges the response from CVWD, and appreciates the support for this important remediation project.

RESPONSE TO: ***California Communities Against Toxics, Del Amo Action Committee, California Safe Schools, and Coalition for a Safe Environment***
RECEIVED NOVEMBER 16, 2016

COMMENT 1: ***Our organizations wish to express our support for the Los Angeles Department of Water and Power's (LADWP) San Fernando Groundwater Basin Remediation Project (Project). The Project will restore drinking water resources and remove contamination from the San Fernando Groundwater Basin (SFB) in an effort to restore its beneficial use as a critical part of the water supply for the over 4 million people of the City of Los Angeles (City).***

Our organizations have been working for a number of years to bring together state agencies, local government, regulators, and nonprofit organizations to talk about moving forward efforts to restore the groundwater basins in Southern California. We have been concerned about linking groundwater restoration efforts to the cleanup of source zones of contamination. We appreciate the State Water Board's actions to work cooperatively with us and other agencies on our groundwater restoration efforts.

Historical industrial contamination is increasingly restricting the ability of the City to utilize its primary source of local groundwater, the SFB. Local groundwater has been a key water resource for the City, providing about 12 percent of total supply for Los Angeles over the last five years and since 1970 has provided up to 23 percent of supply during extended dry periods. Groundwater is also one of the City's most affordable sources of supply, especially as imported water becomes increasingly constrained due to climate extremes and environmental regulations.

To restore the full beneficial use of this important resource, LADWP is working with regulatory agencies and other stakeholders to implement the Project, which will construct state-of-the-art remediation facilities to address contamination impacting pumping wells in the SFB. Even with the cost of these remediation facilities, local groundwater will be more affordable than purchased, imported supplies, thereby allowing LADWP to continue providing lower rates to customers who use less water. LADWP's ability to maintain these lower rates significantly benefits the many disadvantaged residents of the City of Los Angeles.

Our organizations appreciate the City's and LADWP's efforts to implement this Project, which will provide tremendous benefits to the neighborhoods of Los Angeles, which contain a significant number of economically disadvantaged residents and communities, and also to the entire City.

We support the LADWP's efforts to restore local groundwater and to preserve one of the City's most affordable and reliable water supplies. As a result, we also wholeheartedly support the San Fernando Groundwater Basin Remediation Project and LADWP's application for funding through the Proposition 1 Groundwater Grant Program. State funding is essential to ensuring that the Project will move forward in a timely manner and to mitigating cost impacts to the City's economically disadvantaged ratepayers.

Signatories:

Jane Williams
Executive Director
California Communities Against Toxics

Cynthia Babich
Executive Director
Del Amo Action Committee

Robina Suwol
Executive Director
California Safe Schools

Jesse Marquez
Executive Director
Coalition for a Safe Environment

LADWP RESPONSE: LADWP acknowledges the response from California Communities Against Toxics, Del Amo Action Committee, California Safe Schools, and Coalition for a Safe Environment, and appreciates the support for this important water resources project.

RESPONSES TO: *Pacoima Beautiful*
RECEIVED NOVEMBER 3, 2016

COMMENT 1: ***Pacoima Beautiful wishes to express support for the Los Angeles Department of Water and Power's (LADWP) San Fernando Groundwater Basin Remediation Project (Project). The Project will effectively clean up and remove contamination from the San Fernando Groundwater Basin (SFB) in order to restore its beneficial use as a critical part of the water supply for the over 4 million people of the City of Los Angeles (City).***

Pacoima Beautiful (PB) is a non-profit environmental justice organization in the Northeast San Fernando Valley. PB works to empower our community through programs that provide environmental education, advocacy and local leadership in order to foster a healthy and safe environment.

Historical industrial contamination is increasingly restricting the ability of the City to utilize its primary source of local groundwater, the SFB. Local groundwater has been a key water resource for the City, providing about 12 percent of total supply for Los Angeles over the last five years and since 1970 has provided up to 23 percent of supply during extended dry periods. Groundwater is also one of the City's most affordable sources of supply, especially as imported water becomes increasingly constrained due to climate extremes and environmental regulations.

To restore the full beneficial use of this important resource, LADWP is working with regulatory agencies and other stakeholders to implement the Project, which will construct state-of-the-art remediation facilities to address contamination impacting pumping wells in the SFB. Even with the cost of these remediation facilities, local groundwater will be more affordable than purchased, imported supplies, thereby allowing LADWP to continue providing lower rates to customers who use less water. LADWP's ability to maintain these lower rates significantly benefits the many disadvantaged residents of the City of Los Angeles.

Pacoima Beautiful has been engaged in the stakeholder process for this and other water-related projects through its participation in the City's One Water LA 2040 Plan development effort. As part of this effort, community stakeholders participated in developing Guiding Principles that were adopted in 2015. One of these stakeholder-supported principles was to "Recognize the importance of remediating and maintaining the health of the City's groundwater basins and consider recommendations of LADWP's groundwater program." Pacoima Beautiful appreciates the City's and LADWP's efforts to implement this Project, which will provide tremendous benefits to Pacoima, Sun Valley, and Panorama City, all of which contain a significant number of economically disadvantaged residents.

Pacoima Beautiful supports LADWP's efforts to restore local groundwater and to preserve one of the City's most affordable and reliable water supplies. As a result, Pacoima Beautiful also wholeheartedly supports the San Fernando Groundwater Basin Remediation Project and LADWP's application for funding through the Proposition 1 Groundwater Grant Program. State funding is essential to ensuring that the Project will move forward in a timely manner and to mitigating cost impacts to the City's economically disadvantaged rate payers.

Signatory:

Veronica Padilla
Executive Director

LADWP RESPONSE: LADWP acknowledges the response from Pacoima Beautiful, and appreciates the support for this important remediation project.

RESPONSES TO: *UPPER LOS ANGELES RIVER AREA WATERMASTER* RECEIVED NOVEMBER 16, 2016

COMMENT 1: ***As the Court-appointed Watermaster for the Upper Los Angeles River Area (ULARA), I am writing to express my complete support for LADWP's Proposition 1 Grand Funding Application to the State Water Resources Control Board for the San Fernando Groundwater Basin Remediation Project (Remediation Project). The principal benefits of the Remediation Project are the effective and timely cleanup and removal of the known and widespread groundwater contamination in the San Fernando Groundwater Basin (SFB). Such benefits will aid not only LADWP, but also the public and other water agencies which provide drinking water from this basin. Further, this Remediation Project clearly recognizes the importance of addressing the historically-known, industry-induced groundwater contamination that has restricted the ability of LADWP (and others) to utilize local groundwater resources for many years.***

Based on the 1979-dated Final ULARA Judgment, the ULARA Watermaster has a responsibility to assist the Court in its administration and enforcement of the provisions of the Judgment within ULARA's four separate groundwater basins. The SFB, for which the subject grant funding application is being prepared, is by far the largest of the four groundwater basins in ULARA in terms of its: lateral size; vertical depth; number of municipal-supply water wells; total groundwater extractions; and the scope and magnitude of its known groundwater contamination. Based on my responsibility to the Judgment, I am appreciative that LADWP has taken upon itself to be a leader in this vitally important Remediation Project, and I am certain the Court will take an affirmative view of my support, as Watermaster, of this LADWP effort.

I recognize that this current LADWP action is just one of several that Los Angeles has undertaken over the years within the four ULARA groundwater basins. This current grant application and groundwater remediation project, along with those other actions (water recycling, water conservation, stormwater capture, etc) are vital to ensuring the long-term sustainability of the local groundwater resources, thereby reducing the need to import water from other sources at higher costs. State funding through this Proposition 1 Grant Program is essential to ensuring that the Remediation Project will move forward in a timely manner, and to promoting sustainable, reliable water resources within the San Fernando Groundwater Basin.

Signatory:

Richard C. Slade
ULARA Watermaster

LADWP RESPONSE: LADWP acknowledges the response from the ULARA Watermaster, and appreciates the support for this important remediation project.

RESPONSE TO: *Urban Semillas*
RECEIVED NOVEMBER 11, 2016

COMMENT 1: ***On behalf of Urban Semillas, I wish to express our strong support for the Los Angeles Department of Water and Power's (LADWP) San Fernando Groundwater Basin Remediation Project (Project). The Project will effectively clean up and remove contamination from the San Fernando Groundwater Basin (SFB) in order to restore its beneficial use as a critical part of the water supply for the over 4 million people of the City of Los Angeles (City).***

For the past decade, Urban Semillas has worked tirelessly to ensure underserved communities and their opinions are represented when it comes to issues of water quality and supply. Our communities understand the connection and the importance of cleaning up the San Fernando Groundwater Basin for the future of our local water supply for our families.

Historical industrial contamination is increasingly restricting the ability of the City to utilize its primary source of local groundwater, the SFB. Local groundwater has been a key water resource for the City, providing about 12 percent of total supply for Los Angeles over the last five years and since 1970 has provided up to 23 percent of supply during extended dry periods. Groundwater is also one of the City's most affordable sources of supply, especially as imported water becomes increasingly constrained due to climate extremes and environmental regulations.

To restore the full beneficial use of this important resource, LADWP is working with regulatory agencies and other stakeholders to implement the Project, which will construct state-of-the-art remediation facilities to address contamination impacting pumping wells in the SFB. Even with the cost of these remediation facilities, local groundwater will be more affordable than purchased, imported supplies, thereby allowing LADWP to continue providing lower rates to customers who use less water. LADWP's ability to maintain these lower rates significantly benefits the many disadvantaged residents of the City of Los Angeles.

Urban Semillas has been engaged in the stakeholder process for this and other water-related projects through its participation in the City's One Water LA 2040 Plan development effort. As part of this effort, community stakeholders participated in developing Guiding Principles that were adopted in 2015. One of these stakeholder-supported principles was to "Recognize the importance of remediating and maintaining the health of the City's groundwater basins and consider recommendations of LADWP's groundwater program." We commend the City's and LADWP's efforts to implement this Project, which will provide tremendous benefits to many economically disadvantaged communities and the residents of the City as a whole.

Urban Semillas supports LADWP's efforts to restore local groundwater and to preserve one of the City's most affordable and reliable water supplies. As a result, we also wholeheartedly support the San Fernando Groundwater Basin Remediation Project and LADWP's application for funding through the Proposition 1 Groundwater Grant Program. State funding is essential to ensuring that the Project will move forward in a timely manner and to mitigating cost impacts to the City's economically disadvantaged ratepayers.

Signatory:

Miguel A. Luna
Executive Director

LADWP RESPONSE: LADWP acknowledges the response from Urban Semillas, and appreciates the support for this important remediation project.

RESPONSES TO:

COMMENTS RE: "DECEMBER 2016 INTERIM REMEDIAL INVESTIGATION/ FEASIBILITY STUDY REPORT FOR NORTH HOLLYWOOD WEST WELL FIELD"

BY NORTON ROSE FULBRIGHT DATED MARCH 29, 2017

COMMENT 1: ***INTRODUCTION***

We are submitting the enclosed comments on behalf of CalMat Co. d/b/a Vulcan Materials Company, Western Division, regarding the Proposed Plan for the North Hollywood West Well Field that LADWP issued on or about December 7, 2016. CalMat's comments also refer to the Interim Remedial Investigation/Feasibility Study Report dated December 2016, the Baseline Health and Human Risk Assessment dated December 2016, and the Mitigated Negative Declaration dated December 2016. CalMat's comments consist of this letter as well as the enclosed technical comments CalMat's consultant, Golder Associates, prepared.

LADWP RESPONSE:

This comment is introductory in nature but asserts that comments refer to, among other documents, the Mitigated Negative Declaration dated December 2016. However, upon review neither CalMat's comments, nor the technical comments provided by Golder Associates, makes reference to or comments on the Mitigated Negative Declaration.

LADWP's responses to CalMat's comments consist of these responses as well as the responses to the comments of CalMat's consultant, Golder Associates (Response to Golder). LADWP's responses do not refer or relate to the Mitigated Negative Declaration.

COMMENT 2: ***EXECUTIVE SUMMARY***

It appears that LADWP pre-picked an alternative that met the Proposition 1 bond fund requirements, and then calculated backward to justify it as an appropriate remedial alternative. LADWP's clear objective was to justify funding a new water treatment plant rather than selecting an appropriate groundwater remedy. This is not in compliance with CERCLA or the NCP. LADWP dismissed or prematurely excluded from its modeling and remedy selection three remedial actions in the vicinity of the North Hollywood West well field. All three remedies are almost certain to impact any remedial alternative at the North Hollywood West well field – the on-site source control remedy at the Hewitt Site is expected to eliminate LADWP's assumed ongoing source of 1,4-dioxane within a few years (not 13); the EPA-requested installation of offsite extraction wells is expected to eliminate 1,4-dioxane between the Hewitt Site and the North Hollywood West well field; and the NHOU Cooperative Containment Concept at the North Hollywood East well field is expected to eliminate ongoing sources to the east of the North Hollywood West well field and significantly impact water gradient, among other effects. LADWP also ignores other chemicals of concern – even though it acknowledges that TCE, PCE, 1,1-DCE, iron, nitrate, and hexavalent chromium exceed 1,4-dioxane as

risk drivers. This also is not in compliance with CERCLA or the NCP. Taken together, in no way is LADWP's proposed $100 million treatment system necessary or cost effective.[1]

To comply with CERCLA, LADWP must complete the remedy selection process consistent with the NCP. [2] This requires a thorough and detailed analysis of all available and relevant information, especially due to the scope and complexity of the North Hollywood West well field, and the $100 million estimated remedial cost. Instead, LADWP's Proposed Plan is cursory and lacking in critical detail. Among other deficiencies, the Proposed Plan:

- ***Fails to consider and incorporate more recent data into the analysis, instead relying on outdated and mixed data sets;***
- ***Relies on a flawed and outdated conceptual site model that does not adequately characterize the site conditions and dynamics in contravention of the NCP;***
- ***Uses a flawed risk assessment that employs unrealistic assumptions and ignores the primary drivers of risk;***
- ***Significantly overestimates the extent and mass of 1,4-dioxane contamination it needs to address and treat in its Proposed Plan;***
- ***Overestimates the size and cost of any needed treatment system;***
- ***Fails to consider many remedial alternatives that would be more cost-effective than its preferred alternative;***
- ***Excludes chemicals of concern other than 1,4-dioxane that would materially affect the remedy selection decision; and***
- ***Fails to include in the FS or Proposed Plan adequate cost estimation information, which makes it impossible for LADWP or CalMat to determine whether the selected alternative's costs are "proportional to its overall effectiveness."***

[1] There also is an apparent conflict of interest in LADWP serving as an applicant for Proposition 1 funding and both the project proponent and lead agency for CEQA purposes. The State Water Resources Control Board "Proposition 1 Groundwater Grant Program Guidelines" at Section 4.8 expressly prohibit funding for projects that "avoid, but do not prevent or cleanup, the groundwater contamination," effectively compelling LADWP, as applicant, to select the treatment remedy if it wants to obtain Proposition 1 funds. And because it is the project proponent and lead agency, there is no independent viewpoint providing critical review.

[2] 42 U.S.C. § 9604(a)(1) (authorizing cleanup action that is "consistent with the National Contingency Plan"); id. § 9607(a)(4)(B) (costs must be necessary and comply with the NCP); see also 40 C.F.R. §300.700(c)(3)(i) (identifying applicable NCP requirements for remedy selection).

<u>LADWP RESPONSE:</u>

CalMat's assertion that LADWP has "pre-picked an alternative that met the Proposition 1 bond fund requirements, and then calculated backwards to justify it as an appropriate remediate alternative" is baseless, not correct, and belies the facts. LADWP has complied with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), completed an extensive study, engaged in wide-ranging public participation steps, and fully considered and evaluated public comments, which have been generally supportive, and CalMat's comments which have not. LADWP extended the public comment period (creating a 112 day comment period, from December 7, 2016 to March 29, 2017), and provided CalMat with additional documents. Only after all of these steps, and others, will LADWP undertake the remedy selection process. Allegations of pre-picking an alternative are simply unfounded and unsupported, by CalMat's comments or the technical comments provided by Golder Associates.

LADWP evaluated scenarios including remediation at the Hewitt Landfill and the Cooperative Containment Concept (CCC) North Hollywood Operable Unit (OU) Second Interim Remedy (2IR). LADWP also considered proposed or hypothetical actions by third parties in the RI/FS (Table A4-5). As provided in more detail in the Response to Golder, no third party remedial action plans or remedial design for source control, or for downgradient plume control remedies, exists in the vicinity of the NHW Well Field. CalMat claims, without providing any evidence or support, that the on-site source control remedy at the Hewitt Site is expected to eliminate LADWP's assumed ongoing source of 1,4-dioxane within a few years.

CalMat claims that risk drivers other than 1,4-dioxane are ignored, but that statement is not correct. Such risk drivers are evaluated in the risk assessment and the RI/FS and the Proposed Plan expressly acknowledges these other risks but states that the risk will be addressed in other actions. The proposed action is intended to be an interim remedial action (limited in scope) to address the 1,4-dioxane groundwater plume at the NHW Well Field. One or more additional response actions will be evaluated in the future to address the broader VOC groundwater plume that exists in the area.

LADWP has complied with CERCLA and the NCP, and immaterial or insubstantial deviations are not considered inconsistent with the NCP. 40 C.F.R. §300.700 (c)(4). Further, LADWP is not required to conduct a detailed analysis of every hypothetical alternative or scenario. "A detailed analysis shall be conducted on the limited number of alternatives that represent viable approaches to remedial action after evaluation in the screening stage." 40 C.F.R 300.430(e)(9)(i) Alternatives may be screened for effectiveness, implementability, and cost and eliminated based on one or more of those criteria as not representing viable approaches. 40 C.F.R 300.430(e)(7) and (9). As explained in the RI/FS, response to comments and related documents, LADWP appropriately screened out certain potential remedial technologies and approaches, evaluated an appropriate range of alternatives and has selected the alternative that best meets the RAOs and NCP criteria. CalMat's allegations of deficiencies are addressed in more detail below and in the Response to Golder.

In a footnote to its letter, CalMat suggests that "an apparent conflict of interest" exists for LADWP acting as a lead agency for CEQA and for Proposition 1 funding. There is no conflict of interest. The term "Conflict of Interest" is specifically defined in Section 10.1 of the "Proposition 1 Groundwater Grant Program Guidelines" cited by CalMat, as follows: "Applicants are subject to state and federal conflict of interest laws. Failure to comply with these laws, including business and financial disclosure provisions, will result in the application being rejected and any subsequent grant agreement being declared void. Other legal action may also be taken. Before submitting an application, applicants are urged to seek legal counsel regarding conflict of interest requirements. Applicable statutes include, but are not limited to, California Government Code Section 1090 and California Public Contract Code Sections 10410 and 10411." California Govt. Code sec. 1090 prohibits, among other things, city officers or employees from being financially interested in a contract made by them in the official capacity, or from making purchasers/vendors from a sale made in their official capacity. California Publ. Contract Code sec. 10410 prohibits, among others officers and employees from receiving compensation from employment, activity, enterprise or as an independent contractor, through a state contract sponsored or funded by the state. California Publ. Contract Code sec. 10411 extends certain prohibitions beyond retirement, dismissal, or separation from employment. LADWP, nor its officers or employees have business or financial interests which create a conflict of interest. The NCP does not prohibit applying for funding, and requires the consideration of costs.

<u>COMMENT 3:</u> ***I. The Proposed Plan Selects a Remedial Alternative That Is Not Necessary or Effective***

The NCP requires LADWP to perform an analysis of alternative remedial approaches before selecting a preferred alternative. [3] The evaluation of remedial alternatives occurs in the feasibility study, which must ensure that appropriate remedial alternatives were developed and evaluated such that relevant information can be presented to a decision-maker and an appropriate remedy selected. [4] The evaluation of alternatives must reflect the scope and complexity of the site. [5] Further, the NCP requires that LADWP select a remedy that is protective of human health and the environment, that maintains protection over time, and that minimizes untreated waste.[6] The NCP also requires that LADWP "prevent further migration of the plume, prevent exposure to the contaminated groundwater, and evaluate further risk reduction" when restoration of ground water to beneficial uses is not practicable.[7]

LADWP failed to perform an adequate analysis of alternative remedial approaches that reflect the scope and complexity of the site. This is partly because LADWP used stale and incomplete data sets, and partly because LADWP arbitrarily excluded data regarding on-site source control at the Hewitt Site, anticipated off-site extraction wells between the Hewitt Site and the North Hollywood West well field, and the North Hollywood East Cooperative Containment Concept remedy, as well as analysis of COCs other than 1,4-dioxane. In addition, as detailed in the enclosed Golder comments, LADWP's selected alternative is likely ineffective at protecting human health and the environment, and could be detrimental as follows:

- ***LADWP's use of existing water production wells as extraction wells for groundwater treatment will be extremely inefficient and will not effectively treat the thin layer of 1,4-dioxane largely concentrated at the water table.***
- ***Instead of targeting specific zones of contamination to maximize removal of mass, LADWP's selected remedy will unnecessarily pump and treat enormous volumes of clean water.***
- ***LADWP's expanded pumping will make 1,4-dioxane more difficult to remediate instead of treating it.***

Contrary to the NCP, it appears that LADWP's remedy selection came before its analysis of alternative remedial options. There is no other explanation for LADWP's omission or premature exclusion of a number of other remedies or combinations of remedies that are feasible and more protective and cost effective than LADWP's selected alternative. LADWP should have analyzed, at a minimum, the following options:

- ***reconstruction and re-equipping or replacement of production wells (not considered);***
- ***in situ treatment (not considered);***
- ***alternative pumping plan (not fully considered);***
- ***blending (retained but only in association with an ex situ treatment system);***
- ***hydraulic control using shallow extraction wells (not retained or fully considered); and***
- ***the reduction in 1,4-dioxane impacting the wells as a result of future remedial measures at the Hewitt Site and in between the Hewitt Site and the North Hollywood West well field (not considered).***

[3] Id. 40 C.F.R. § 300.430(a).

[4] Id. 40 C.F.R. § 300.430(e)(1).

[5] ***Id. 40 C.F.R. § 300.430(a)(ii)(C).***

[6] ***Id. § 300.430(a)(1)(i).***

[7] ***Id. § 300.430(a)(1)(iii)(F).***

LADWP RESPONSE:

CalMat incorrectly claims that the Proposed Plan selects a remedial alternative that is not necessary or effective. CalMat points out that the NCP requires LADWP to perform an analysis of alternatives in a feasibility study that presents relevant information to the decision maker, yet, but for reaching a different conclusion, CalMat fails to detail how the alternatives evaluated by LADWP did not reflect the scope and complexity of the site, among other things.

The LADWP Proposed Plan, RI/FS and related documents meet the requirements of the NCP. The RI/FS evaluates a reasonable range of alternatives, presents relevant information to the decision maker and the alternatives reflect the scope and complexity of the site.

The requirements, objectives, expectations and considerations of the NCP are codified 40 C.F. R. Part 300. CalMat's citations to sections of 40 C.F.R. Part 300 as NCP requirements, which may be objectives, expectations, considerations or other, is misplaced. By example only, citing §300.430(a)(1)(iii)(F), CalMat asserts that the "NCP also **requires** that LADWP 'prevent further migration of the plume, prevent exposure to the contaminated groundwater, and evaluate further risk reduction' when restoration of ground water to beneficial uses is not practicable". If fact, 40 C.F.R. section 300.430(a)(1)(iii) are codified expectations:

> "Expectations. EPA generally shall consider the following expectations in developing appropriate remedial alternatives: **(F)** EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site. When restoration of ground water to beneficial uses is not practicable, EPA expects to prevent further migration of the plume, prevent exposure to the contaminated ground water, and evaluate further risk reduction."

Preventing further migration of the plume, preventing exposure to contaminated groundwater, and evaluating further risk reduction are expectations when restoring groundwater to beneficial uses is not practicable. LADWP's proposed plan expects to restore groundwater to beneficial uses.

LADWP's analysis of alternatives is adequate in accordance with the NCP. As stated above, LADWP evaluated scenarios including remediation at the CCC and also considered proposed or hypothetical actions by third parties in the RI/FS. CalMat's assertion that the data was stale/old, or incomplete/excluded is addressed in the section below. CalMat's assertion that LADWP's selected remedy is "*likely* ineffective" at protecting human health and the environment is based on Golder's alternate suggestion that source control is the "most effective", that interceptor wells should be used, that blending should occur, that LADWP's wells should be abandoned, and that dilution of influent occurs due to LADWP's pumping, which were evaluated by LADWP. *See*; Response to Golder.

- LADWP's use of existing water production wells will be efficient and effective at treating the 1,4-dioxane over a wide range of concentrations. Fate and transport modeling has shown that 1,4-dioxane is already present at the screened intervals above NL, and is projected to continue as the plume moves toward the will field as is discussed in more detail in the Response to Golder, Section A - third paragraph; Section B - Retrofit/New Production Wells bullet; Comment 31(g); Comment 31(h).

- LADWP's selected remedy would pump and treat through combined operation of the remediation wells which would draw the 1,4-dioxane plume toward and be captured by the wells as is discussed in more detail in the Response to Golder, Section A - third paragraph; Comment 20, 25, 26, 31(g), and 31(h).
- LADWP's pumping will allow LADWP to capture and remediate the 1,4-dioxane as described generally in the Response to Golder, Section A - third and fourth paragraph.

LADWP has complied with CERCLA and the NCP and evaluated reasonable and viable approaches including providing a detailed analysis of a reasonable range of alternatives, developing a RI/FS, providing a Community Information Plan and, after providing ample notice inviting public comment and participation. As to the following options proposed for review by CalMat, those options were addressed as described below.

- Reconstruction and re-equipping or replacement of production wells as is discussed in more detail in the Response to Golder, Section B – multiple bullets, Comment 19.
- In situ treatment as is discussed in more detail in the Response to Golder, Section B – multiple bullets, Comment 23.
- Alternative pumping plan as is discussed in more detail in the Response to Golder, Section B – multiple bullets
- Blending as is discussed in more detail in the Response to Golder, Section B – multiple bullets, Section H, Comments 21 and 24.
- Hydraulic control using shallow extraction wells as is discussed in more detail in the Response to Golder, Section B – multiple bullets, Comments 20 and 21.
  Proposed or hypothetical actions by third parties as is discussed in more detail in the Response to Golder, Section C, Comments 31 (d), (i) and (q)(5).

<u>**COMMENT 4:**</u> ***II. The Proposed Plan Is Not Consistent with the NCP Because It Uses Old Data and Excludes Material Data***

LADWP's Proposed Plan is not consistent with the NCP because it relies on outdated data and ignores significant data that would materially affect LADWP's remedy selection determination at North Hollywood West. The NCP requires that the remedial investigation "collect data necessary to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives."[8] The feasibility study must then identify and evaluate remedial alternatives. The primary objective of these requirements is to ensure that appropriate remedial alternatives are developed and evaluated, such that relevant information is presented to a decision-maker and an appropriate remedy selected. [9] The NCP further requires that the "[d]evelopment of alternatives [in the FS] shall be fully integrated with the site characterization activities of the remediation investigation."[10] Thus, the evaluation of alternatives in the FS cannot meet NCP requirements if the data upon which it is based do not adequately characterize the site.[11] The data LADWP relied on do not adequately characterize the site; therefore, LADWP's Proposed Plan and RI/FS are not consistent with the NCP.

As detailed in Golder's comments, the deficiencies include:

- ***Use of 2014 plume maps with limited inclusion of recent material data that CalMat has developed and provided or otherwise made available to LADWP;***
- ***Failure to update its conceptual site model with this data;***

- ***Failure to consider recent CalMat documents on the hydrogeology and nature and extent of contamination in the vicinity of the Hewitt Site and North Hollywood West well field, specifically the 2016 Site Assessment Report (CSM/HHRA);***
- ***Mixing data sets instead of using current comprehensive snap shots of plume dimensions;***
- ***Disregarding ongoing and planned remedial activities, including on-site remediation at the Hewitt Site, remediation of groundwater between the Hewitt Site and the North Hollywood West well field, and remediation of groundwater at the North Hollywood East well field, and in doing so, assuming the Hewitt Site will remain an ongoing source and disregarding the impact of expected, significant pumping between the Hewitt Site and North Hollywood West well field and at the North Hollywood East well field;***
- ***Failure to consider the construction and condition of the aging North Hollywood West wells, and their potential to exacerbate contamination.***

LADWP's arbitrary refusal to consider and incorporate relevant data into its analysis renders the analysis invalid. As a result, LADWP's analysis does not adequately characterize current conditions at the North Hollywood West well field in contravention of the NCP, and the Proposed Plan is not accurate is assessing whether the effects of the selected alternative will be materially greater than the effects of the alternative remedial options LADWP failed to consider.

[8] Id. § 300.430(d)(1).

[9] Id. § 300.430(e)(1).

[10] Id.

[11] Id.; see also id. § 300.430(d)(1).

<u>LADWP RESPONSE:</u>

The requirements, objectives, expectations and considerations of the NCP are codified 40 C.F. R. Part 300.

"The purpose of the remedial investigation (RI) is to collect data necessary to adequately characterize the site for the purpose of developing and evaluating remedial alternatives." 40 C.F.R. § 300.430(d)(1). Thereafter, LADWP was required, and did characterize the nature of and threat posed, and gathered data to assess the following factors: "(i) Physical characteristics of the site, including important surface features, soils, geology, hydrogeology, meteorology, and ecology;(ii) Characteristics or classifications of air, surface water, and ground water; (iii) The general characteristics of the waste, including quantities, state, concentration, toxicity, propensity to bioaccumulate, persistence, and mobility; (iv) The extent to which the source can be adequately identified and characterized; (v) Actual and potential exposure pathways through environmental media; (vi) Actual and potential exposure routes, for example, inhalation and ingestion; and (vii) Other factors, such as sensitive populations, that pertain to the characterization of the site or support the analysis of potential remedial action alternatives." 40 C.F.R. § 300.430(d)(2). The data gathered by LADWP and relied upon is more than sufficient to adequately characterize the site in accordance with 40 C.F. R. Part 300. The fact that more data will become available does not negate LADWP's data collection and characterization, and indeed data is often collected following the completion of a Proposed Plan. As new data becomes available after the remedy is selected, LADWP will factor that data into the remedial design and remedial action process, as necessary.

Moreover, as discussed in the response to comments, LADWP has reviewed the CalMat data that has become available since the publishing of the RI/FS and Proposed Plan, and that additional data does not change the analysis or conclusions of the RI/FS and Proposed Plan.

As to the comments detailed by Golder, LADWP responds as follows.

- Use of 2014 plume maps as is discussed in more detail in the Response to Golder, Section D, Comments 1, 4, 10, 14, 28, 31(c), 31(q)(2), and 31(q)(9).
- Its conceptual site model as is discussed in more detail in Response to Golder, Section D, Comment 4, 6, 14, 28, and 31(c).
- CalMat documents on the hydrogeology and nature and extent of contamination in the vicinity of the Hewitt Site and North Hollywood West well field, specifically the 2016 Site Assessment Report (CSM/HHRA) as is discussed in more detail in the Response to Golder, Section D, Comment 1, 4, 6, 10 and 14.
- Use data sets as is discussed in more detail in the Response to Golder, Section D, Comment 5 with respect to water levels not plume, and Comment 31(c).
- Proposed or hypothetical actions by third parties as is discussed in more detail in the Response to Golder, Section C, Comments 2, 26, 31 (d), (i) and (q)(5
- The North Hollywood West wells, as is discussed in more detail in the Response to Golder, Section G, and Comment 7.

LADWP gathered data necessary to adequately characterize the site as required by the NCP and conducted a detailed analysis of viable alternatives. CalMat assertion that LADWP's analysis did not adequately characterize the current conditions at the NHW Well Field belies the facts as set forth in the RI/FS and as detailed in the Response to Golder, Sections C, D and comments set forth above.

COMMENT 5: ***III. LADWP's Site Modeling Does Not Adequately Characterize Site Conditions or Dynamics***

LADWP's modeling does not adequately characterize site conditions or dynamics. As discussed above, the NCP mandates that "[t]he purpose of the [RI] is to collect data necessary to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives."[12] As part of this process, the NCP requires LADWP to "[d]evelop a conceptual understanding of the site based on the evaluation of existing data ."[13] A conceptual site model based on all available data is a fundamental requirement in producing a Proposed Plan and RI/FS, as well as in finding an appropriate remedial alternative for North Hollywood West.[14] LADWP's conceptual site modeling evidences a fundamental failure to understand the complex and dynamic site conditions in North Hollywood West, and therefore is deficient under the NCP, for the following reasons, detailed in Golder's comments:

- ***LADWP relies on the AMEC 2015 model for the North Hollywood Operable Unit. The AMEC model states that the North Hollywood West well field is outside of the NHOU investigation area, requiring LADWP to extrapolate its model for the well field despite actual data CalMat has gathered;***
- ***The AMEC model is calibrated not to contaminant distributions, but to groundwater heads and water flux.***

- ***LADWP presents no support that the AMEC regional model properly represents conditions in the North Hollywood West well field. CalMat has informed LADWP on several occasions that based on actual data, the AMEC model is not properly calibrated for the area north of North Hollywood West and gives a poor representation of water levels and flow directions in that area.***
- ***Based on actual data in CalMat's CSM/HHRA, there is no support for LADWP's assumption that the highest value of 1,4-dioxane observed at the Hewitt Site will ever be measured in the vicinity of North Hollywood West well field.***
- ***LADWP's use of mixed data ignores the dynamic nature of the groundwater contaminant mass and extent, significantly overestimating treatment duration and overall short and long term effectiveness of the remedy.***

LADWP RESPONSE:

CalMat suggests that the LADWP modeling does not adequately characterize site conditions or dynamics, and criticizes the use of the AMEC model. LADWP's analysis does not reach the same conclusion. As set forth in the Response to Golder, Section F, the "model is sufficiently well calibrated to water level data in the North Hollywood OU study area (encompassing the Hewitt pit and the NHW remediation and secondary wells) to simulate interaction of this well field with existing mapped contaminants." While CalMat may express their dissatisfaction with the modeling results, it does not negate the methodologies or results which adequately characterize the site conditions and dynamics for purposes of the RI/FS, Proposed Plan, HHRA and remedy selection.

As to the comments detailed by Golder, LADWP responds as follows.

- As to the location NHW wells and Hewitt Pit, please see Response to Golder, Section F and Comment 25.
- As to the AMEC model calibration, please see Response to Golder, Section F.
- As to the AMEC model's representation of conditions in the NHW Well Field, please see Response to Golder, Section F, and Comments 4 and 31(a).
- As to the value of 1,4-dioxane observed at the Hewitt Site, please see Response to Golder, Section D.
- As to CalMat's other data arguments, please see, among other things, Response to Golder, Section C and D.

COMMENT 6: ***IV. LADWP Did Not Comply with NCP Requirements for Risk Assessments***

The NCP requires LADWP to conduct an appropriate risk assessment for the purpose of establishing acceptable exposure levels for use in developing and evaluating remedial alternatives in the feasibility study.[15] LADWP has not met this requirement. The Proposed Plan, RI/FS, and HHRA do not provide a discussion of the data used, data uncertainty, nor why they were used. In its risk assessment, LADWP indicates that risk from exposure to 1,4- dioxane falls within EPA's risk management range, but the RI/FS does not address the primary risk drivers for the production and monitoring wells, PCE and TCE. As detailed in Golder's comments, PCE is the primary risk driver for both the production and monitoring wells, with carcinogenic risks one-to-two orders of magnitude greater than those associates with 1,4- dioxane. As a result, the risk evaluation's conclusion, that

1,4-dioxane requires remedial action while ignoring other COCs including PCE, or blending for other COCs, is faulty.

[15] Id. § 300.430(a)(2) (requiring that a risk assessment be prepared when developing and conducting an RI/FS); id. § 300.430(d)(4) ("[T]he lead agency shall conduct a site-specific baseline risk assessment to characterize the current and potential threats to human health and the environment that may be posed by contaminants migrating to ground water or surface water . . . .")

LADWP RESPONSE:

CalMat asserts that LADWP did not comply with the NCP requirements for Risk Assessments. LADWP does not agree. LADWP prepared a site-specific risk assessment as part of the RI/FS that characterizes the current and potential threats to human health and the environment that may be posed by contaminants migrating to ground water or surface water. The RI/FS evaluated all the chemicals present in groundwater within the capture zone of the well field. As explained in the RI/FS and Proposed Plan, the proposed IRA is intended to be an IRA to address the 1,4-dioxane groundwater plume present at the NHW Well Field. LADWP's RI/FS acknowledged that other chemicals in groundwater also pose a risk and that a response action should be evaluated for such chemicals. Such risks are not ignored. As explained in more detail in Golder Response E, the commenter is conflating risk assessment and risk management. The risk management decision to focus initially on 1,4-dioxane is technically sound, appropriate and consistent with the NCP. One or more additional response actions will be evaluated at a future date to address the broader VOC groundwater plume that exists in the area. As explained by the EPA, "[a]n interim action is limited in scope and only addresses areas/media that also will be addressed by a final site/operable unit Record of Decision" (EPA 1991a). 1,4-Dioxane has been measured in groundwater at concentrations exceeding 10 times the NL, both at the NHW production wells and at numerous locations up-gradient of the NHW production wells. This magnitude of exceedance falls outside the levels that permit the water to be served even with blending pursuant to the current Blending Plan and State of California Domestic Water Supply Permit issued by DDW to LADWP. This interim remedial remedy focuses on 1,4-dioxane as a risk management strategy because 1,4-dioxane is posing the most significant impact on the beneficial use of groundwater in accordance with the LARWQCB Basin Plan, which conforms with the State of California Antidegradation Policy (i.e., SWRCB Resolution 68-16 and 92-49), an ARAR for this IRA. See also, the Response to Golder, Section E and Comments 16 and 17 (a) – (c), and the stand-alone HHRA report.

COMMENT 7: ***V. The Proposed Plan's Assessment of Cost-Effectiveness Is Inconsistent with the NCP***

The NCP includes among its "Primary Balancing Criteria" the requirement that "each remedial action selected shall be cost effective" if it satisfies the "threshold criteria" for selection of a remedy, and if its costs are "proportional to its overall effectiveness."[16] In the preamble to the NCP, EPA explained that, although cost effectiveness is not one of the two threshold criteria established by the NCP, it nonetheless "is like the two threshold criteria in that it is a statutory requirement with which an alternative must comply in order to be eligible for selection as the remedy."[17] Further, EPA explained that "[t]he statutory finding of cost-effectiveness is not 'balanced' with any other statutory requirement, but rather certain evaluation criteria are balanced to reach the conclusion that the remedy is cost effective."[18] Thus, LADWP must evaluate the cost-effectiveness of the various alternatives to comply with the NCP.[19] As detailed in Golder's comments, LADWP's lack of supporting data in the Proposed Plan or FS for its cost estimate makes any substantive evaluation

impossible.[20] LADWP includes a "lump sum" category of costs, but offers no explanation as to what is included. LADWP disregards EPA's guidance on preparing cost estimates by providing no vendor quotes and no indication of contractor markups, overhead, or profit. [21] Without more information, the public cannot effectively evaluate whether LADWP's cost estimate complies with the NCP requirement that the $100 million cost of LADWP's preferred alternative be proportional to its overall effectiveness.

[16] 40 C.F.R. § 300.430(f)(1)(ii)(D).

[17] 55 Fed. Reg. 8666, 8728 (Mar. 8, 1990).

[18] Id.

[19] See also EPA, The Role of Cost in the Superfund Remedy Selection Process 2 (Sept. 1996) ("Cost is a critical factor in the process of identifying a preferred remedy. In fact, CERCLA and the NCP require that every remedy selected must be cost-effective.").

[20] LADWP appears to have provided more detailed cost estimate information in the batch of documents and information it provided on March 21, but CalMat has not had sufficient opportunity to review this information. LADWP has also not made this information available publicly.

[21] EPA, A Guide to Developing and Documenting Cost Estimates During the Feasibility Study (July 2000).

<u>LADWP RESPONSE:</u>

LADWP has provided an appropriate level of detail for its cost estimate, consistent with the NCP. Please see Response to Golder, Comments 32 (a) – (f).

<u>COMMENT 8:</u> ***VI. LADWP Arbitrarily Failed to Consider Other Contaminants of Concern***

Despite acknowledging that other COCs are substantial drivers of risk at North Hollywood West, LADWP's feasibility study arbitrarily excludes evaluation of any COCs other than 1,4-dioxane. Despite stating in the RI/FS that TCE, PCE, and 1,1-DCE are present in North Hollywood West wells, LADWP focuses its analysis and remedial measures solely on 1,4-dioxane, which is lower in overall risk to human health than other COCs. Because LADWP does not consider other COCs, it is impossible to determine whether LADWP's proposed $100 million treatment system is necessary or cost effective.

Further, LADWP's risk evaluation states that COCs other than 1,4-dioxane are above risk screening levels, as well as concentrations above state and federal maximum contaminant levels (MCL). Based on this, any assessment of remedy effectiveness must consider these other COCs. For example, nitrate has historically been above the MCL, and though mitigated through blending, LADWP's Proposed Plan should address this issue if LADWP is actually trying to remediate groundwater.

Contrary to CERCLA's goals, as detailed in the enclosed Golder comments, it appears that LADWP's arbitrary exclusion of other COCs results in a selected alternative and treatment technology that could actually be damaging to public health – not protective. According to LADWP's modeling,

LADWP's selected remedy will pull hexavalent chromium into the North Hollywood West well field, and AOP is not effective at treating hexavalent chromium.

LADWP RESPONSE:

In this comment, CalMat offers its opinion that LADWP "arbitrarily excludes evaluation" of chemicals of concern (COCs) other than 1,4-dioxane. LADWP does not agree. The decision to focus this response action on 1,4-dioxane was intentional and reasonable. The proposed action is intended to be an IRA to address the 1,4-dioxane groundwater plume present at the NHW Well Field. This risk management approach is appropriate and consistent with CERCLA.

The risk management decision to focus initially on 1,4-dioxane plume threatening the NHW Well Field separately from the more widespread VOC contamination is appropriate for several reasons. First, 1,4-dioxane has exceeded the levels that would allow for blending under the Permit, while VOCs have been present at levels that can be managed through blending. Second, the 1,4-dioxane plume is more limited in its spatial distribution than the widespread VOC plume in the area and it is important to limit that migration as soon as possible. This need is made more urgent because 1,4-dioxane requires treatment that is different than the treatment to be used to manage VOCs alone. The further migration of the 1,4-dioxane plume will therefore greatly increase the cost and difficulty of further addressing the plume and further impair the beneficial uses of the basin. Third, 1,4-dioxane is fully miscible in water and therefore travels quickly, posing a continued risk to human health and the environment.

One or more additional response actions will be evaluated at a future date to address the broader VOC groundwater plume that exists in the area. As explained by the EPA, "[a]n interim action is limited in scope and only addresses areas/media that also will be addressed by a final site/operable unit Record of Decision" (EPA 1991a). Nitrate has not exceeded 10 times the MCL, and therefore has been managed with blending pursuant to the current Blending Plan and State of California Domestic Water Supply Permit issued by DDW to LADWP. See also, the Response to Golder, Section E and Comments 16 and 17 (a) – (c), and the stand-alone HHRA report.

Lastly, CalMat asserts that the proposed IRA "could actually be damaging to public health" since it will pull hexavalent chromium into the NHW Well Field. LADWP does not agree with this assessment. The concentration of hexavalent chromium has not exceeded the MCL nor is it anticipated to arrive at the NHW well field. The former Bendix Site (Honeywell) is using both groundwater extraction and reinjection, and in situ reduction to control the hexavalent chromium (CrVI) plume from the site. The 100 GPM groundwater extraction and treatment system for in situ treatment includes five active groundwater extraction wells and two treated-water-only injection trenches to provide hydraulic control of the on-site CrVI plume, and two injection trenches are used to reinject the treated water on-site. Operation of the on-site remediation system began in January 2009 and continues to present. In addition, direct injection of calcium polysulfide (CaSx) chemical reductant into the shallow aquifer is used to create a reductive zone that acts as a permeable reactive barrier for on-site groundwater.

As reported by Stantec (2016) the areal extent of the on-site CrVI plume in groundwater has been reduced by more than 50% as a result of the pilot testing completed in 2012 and 2013.

This same remedial approach of direct injection of chemical reductant into shallow groundwater is used to for off-site CrVI in situ treatment to control the off-site Cr-VI plume. Reductant solution delivery using this system began on March 27, 2017 (Stantec 2017). Stantec used reactive transport modelling to design the off-site injection remediation system, which is designed to be effective in controlling the off-site CrVI plume from the Bendix site (Stantec 2016).

As explained in Response to Golder, Section E, this claim that the LADWP response action could be damaging to public health is simply not accurate.

COMMENT 9: ***VII. LADWP Fails to Establish Appropriate Chemical-Specific Exposure Levels***

The NCP requires that LADWP "establish remedial action objectives specifying contaminants and media of concern, potential exposure pathways, and remediation goals . . . [that] establish acceptable exposure levels that are protective of human health and the environment . . . ."[22] In violation of the NCP, LADWP has failed to develop risk-based exposure levels based on currently available information and excludes from consideration all potential COCs other than 1,4-dioxane.

LADWP appears to use notification levels as the exclusive basis for its remedial action objectives. Although preliminary remediation goals may be "developed based on readily available information," LADWP is obligated to modify its remediation goals as more information becomes available during the RI/FS process.[23] As discussed above, LADWP has excluded information from its analysis and relied on outdated data during the RI/FS process. The NCP requires that LADWP modify its remediation goals based on the information that is available to it.[24] In addition, and as discussed above and in Golder's comments, LADWP has not analyzed or considered all potential contaminants of concern in the area.

[22] 40 C.F.R. § 300.430(e)(2)(i).

[23] Id. ("Preliminary remediation goals should be modified, as necessary, as more information becomes available during the RI/FS.").

[24] Id.

LADWP RESPONSE:

CalMat asserts that the LADWP has failed to establish appropriate chemical-specific exposure levels. LADWP does not agree. LADWP established remedial action objectives specifying contaminants and media of concern, potential exposure pathways and remediation goals that establish acceptable exposure levels that are protective of human health and the environment. The potential exposure media and pathways (contaminated drinking water) are described in the RI/FS and evaluated in the HHRA. LADWP set preliminary cleanup goals for the interim remedial action to address the 1,4-dioxane plume equal to the California NL. California established the NL of 1 µg/L, which is based on a USEPA risk analysis of ECR of approximately 10^{-6}. This value is based on the ingestion of drinking water, which is appropriate for the domestic use end use contemplated for the beneficial use of groundwater in this area. While USEPA calculated an ECR of 10^{-6} at 0.35 µg/L, the NL of 1 µg/L is within a factor of 3 and is therefore within an acceptable ECR risk range comparable to a typical MCL and acceptable risk range for a CERCLA response action. LADWP also identified the NL for 1,4-dioxane as a TBC, which further supports its use in the creation of cleanup levels. NLs are health based advisory levels for chemicals in drinking water that are established for chemicals for which there are no formal regulatory standards (MCLs). NLs set for drinking water in the 10^{-6} range are an appropriate metric for cleanup levels for water intended for domestic use.

The use of a groundwater NL as a preliminary remediation goal (PRG) for 1,4-dioxane is appropriate, thus it is not necessary to calculate a site-specific groundwater PRG for 1,4-dioxane. NLs are calculated using typical exposure assumptions used for risk assessment, including a 2-liter/day ingestion rate, a 70-kilogram adult body weight, and exposure over a 70-year lifetime (SWRCB, 2015). Although PRGs generally use a target cancer risk of $1x10^{-6}$, the NL for 1,4-dioxane (1 µg/L) is based on a cancer risk of 3×10^{-6}, due to the difficulty in detecting 1,4-dioxane at very low levels (SWRCB, 2015). EPA's Risk Assessment Guidance for Superfund on Development of Risk-Based Preliminary Remediation Goals notes that a principal criterion for remedy selection under the NCP is that the remedy and its associated cleanup levels must provide "overall protection of human health and the environment" (EPA, 1991b). A groundwater cleanup goal based on a cancer risk of 3×10^{-6} falls within EPA's target cancer risk range of 1×10^{-6} to 1×10^{-4} established in the NCP (EPA, 1990) and a subsequent EPA interpretive memorandum (EPA, 1991c), thus it meets the criterion for protection of human health. In summary, the NL for 1,4-dioxane is a health-based value used for public water supplies in California, thus use of the NL as a groundwater PRG is valid for the NHW site.

During the public comment period, LADWP did not receive any information to indicate that less stringent cleanup levels are appropriate. LADWP also notes that, for the North Hollywood Operable Unit (NHOU), which is part of Superfund Site in the same groundwater basin as the NHW Well Field, EPA identified the NL for 1,4-dioxane as a cleanup criteria.

For groundwater that would be served as potable water as part of the interim remedy, LADWP established additional preliminary cleanup goals based on applicable California and federal MCLs, since that treated water would be served for domestic use.

CalMat further claims that LADWP is obligated to modify the cleanup levels as more information becomes available, but CalMat does not identify any information that warrants changing the cleanup levels. LADWP does note, that during the public comment period, the DDW submitted a comment letter which confirmed that DDW may require evaluation in accordance with the DDW Policy Memo 97-005 for Direct Domestic Use of Extremely Impaired Sources. That directive includes additional monitoring requirements, design evaluation, and treatment goals. DDW noted that this evaluation may result in treatment goals that are lower than the preliminary goals listed in Tables 2A and 2B of the FS. This additional information from DDW will be incorporated into the remedy decision document. Please also see Response to Golder, Section E, and Comment 18.

With respect to the comment on other potential contaminants of concern, as explained above, the proposed action is intended to be an interim remedial action to address the 1,4-dioxane groundwater plume present at the NHW Well Field. See also, the Response to Golder, Section E and Comments 16 and 17 (a) – (c), and the stand-alone HHRA report.

COMMENT 10: ***VIII. LADWP Has Deprived CalMat and Other Stakeholders of a Meaningful Opportunity to Comment on the Proposed Plan***

LADWP has not provided CalMat or the public a reasonable and meaningful opportunity to comment on the Proposed Plan. The NCP provides that the administrative record should contain "documents containing factual information, data and analysis of the factual information, and data that may form a basis for the selection of a response action."[25] In addition, the NCP requires that the administrative record be made available for public inspection "at the commencement of the remedial investigation

phase."[26] LADWP has not complied with either requirement concerning the contents and publication of its administrative record.

To date, LADWP has not made its administrative record publicly available as of the date of this letter. This is a clear violation of the NCP, which requires that the administrative record be made available to the public "at the commencement of the remedial investigation phase."[27] CalMat notified LADWP of the NCP's requirement and requested that LADWP publish the administrative record and extend the public comment period to give the public time to review and make meaningful comments.[28] LADWP did extend the public comment period to the present date, but has not publicly published the entire administrative record.[29]

Instead, LADWP's refusal to comply with the NCP forced CalMat to engage in an onerous backand-forth to request responsive information via a California Public Records Act request to LADWP requesting the administrative record.[30] LADWP responded to this request by seeking to narrow the scope of documents it would provide, rather than just producing the entire administrative record that it should have created contemporaneously with the Proposed Plan, per NCP requirements.[31] LADWP then began slowly providing documents in batches. It delivered the first batch in early February, a second batch on March 21, 2017 – just eight days prior to the close of the public comment period. LADWP has stated that it will provide another batch in early April – after the close of the public comment period. CalMat requested an extension of the March 29 public comment deadline to allow it time to review the documents from March 21, as well as any documents received in early April, but LADWP refused. As a result, this letter and the enclosed Golder comments reflect documents reviewed to date, but obviously do not include comments on documents and information CalMat has not yet received.

To the extent that CalMat has been able to review the provided documents, the documents appear to be responsive to the PRA request, but the administrative record is not limited to the narrow scope of documents LADWP has provided. The NCP details the contents of the administration record, which should contain at the very least all documents that form the basis for selection of a response action and any public comments or documents that demonstrate the public's opportunity to participate. [32] Without all of the documents relied upon by LADWP in selecting its preferred alternative, CalMat cannot provide meaningful comments.

[25] Id. § 300.810(a)(1).

[26] Id. § 300.815(a).

[27] Id. ("The administrative record file for the selection of a remedial action shall be made available for public inspection at the commencement of the remedial investigation phase.").

[28] Letter from CalMat to LADWP regarding the administrative record and continuation of the public comment period (Jan. 18, 2017).

[29] Letter from LADWP to CalMat regarding the administrative record and continuation of the public comment period (Jan. 25, 2017).

[30] California Public Records Act Request No. R17-09 (Jan. 17, 2017).

[31] Letter from LADWP to CalMat regarding PRA Request No. R17-09 (Jan. 27, 2017); see also Letter from CalMat to LADWP regarding PRA Request No. R17-09 (Jan. 17, 2017) (responding to LADWP's offer to provide seven categories of documents reiterating that CalMat requested the entire administrative record).

[32] See generally40 C.F.R. § 300.810 (describing the administrative record's required contents).

LADWP RESPONSE:

In this comment, CalMat alleges that LADWP has deprived CalMat and other stakeholders of a meaningful opportunity to comment on the proposed plan. LADWP does not agree. LADWP has complied with the requirements of the NCP for private party response actions and has given CalMat and other stakeholders a meaningful opportunity to comment on the Proposed Plan. Per the express provisions of the NCP, LADWP, as a private party, is not required to establish an administrative record. The NCP only requires a "lead agency" to establish an administrative record. CalMat is erroneously attempting to apply the administrative record requirements for a "lead agency" upon LADWP.

LADWP's response action at the NHW Well Field is classified in the NCP as a private party response action. The NCP provides "any person may undertake a response action to reduce or eliminate a release of a hazardous substance, pollutant, or contaminant" (*Id.* § 300.700(a)) and for a CERCLA § 107(a) cost recovery action, responsible parties shall be liable to these private parties for necessary costs of response actions consistent with the NCP (*Id.* § 300.700(c)(2)). The NCP provides further guidance as to what private party response actions will be considered "consistent with the NCP". *Id.* § 300.700(c)(3)(i). While the NCP does require that private party response actions provide an opportunity for public comment, it explicitly exempts private parties from establishing and maintaining an administrative record, as follows.

The following provisions of this part regarding public participation are potentially applicable to private party response actions, **with the exception of administrative record and information repository requirements stated therein**." *Id.* § 300.700(c)(6) [emphasis added].

The NCP provides that "[t]he **lead agency** shall establish an administrative record that contains the documents that form the basis for the selection of a response action. The **lead agency** shall compile and maintain the administrative record in accordance with this subpart." 40 C.F.R. § 300.800(a) [emphasis added]. "Lead agency" is defined in the NCP as "the agency that provides the OSC/RPM to plan and implement response actions under the NCP. EPA, the USCG, another federal agency, or a state (or political subdivision of a state) operating pursuant to a contract or cooperative agreement executed pursuant to section 104(d)(1) of CERCLA, or designated pursuant to a Superfund Memorandum of Agreement entered into pursuant to subpart F of the NCP or other agreements may be the lead agency for a response action." *Id.* § 300.5. LADWP is not a federal agency nor a state. LADWP is also not a political subdivision of a state operating pursuant to a contract or cooperative agreement executed pursuant to section 104(d)(1) of CERCLA, nor has LADWP entered into any agreement which designates it as the lead agency for this response action. Therefore, LADWP is not a "lead agency" for its response action at the North Hollywood West Well Field.

In this case, the public outreach and opportunity for public was quite extensive, and went beyond the requirements of the NCP. LADWP conducted community outreach to invite the participation of residents, community leaders, property owners, regulatory agencies, potentially responsible parties and all interested members of the public at large. LADWP mailed over 500 letters to residents, community groups, stakeholders, and regulatory agencies. LADWP published notices of the public comment period and public meetings in newspapers. LADWP also sent email notifications to 88 neighborhood councils and posted information on LADWP's Facebook page. The documents were posted on the LADWP website www.ladwp.com/remediation. Printed copies and electronic copies of the documents were maintained at four public repositories for public viewing:

- City of Los Angeles Central Library;
- City of Glendale Public Library;
- City of Burbank Public Library; and
- Panorama City Public Library.

LADWP held two public meetings with a court reporter present and also met with community groups. LADWP extended the public comment period multiple times, providing more than 110 days of public comment (compared to the minimum requirement of 30 days). LADWP received and reviewed extensive comments from the public.

LADWP disagrees with CalMat's characterization of the documents that LADWP made public at the start of and during the public comment period. LADWP did provide the documents that form the basis for selection of a response action. These documents were made available to the public at the document repositories and the information in those documents provides ample opportunity for meaningful public review and comment. In addition, in response to a request from CalMat, LADWP promptly provided the actual computer model files so that Calmat could use those files in preparing its comments. LADWP also prepared and published a preliminary response to early comments submitted by CalMat that included additional details about the modeling, data and a sensitivity analysis.

COMMENT 11: ***CONCLUSION***

For the reasons set forth above and in the enclosed Golder comments, the Proposed Plan was not prepared in accordance with CERCLA or the NCP. Because of the numerous and significant deficiencies in LADWP's Proposed Plan, LADWP should not issue an Interim Remedial Action Plan until it addresses these problems. Failure to do so would result in a selected alternative that is not necessary or effective, with costs that are not proportional to the benefits. It is not in the best interest of LADWP, CalMat, or the public for LADWP to proceed based on the current Proposed Plan.

CaLMat supports a preferred alternative chosen based on current data, peer-reviewed science, and compliance with legal requirements. LADWP must address the deficiencies in its Proposed Plan to achieve that result.

Thank you for considering these comments.

LADWP RESPONSE:

This CalMat comment is a restatement of CalMat's position that the Proposed Plan was not prepared in accordance with CERCLA or the NCP. As set forth above, and in response to the Golder Comments and related documents, the Proposed Plan and related documents have been prepared in accordance with CERCLA and the NCP. The proposed alternative best meets the CERCLA remedy selection criteria, and is necessary, effective and cost effective.

RESPONSES TO:

COMMENTS RE: "DECEMBER 2016 INTERIM REMEDIAL INVESTIGATION/ FEASIBILITY STUDY REPORT FOR NORTH HOLLYWOOD WEST WELL FIELD"

BY GOLDER ASSOCIATES RECEIVED MARCH 29, 2017

GENERAL COMMENTS

A. The Selected Alternative Is Not An Effective Remedial Option

[COMMENT PART 1]

The Proposed Plan selects a remedy described as "Groundwater Pump and Treat for Direct Domestic Use." This remedy involves use of LADWP's existing drinking water wells as remediation wells, with a large aboveground treatment plant. The Proposed Plan claims that "human health would be protected by capturing and removing 1,4-dioxane contaminated groundwater from the NHW Well Field area through hydraulic control, and treating the contaminated groundwater aboveground to permanently remove 1,4- dioxane, as well as PCE, TCE, and 1,1-DCE from groundwater." (p. 11).

Putting aside the numerous flaws in LADWP's analysis catalogued in detail below, over the long term, the use of existing LADWP wells and a large treatment plant may be a good treatment option, but is not an effective remedial option. First, this analysis does not account for the most effective remediation occurring in the basin – source control occurring at the PRP Sites. In this instance, active remediation at the source locations will have a significant impact on the presence of 1,4-dioxane in groundwater, and it will limit the need for a long term remedy by LADWP. While the sources of many COCs like PCE and TCE are not identified, this is not the case for 1,4-dioxane at the Hewitt Landfill, where active source control is currently being implemented under the oversight of the Water Board and USEPA.

LADWP RESPONSE:

In this comment, the reviewer suggests that pumping groundwater from existing production wells and treating the water for direct domestic use is not an effective remedial option. The Proposed Plan selected the remedy of "Groundwater Pump and Treat for Direct Domestic Use" based on an evaluation of EPA's nine criteria to evaluate remedial alternatives including protection of human health and the environment, compliance with regulatory requirements, cost-effectiveness, and provision of lasting solutions.

The reviewer suggests the LADWP's analysis does not account for source control. Source control was evaluated and included in the possible scenarios evaluated in RI/FS Appendix A, including remediation at the Hewitt Site and the CCC of the North Hollywood OU 2IR. It is important to note that there are no remedial action plans or remedial designs for source control or downgradient plume control remedies in the vicinity of the NHW IRA approved by the State. Proposed or hypothetical actions by third parties were considered in the Interim RI/FS; as described in Appendix A Section A4.3, (with transport results for these scenarios summarized in Appendix A Section A4.4). However, the level of uncertainty in the execution of these actions required LADWP to consider the implications for the beneficial use at the NHW Well Field, should the third party remedies not proceed, not proceed in a timely manner, or not be effective. Additional detail regarding the impact of third party source or plume control on the NHW IRA was provided to CalMat in February 2017 in a document titled "Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD).

Hydraulic control with new shallow wells and treatment was also considered in the RI/FS but was screened out for several reasons. The reasons included ineffectiveness of capturing the portion of the 1,4-dioxane plumes between shallow extraction wells and the NHW production wells, in which case treatment at production wells is still needed, and the effectiveness of extraction wells which may not be able to overcome the hydraulic influence of nearby production well pumping. Further, this approach would require a longer time to implement for studying, obtaining permits, constructing conveyance and recharge systems, and designing and constructing treatment. Again, fate and transport modeling of this option showed that treatment would still be necessary even with source control and new shallow extraction wells located between Hewitt Site and the NHW Well Field, albeit with a reduced timeframe required for treatment (depending on if and when the wells are installed). A summary of this analysis is provided in a document titled *Additional Scenario Simulation for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field* (Appendix D of the IRAD). LADWP will continue to monitor progress on other actions and make adjustments to the response action as appropriate.

[COMMENT PART 2]

In addition, LADWP installed its wells for water production – not for effective remediation. Concentrations of 1,4-dioxane above 1 µg/L are rarely observed below approximately 320 feet below ground surface (bgs) or approximately 30 feet below the water table based on the investigations performed by CalMat to date; however, LADWP's municipal production wells produce water from the water table down to 910 feet bgs (over 600 feet of screened interval). As LADWP pumps, concentrations will decrease (at least for 1,4-dioxane, although it is less certain for other COCs) as more water is pulled into the system vertically due to the long screens of the LADWP wells, and horizontally, as the cone of depression increases due to the high pumping rate of the LADWP wells. This quickly dilutes the influent, resulting in the need for treatment of vast quantities of water.

Operation of NH-45 during 2016 is an example of this relationship, as concentrations of 1,4-dioxane in this well went from a high of 7.59 µg/L in January to below the laboratory reporting limit by July, as the well was pumped. The selected alternative is an extremely inefficient and costly approach to treat a thin layer and limited mass of 1,4-dioxane at the water table. Effective pump and treat systems target specific zones of contamination to maximize removal of mass without pumping more water than is necessary. Pumping unnecessary amounts of water will dewater surrounding areas and may exacerbate other sources of contamination.

LADWP RESPONSE:

In this comment, the reviewer suggests that pumping groundwater from existing NHW production wells is not an effective remedial option. For the NHW Well Field, the OU is defined as the groundwater entering the NHW production wells under active pumping conditions. The 1,4-dioxane plume emanating from Hewitt Pit has migrated to the NHW production wells and has impaired the beneficial use of the water produced by the wells. The Proposed Plan incorporates the use of existing NHW production wells based on an evaluation of EPA's nine criteria to evaluate remedial alternatives including protection of human health and the environment, compliance with regulatory requirements, cost-effectiveness, and provision of lasting solutions. Observed concentrations of 1,4-dioxane across the A-Zone and B-Zone were considered in the RI/FS groundwater modeling, with dilution of the 1,4-dioxane plume over the screened interval of production wells being accounted for in the plume definition for fate and transport modeling. NHW production well data has shown that 1,4-dioxane is already present at the screened intervals above the NL, which is projected to continue as the plume moves toward the well field. Dilution of the 1,4-dioxane plume over the screened interval of production wells has not sufficiently decreased the concentration to levels acceptable for drinking water. For example, the noted decreasing trend in 1,4-dioxane concentrations in production well NH-45 during Q1 and Q2 2016 is accompanied by an overall increasing trend during the same period for NH-34 and NH-37 (which were also pumping). Wells NH-34 and NH-37 are closer to the source and plume core relative to NH-45, therefore, the noted decreasing trend in NH-45 is in response to active pumping at these nearby wells which capture more of the 1,4-dioxane plume. This response of production wells to pumping in other adjacent production wells is replicated in the fate and transport forecast modeling results. Fate and transport modeling was applied to various pumping scenarios, including the concept of treating only three wells as dedicated Remediation wells that run throughout the year, to minimize the number of wells that require treatment by focusing the plume.

The western NHW production wells (NH-26, 34, 36, 37, 43a, 44 and 45) including the remediation wells are screened across or just below the water table (290 feet below ground surface [ft bgs], as given in the comment) with top of screen depths ranging from 202 ft bgs (NH-34) to 340 feet (NH-44 and 45), and therefore will be effective at capturing the zone of contamination in the top 30 feet of the saturated zone, without causing vertical downward movement of the plume.

Production well data water quality collected during well field pumping was used in fate and transport modeling, combined with monitoring well data from depth-discreet levels. Concentrations in the individual wells may have varied in the past due to pumping patterns of production wells to meet water supply needs. The Proposed Plan will be effective at capturing and treated the 1,4-dioxane plume over a wide range of concentrations.

[COMMENT PART 3]

LADWP should complete a more thorough analysis of the overall effects of its Proposed Plan in the context of actual remediation and not just water treatment. LADWP should consider use of interceptor wells targeting only contaminated zones; abandonment of poorly constructed LADWP wells; short duration blending; and the effects of the other remedies being contemplated in the NHOU. We discuss all of these alternatives in detail below.

LADWP RESPONSE:

Included below are responses to comments relating to interceptor wells (response to comment B), replacement wells (response to comment B and G), short duration blending (response to comment B), and effects of other remedies at North Hollywood OU (response to comment C).

B. LADWP's Identification and Screening of Remedial Technologies Are Inadequate Because They Exclude or Eliminate Remedies or Remedy Combinations That Are Feasible and More Cost Effective

[COMMENT PART 1]

In addition to excluding source control, the Proposed Plan and the underlying RI/FS do not include, or eliminate, numerous remedies or combinations of remedies that are feasible and more cost effective than the remedy selected. At a minimum, LADWP fails to evaluate adequately:

- ***In situ treatment (not considered);***
- ***Alternative pumping plan (not fully considered);***
- ***Blending (retained but only in association with an ex situ treatment system);***
- ***Reconstruction and re-equipping (or replacement) of production wells (not considered); and***
- ***Hydraulic control using new shallow extraction wells (not retained or fully considered).***

LADWP should consider each of these individually and in combination, as appropriate. Evaluating combinations of alternatives already in the RI/FS yields feasible and more cost effective remedial options:

LADWP RESPONSE:

In this comment, the reviewer suggests LADWP did not consider or did not fully consider certain General Response Actions, technologies and process options that could be relevant to the RI/FS. The RI/FS includes an evaluation of five General Response Actions, including

- no action;
- institutional actions, including alternate water supply, alternate pumping plans, blending, bypass, groundwater use restrictions, and monitoring;
- containment actions, including hydraulic control using existing groundwater production wells and hydraulic control using new shallow extraction wells;
- ex situ treatment, including groundwater treatment, treated water end-use options; and
- in situ treatment.

The evaluation of the above-listed General Response Actions, technologies and process options was consistent with EPA guidance.

[COMMENT PART 2]

- ***In Situ Treatment: LADWP did not consider in situ treatment options based on a review of website information, the depth and distribution of 1,4-dioxane, and hydrogeology. Golder***

has completed bench scale treatment studies of in situ treatment using ozone and hydrogen peroxide that show effective treatment of 1,4-dioxane. Given the plume configuration, with most of the 1,4- dioxane mass still well north of the North Hollywood West well field, an in situ barrier utilizing injection or sparging of ozone/hydrogen peroxide may be a viable alternative for protection of the North Hollywood West well field while CalMat implements source control at the Hewitt Site. In addition, considering the significant increase in extraction from the North Hollywood West well field, the Rinaldi-Toluca well field, and the Second Interim Remedy, this alternative may become more attractive as it does not compete with these activities for limited groundwater resources in the area. LADWP should retain this alternative for evaluation, as it is more cost effective and faster to implement than the selected alternative.

LADWP RESPONSE:

In this comment, the reviewer suggests LADWP did not consider in-situ treatment options. This is not correct. In the FS, in situ treatment was considered and eliminated because it is unlikely to be effective in treating the 1,4-dioxane plume entering the NHW production wells. This is due to the depth and areal distribution of the plume; 1,4-dioxane is detected in groundwater at depths exceeding 200 ft below groundwater surface and is distributed in a plume that is greater than 1,000 feet wide in an urban environmental setting. Even if in situ treatment was effective, it would not address the plume that has migrated to theNHW Well Field and requires remediation to restore beneficial use of the water. This is supported by transport simulation summarized in the RI/FS Appendix A and presented in 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to Calmat in February 2017 for review. The fate and transport modeling simulation results indicate that the requirement for treatment of the production well water is not eliminated as a result of proposed or hypothetical remedial actions by third parties, such as in situ treatment at the Hewitt Pit Source (as indicated by result summarized in RI/FS Table A4-5).

[COMMENT PART 3]

- ***Alternative Pumping Plan: Though we understand LADWP is considering a Groundwater Management Plan, LADWP's evaluation of alternatives does not address optimizing operation of the Tujunga, Rinaldi-Toluca and North Hollywood West well fields in a manner that would limit contaminant transport to the well fields. Modifications to operations could be accomplished immediately upon completion of the analyses.***

LADWP RESPONSE:

In this comment, the reviewer suggests LADWP's remedial alternatives do include optimizing operation of NHW, Rinaldi-Toluca, and Tujunga wells field to limit contaminant transport. This is not correct. The RI/FS states that given the size and complexity of the SFB and the need to expedite cleanup, LADWP is currently evaluating a phased analysis and response for each of its 11 well fields in the SFB, including the NHW Well Field. The phased analysis and response includes optimizing operation of NHW, Rinaldi-Toluca, and Tujunga wells field to limit contaminant transport. This phased analysis and response is consistent with the NCP, which states in Section 300.430 (a) (ii) (A) that sites should generally be remediated in operable units (OUs) when early actions are necessary or appropriate to achieve significant risk reduction quickly, when phased analysis and response is necessary or appropriate given the size or complexity of the site, or to expedite the completion of total site cleanup.

LADWP considered alternate pumping plans for the NHW, Tujunga, and Rinaldi-Toluca well fields. For NHW, six alternate pumping scenarios were evaluated to identify an effective and cost-effective pumping plan for the NHW well field. Refinement of pumping for unspecified third party pumping was not considered due to uncertainties in project definition. Instead, LADWP performed a “bookend” analysis that captures potential realistic conservative and optimistic case remedial actions. For example, Alternative Scenario 3-1 (RI/FS Table A4-5) described in the RI/FS considered the implications for NHW water treatment if no planned third party remedial actions proceed (i.e., the conservative case). The bookend case is Alternative Scenario 3-5 (RI/FS Table A4-5), which includes an approximation of planned remedial actions including Hewitt Site source control (with reinjection) and the EPA North Hollywood OU 2IR including the CCC, which together represent the most aggressive third party remedial actions planned at the time of the RI/FS (i.e., the optimistic case).

[COMMENT PART 4]

- ***Short Term Alternative Pumping Plan + Blending: This is the current approach that LADWP has used to effectively manage COCs at the North Hollywood West well field. LADWP has not shown that an Alternative Pumping Plan in concert with blending is not a viable short-term solution for 1,4-dioxane while CalMat implements source control measures at the Hewitt Site and other remedies like the Second Interim Remedy are implemented. LADWP claims that blending is no longer viable; however, the available time-concentration data do not support LADWP’s claim that seven wells had to be removed from service to prevent 1,4-dioxane from exceeding the NL at the blend point. This should be more thoroughly evaluated due to the significant cost savings over LADWP’s selected remedy.***

LADWP RESPONSE:

In this comment, the reviewer suggests that LADWP has not shown that the current approach is no longer effective to manage COCs at the NHW well field. In the RI/FS, the current approach was evaluated as Alternative 2. Alternative 2 was ranked comparatively lower than Alternative 3 in accordance with EPA’s nine criteria for evaluating remedial alternatives.

Alternative 2 does not include source control by CalMat. As of December 2016, there was no plan approved by the State to mitigate 1,4-dioxane releases from the Hewitt Pit. Data provided in the FS shows that 1,4-dioxane concentrations exceeded 10 times its NL, which exceeds the DDW Permit Limit, resulting in seven production wells being removed from service. As such, the current approach including blending is no longer effective. The Second Interim Remedy is not designed to address 1,4-dioxane in the area on North Hollywood West.

[COMMENT PART 5]

- ***Retrofit/New Production Wells + Alternate Pumping Plan + Blending + Monitoring: This combination of alternatives could eliminate the need for an ex situ groundwater treatment system. The North Hollywood West well field consists of older wells with shallow screen intervals and pump intakes set near the current water table. The 1,4-dioxane impact to groundwater is distributed in the upper portion of the water table. By retrofitting existing wells or installing new wells to eliminate shallow screens and to draw water from deeper portions of the aquifer (as does the Rinaldi-Toluca well field), it is likely that 1,4-dioxane intake into the production wells would be significantly reduced. This measure in concert with an Alternate Pumping Plan, blending (as needed), source control at the Hewitt Site, and monitoring would be highly cost effective in comparison to the selected alternative.***

LADWP RESPONSE:

In this comment, the reviewer suggests the retrofit / installation of new wells in deeper uncontaminated portions of the SFB would avoid contamination. The RI/FS was developed to protect human health and the environment by reducing the potential for exposure to 1,4-dioxane in groundwater at concentrations exceeding its NL of 1 µg/L; limit the migration of 1,4-dioxane in groundwater in the vicinity of the NHW Well Field at concentrations that prevent the beneficial use of the SFB; remove 1,4-dioxane from groundwater in the vicinity of the NHW Well Field to maintain the beneficial uses of the SFB and restore the aquifer to the extent practicable; and restore LADWP's capability to operate its existing NHW Well Field consistent with historical and planned use of the NHW Well Field in a flexible manner. The retrofit / installation of new wells in deeper uncontaminated portions of the SFB does not address these objectives. Further, it should be noted that the Rinaldi Toluca and Tujunga well fields were originally sited in the early 1990s for exactly the purpose the reviewer describes (i.e., to find areas of the basin un-impacted by contamination) however the new wells subsequently also captured groundwater contamination from upgradient sources. Trying to avoid contamination, rather than addressing its presence through active remedial action, has therefore been demonstrated to be a wholly unsuccessful strategy.

Actions consisting of alternate pumping plans, blending and monitoring were presented as Alternative 2. Alternative 2 was ranked comparatively lower than Alternative 3 in accordance with EPA's nine criteria for evaluating remedial alternatives.

[COMMENT PART 6]

- ***Hydraulic Control with New Shallow Wells + Above Ground Treatment + Alternative Pumping Plans + Blending + Monitoring: In the Proposed Plan and RI/FS, LADWP does not retain as an option hydraulic control with new purpose-built shallow remediation wells and an above ground treatment system. The RI/FS states that "shallow extraction wells would not be able to prevent 1,4-dioxane from entering the NHW well field Production." (p. 29). This claim is completely unsubstantiated, and not supported by Golder's evaluations or the off-site strategy the USEPA has proposed. It has no modeling support; in fact, LADWPs***

consultant has previously shown a remediation system comprised of three on-site wells at Hewitt and one downgradient well as a proposed solution. Based on the updated CSM containing data CalMat has collected since 2014, shallow interceptor wells are likely the most cost-effective option because of the contaminant distribution horizontally and vertically. This is particularly the case given the impact source control will have once implemented.

The RI/FS states that "hydraulic control using new shallow extraction wells … would not be effective at capturing the portion of the 1,4-dioxane groundwater plumes located between shallow extraction wells and the existing production wells, does not eliminate the need for treatment of the NHW production wells impacted by 1,4-dioxane, and may not be able to overcome the influence of nearby production wells pumping at varying rates." (p. 29). This statement is also unsubstantiated and incorrect. The mass of 1,4-dioxane that exists between shallow extraction wells and the production well field is minimal based on available data. Because the mass is minimal compared to the core of the plume located to the north, blending in concert with an alternative pumping plan could be used to manage the well field while source control measures take effect at the Hewitt Site. This would eliminate the need for an ex situ well head treatment system.

LADWP excluded shallow extraction wells in part due to a stated concern about the time it would take to install the wells, but this option would actually be much less expensive and faster to implement than the proposed production wellhead treatment system. The volume of water to be treated would be greatly reduced, thereby reducing both the capital and operational costs of the system. Furthermore, in conjunction with the source control measures required by the Regional Board at the Hewitt Site, the offsite shallow wells would likely be operated for a much shorter period of time than that contemplated by the RI/FS for the wellhead treatment system.

- ***Retrofit/New Production Wells + Hydraulic Control with New Shallow Wells + Bypass + Above Ground Treatment + Alternate Pumping Plan + Blending + Monitoring: This is a combination of the two options above. If retrofitting of the production wells, an alternative pumping plan, and blending are not sufficient to manage the 1,4-dioxane, shallow extraction wells could be evaluated in conjunction with the retrofit production wells***

<u>LADWP RESPONSE:</u>

In this comment, the reviewer suggests that LADWP's position that shallow extraction wells would not be able to prevent 1,4-dioxane from entering the NHW Well Field production wells is completely unsubstantiated. This is not correct. Hydraulic control with new shallow wells and treatment was considered in the RI/FS but was screened out for several reasons. The reasons included ineffectiveness of capturing the portion of the 1,4-dioxane plumes between shallow extraction wells and the NHW production wells, in which case treatment at production wells is still needed, and the effectiveness of extraction wells which may not be able to overcome the hydraulic influence of nearby production well pumping. Further, this approach would require a longer time to implement for studying, obtaining permits, constructing conveyance and recharge systems, and adding designing and constructing treatment within an urban environmental setting. Again, fate and transport modeling of this option showed that treatment would still be necessary even with source control and new shallow extraction wells located between Hewitt Site and the NHW Well Field, albeit with a reduced timeframe required for treatment (depending on if and when the wells are installed). A summary of this analysis is provided in a document titled 'Additional Scenario Simulation for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix D of the IRAD). The concept that hydraulic control with new shallow wells could be "much less expensive and faster to implement than the proposed production wellhead treatment system" is not supported; nor does the option enable the treatment of the groundwater for beneficial use as a water supply. LADWP will continue to monitor progress on other actions and make adjustments to the response action as appropriate.

Furthermore, LADWP completed a review of more recent monitoring well and lysimeter data obtained from GeoTracker (collected since the publication of the RI/FS; presented in Appendix E of the IRAD) that shows that many monitoring wells do not show a distinct decreasing trend in recent observed concentrations. Moreover a number of monitoring wells and lysimeters show a recent increase and/or significant fluctuation in observed 1,4-dioxane concentrations based on recent sampling events, including monitoring wells MW-25A, MW-25B, MW-26A, MW-5, MW-8S, and lysimeters LW-10 and LW-13S. Thus, it is not reasonable to assume a decrease in 1,4-dioxane levels, as implied in the comment.

C. LADWP's Proposed Plan Excludes Material Data and Information on Other Planned Remedial Actions That Will Significantly Impact Remedial Activity at the North Hollywood West Well Field

LADWP is aware that on-site remediation at the Hewitt Site to contain and treat 1,4-dioxane in groundwater is required by the RWQCB and is progressing rapidly. Based on data obtained at the Hewitt Site and the surrounding area, which LADWP has received or to which it otherwise has access, containment of the of 1,4-dioxane plume on the Hewitt Site through source control is likely to result in a significant decrease in the potential mass of 1,4-dioxane that could reach the North Hollywood West well field. As a result, LADWP is designing a remedy that substantially overestimates the environmental conditions to be addressed and remediated and the resulting treatment plant's size and cost.

LADWP also knows that proposed remedial actions (1) between the Hewitt Site and the North Hollywood West well field, and (2) in the vicinity of the North Hollywood East well field, are expected in the near term.

Based on CalMat's understanding of water levels and flow direction in the vicinity of the Hewitt Site and the North Hollywood West well field, exclusion of the anticipated remedy for the North Hollywood East plume creates significant uncertainty in LADWP's evaluation of alternatives and future design considerations.

It is improper for LADWP to fail to consider these other remediation efforts in its analysis and selection of an appropriate remedial alternative to address 1,4-dioxane at the North Hollywood

West well field. LADWP has treated these other remedial activities as "discrete" EPA or Regional Board activities, but they are not. In particular, LADWP's remedy analysis erroneously assumes there will be an ongoing source at the Hewitt Site. That is not a realistic scenario. Assuming that the source of 1,4-dioxane from the Hewitt Site will continue unabated results in a significant overestimation of needed treatment plant size and costs. Similarly, failing to consider the expected pumping at the North Hollywood East well field in the evaluation of alternatives and in fate and transport modeling creates equally unrealistic scenarios.

LADWP RESPONSE:

In this comment, the reviewer suggests that on-site remediation at the Hewitt Site is progressing rapidly and is likely to result in a significant decrease in the potential mass of 1,4-dioxane that could reach the North Hollywood West well field. LADWP is supportive of source control activities and remediation between the source and the LADWP NHW production wells. However, releases of contaminants from CalMat's Hewitt Plan Landfill to groundwater were first documented in the 1980s, approximately 30 years ago. The characterization of one of the contaminants released to groundwater, 1,4-dioxane, did not begin until 2014 after this contaminant was detected in the water extracted by LADWP from its NHW Well Field. At the time of the RI/FS in December 2016, there were no plans approved by the LARWQCB or EPA to remediate the releases. LADWP's Proposed Plan is necessary to remediate the plume that has already reached the LADWP production wells. The impact of potential third party remediation was included in scenarios considered in the RI/FS (see RI/FS Table A4-5). Such third party actions have the potential to be complementary to this proposed LADWP action. Since it is not known how rapidly third party remedial actions are being implemented, their actual scope, whether they will actually be done, or the effectiveness of those actions, LADWP's Proposed Plan is intended to perform even if the third party remediation is not in place.

Source control was evaluated and included in the possible scenarios evaluated, including remediation at the Hewitt Site and the CCC of the North Hollywood OU 2IR (referenced in the comment as "***expected pumping at the North Hollywood East well field")***. It is important to note that there are no State-approved remedial action plans or remedial designs for source control or downgradient plume control remedies in the vicinity of the NHW IRA. Proposed or hypothetical actions by third parties were considered in the RI/FS (Table A4-5) but the level of uncertainty in the execution of these actions required LADWP to consider the implications for groundwater production at the NHW Well Field, should the third party remedies not proceed, not proceed in a timely manner, or not be effective at controlling the source release. Source control at the Hewitt Pit site will not address the 1,4-dioxane mass that is currently between NHW well field and Hewitt Pit site. Additional detail regarding the impact of third party source or plume control on the NHW interim Remedial Action was provided to CalMat in February 2017 in a document titled 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD).

Significant historical data underpins the fate and transport modeling upon which the treatment plant's size and cost were based. For example, the Plume Case considered in the RI/FS was analyzed on the basis of actual groundwater concentration data with the intention to generate a conservative estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field. Please refer to response to General Comment D for additional discussion. LADWP will continue to review new data that are being collected and consider that information as part of the remedial design and remedial action phases of work.

D. LADWP's Proposed Plan Excludes Material Data and Information on the 1,4-Dioxane Contamination and Hydrogeology in the Vicinity of the North Hollywood West Well Field That Significantly Impacts Any Alternatives Analysis

LADWP's analysis also excludes pertinent data in the vicinity of the North Hollywood West well field that CalMat presented to LADWP during numerous technical meetings over the past several years. It appears that LADWP is still using 2014 plume maps with limited inclusion of recent data in its evaluation of 1,4- dioxane, TCE, and PCE. LADWP is also using maximum values rather than average values or the most recent data, which is resulting in significant overestimations of 1,4-dioxane mass and other parameters. LADWP also mixes data sets, instead of using current comprehensive snap shots of plume dimensions (see Sections 1.9.5-1.9.6).

Since 2014, CalMat has installed 12 wells in the A Zone and B Zone, and it is currently installing an additional 14 wells outside of the Hewitt Site to fill data gaps, with nine of those wells being located between the North Hollywood West well field and the Hewitt Site. CalMat also performs quarterly sampling of on-site and off-site wells (eight events since 2014), and it continually logs water levels in both on-site and off-site wells. It does not appear that LADWP has updated its conceptual site model with this data, or otherwise considered it in evaluating remedial alternatives.

LADWP should consult recent CalMat documents on the hydrogeology and nature and extent of contamination in the vicinity of the Hewitt Site and the North Hollywood West well field, specifically the Site Assessment (CSM/HHRA) Report (Golder Associates, 2016). Many of LADWP's assertions about lack of data and lack of time-specific snapshots could be answered through review of that report along with recent data that CalMat makes publicly available through the Regional Board's Geotracker website. In addition, LADWP should revisit its 2015 CSM, and in so doing, consider the more nuanced findings in CalMat's CSM/HHRA with regard to the relationship between the A Zone and B Zone, along with the current vertical and horizontal distribution of all COCs in the area. A CSM based on all available data is a fundamental requirement in producing a CERCLA Feasibility Study and Proposed Plan, as well as in finding an appropriate remedial alternative for the North Hollywood West wells.

Based on CalMat's CSM/HHRA, which addresses the release mechanism at the Hewitt Site, the duration of the release, and the changes in flow direction and gradient over time, there is no support for LADWP's assumption that the highest value of 1,4-dioxane observed at the Hewitt Site will be observed in the vicinity of the North Hollywood West well field. Though briefly discussed in Appendix A, LADWP should consider CalMat's CSM/HHRA and release mechanism at the Hewitt Site before making assumptions about future concentrations of 1,4-dioxane at the North Hollywood West well field.

LADWP RESPONSE:

In this comment, the reviewer suggests that LADWP excludes pertinent data. For the RI/FS, data in the vicinity of the NHW Well Field was used to the extent that this data was available to LADWP for plume definition.

As noted on p. 12-13 of the RI/FS, the primary sources of groundwater data identified for use were:

- LADWP Laboratory Information Management System (LIMS) database;
- GSIS Database;
- EPA SFV Database;
- EPA Plume Maps; and
- GeoTracker.

In particular, LADWP did utilize data related to the Hewitt Site for groundwater modeling analyses, including samples taken between January 2011 and May 2016 (as stated in RI/FS Appendix A p. 30). This data includes data relating to Hewitt Site and sample analyses records from other monitoring locations as follows (date shown indicates the most recent sample available at the time of RI/FS preparation):

- Hewitt Site monitoring wells MW-3, MW-4, 4899 and 4909FR up to and including Q2 2014;
- Hewitt Site monitoring wells MW-1 up to and including Q4 2015;
- Hewitt Site monitoring wells MW-2, MW-6, MW-7, MW-9 up to and including Q4 2015;
- Hewitt Site monitoring wells for MW-5 and MW-8S up to and including Q1 2016;
- Three clustered monitoring wells at sampling location NH-MW-06 up to and including Q4 2015;
- Three clustered monitoring wells at sampling location NH-MW-11 up to and including Q4 2015;
- Two paired monitoring wells at sampling location NH-MW-05 up to and including Q4 2015;
- Two paired monitoring wells at sampling location RT-MW-06 up to and including Q4 2015;
- Monitoring well NH-VPB-06 up to and including Q3 2015; and
- LADWP production wells up to and including Q2 2016.

In addition, as described in RI/FS Appendix A p. 30-31, LADWP evaluated data from monitoring wells screened in the A-Zone and B-Zone (from analyses carried out between January 2011 and May 2016) as part of the plume definition generated for the RI/FS. Furthermore, as described in RI/FS Appendix A p. 32, LADWP assessed the vertical distribution of 1,4-dioxane at locations where monitoring wells were completed in both the A-Zone and B-Zone, and this analysis included data from Hewitt Site monitoring wells, focusing on monitoring well pairs within the Hewitt Site and two locations east of NHW Well Field, with the associated data spanning Q4 2015 to Q1 2016. Based on the observed vertical concentration distribution, the interpreted initial plume distribution in the upper half of B-Zone was inferred to be 10% of A-Zone concentration and the lower half of B-Zone was inferred to be 1% of A-Zone. RI/FS Appendix A p. 40 also indicates that the Interim Remedial Action Plan (IRAP) for Hewitt Site (Golder 2016a) and the Site Assessment (CSM/HHRA) Report for Hewitt Site (Golder 2016b) were also reviewed by LADWP during preparation of the RI/FS. CalMat's CSM/HHRA report (Section 6.4.2.1 Golder 2016) states that in the B-Zone wells, the concentrations of 1,4-dioxane are approximately one to two orders of magnitude lower than in the A-Zone wells, as observed at the following shallow-deep well pairs:

- EW-1S and EW-1D (210 and 4 μg/L);
- MW-5 and MW-5D (30 and 4.8 μg/L); and
- MW-8S and MW-8D (52 and 0.54 μg/L).

It is also noted that during preparation of the RI/FS, nine CalMat-installed wells located between the NHW Well Field and the Hewitt Site were not found in any of the groundwater monitoring reports available to LADWP (CalMat Groundwater Monitoring Report for 2015 and 2016, on GeoTracker). Four LADWP/EPA monitoring wells (NH-C09-310, NH-MW-06-280, NH-MW-06-580, and NH-MW-06-810) that were identified were included in the data set for plume analysis.

Furthermore, the reviewer suggests LADWP should consult CalMat documents on the hydrogeology and nature and extent of contamination in the vicinity of the Hewitt Site and NHW Well Field. As explained in RI/FS Appendix A p. 40, LADWP did evaluate the IRAP for Hewitt Site (Golder 2016a) and the Site Assessment (CSM/HHRA) Report for Hewitt Site (Golder 2016b) and information contained therein was used as part of the development of the simulated source area implemented for groundwater modeling simulations.

In addition, LADWP has reviewed recent monitoring well data for the Hewitt Site obtained from GeoTracker (collected since the publication of the RI/FS).These new data include sample analyses from Q3 2016 through Q2 2017. The new sampling data includes results from newly installed monitoring wells that were first sampled Q1 2017. LADWP has evaluated this information and is considering it in the context of this remedial decision. Review of this recent data is presented in Appendix E of the IRAD. This includes a summary of the data collected since the publication of the RI/FS for 1,4-dioxane, and a comparison to the interpolated concentrations at each location for the Plume Case (presented in RI/FS Appendix A) and each Sensitivity Plume Case presented in the 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to Calmat in February 2017 for review.

Review of the new data indicates that many monitoring wells and lysimeters do not show a distinct decreasing trend in recent observed concentrations. Moreover a number of monitoring wells and lysimeters show a recent increase and/or significant fluctuation in observed 1,4-dioxane concentrations based on recent sampling events, including monitoring wells MW-25A, MW-25B, MW-26A, MW-5, MW-8S, and lysimeters LW-10 and LW-13S. Review of monitoring data as part of the RI/FS, and more recent data presented in Appendix E of the IRAD, indicates that measured concentration fluctuations of one order of magnitude are not unusual within or near the Hewitt Site (e.g., MW-2, MW-5, MW-8S, MW-15).

CalMat acknowledges recent increases in 1,4-dioxane concentrations in some monitoring wells in their recent Q1 2017 WDR Monitoring Report (Calmat 2017), stating "*[i]t is unclear whether this increase is related to natural (wet season) or anthropogenic (well field pumping) basin dynamics, further development of the newly installed wells giving a more representative sample, or the pilot testing. As noted in the current conceptual site model (CSM) swings in concentrations attributed to pumping by the Los Angeles Department of Water and Power (LADWP) and other natural basin dynamics, create difficulty in evaluating trends in wells, especially in wells with limited historical data such as the three noted above."* (p. 3). It is worthwhile to note that the recent increases indicate that these higher concentrations are present in the groundwater system and are not artifcats of any of the above processes.

It is due to the aforementioned variability in observed concentrations within individual monitoring locations, coupled with variability in observed 1,4-dioxane trends across the Hewitt Site monitoring data, that an approach was taken to adopt conservatism as a base scenario for the RI/FS (as stated in RI/FS Appendix A p. 49, the plume definition is intended to provide a conservative yet realistic estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field). The approach of using maximum concentration values (within the period of Jan 2011 to May 2016) rather than average values or the most recent data as a base scenario (Plume Case) provides a conservative yet realistic estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field. To address the uncertainty in this approach, sensitivity analyses were carried out to evaluate the effects of the RI/FS Plume Case definition and source flux boundary condition assumptions on transport modeling simulation results. The sensitivity analyses performed as part of the RI/FS transport modeling consider most recent (up to Q2 2016) observed concentrations in monitoring wells in the A-Zone, and most recent (up to Q2 2016) production well concentrations, as well as the effects of having no Hewitt Site source flux boundary condition assigned in the model. These sensitivity analyses were presented in 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to Calmat in February 2017 for review).

The more recent (Q3 2016 to Q2 2017) monitoring data presented in Appendix E of the IRAD supports the conservative yet realistic approach adopted for RI/FS Plume Case definition and source flux boundary condition assumptions, while the sensitivity analysis provided, which includes the most recent data available at the time of production of the RI/FS, addresses the effect of the conservatism adopted. Although the timeframe required for treatment varies across the RI/FS base case and sensitivity case transport simulations, the results of the sensitivity analyses (Appendix C of the IRAD, provided to Calmat in February 2017 for review including implementation of source control, plume control, and Second Interim Remedy) and the review of the more recent (Q3 2016 to Q2 2017) monitoring data (Appendix E of the IRAD) do not alter the need for the response action, the anticipated duration of treatment, the conclusion that treatment is forecasted to be necessary at the three NHW production wells included in the Proposed Plan and subsequently the soundness of the alternative proposed in the Proposed Plan.

With reference to the comment relating to the current CSM (Golder 2016b) and in relation to future release mechanisms and concentrations at the Hewitt Site, CalMat's CSM/HHRA report (Section 8.2 Golder 2016b) mentioned that preliminary calculations for travel times in the unsaturated zone indicated that it would take the wetting front from the base of the waste from 5 to 20 years based on CalMat's presented calculations to reach the water table depending on conditions. The CalMat CSM/HHRA report also indicates that the current crushed base rock/asphalt cap will reduce the introduction of moisture thereby decreasing the driving gradient for transport through the vadose zone starting sometime in the mid-1980s. Thirty years have passed since the mid-1980s and the 1,4-dioxane concentration in monitoring wells (at the time of production of the RI/FS) were still as high as 240 µg/L in MW-15 (Q2 2016). Furthermore, review of more recent monitoring well data obtained from GeoTracker (collected since the publication of the RI/FS; presented in Appendix E of the IRAD), indicates that monitoring well concentrations in the vicinity of Hewitt Site were recently as high as 250 µg/L in MW-25B (Q1 2017), 470 µg/L in MW-26A (Q1 2017) and 750 µg/L in MW-25A (Q1 2017). Assuming travel time of the wetting front from the base of the waste to the water table being 5 to 20 years based on Calmat's presented calculations, most of the contamination in the vadose zone should have reached groundwater since the mid-1980s. If rock/asphalt cap reduces recharge significantly, monitoring wells should show significantly lower concentrations in recent monitoring events because most of contaminant should have reached the water table and leachate infiltration should be limited with reduced recharge. However, many monitoring wells and lysimeters do not show a distinct decreasing trend in recent observed concentrations, whereas some monitoring wells and lysimeters show a recent increase in observed 1,4-dioxane concentrations based on recent sampling events from 2016 and 2017 (including monitoring wells MW-25A, MW-25B, MW-26A, MW-5, MW-8S, and lysimeters LW-10 and LW-13S; Appendix E of the IRAD). Thus, this CalMat data actually supports the inferred constant release of contaminant is reasonable for conservative simulations.

In this comment, the reviewer also suggests that LADWP assumes that the highest value of 1,4-dioxane observed at the Hewitt Site will be observed in the vicinity of the North Hollywood West well field. LADWP has not made this assumption or statement in the RI/FS.

E. The Proposed Plan and RI/FS Improperly Exclude Consideration of Other COCs

The Proposed Plan and RI/FS exclude discussion and consideration of other COCs in the vicinity of the North Hollywood West well field, namely TCE and PCE. As a threshold matter, a feasibility study (even an interim FS), needs to evaluate all COCs and not just focus on one chemical. Despite stating in the RI/FS that TCE, PCE, and 1,1-DCE are present in North Hollywood West wells, LADWP focuses its analysis and remedial measures solely on 1,4-dioxane. A feasibility study for a $100M treatment system should minimally be expected to consider other pertinent contaminants.

Based on LADWP modeling and the HHRA, which identified a number of chemicals as having cancer and non-cancer risk higher than 1,4-dioxane (e.g., PCE, hexavalent chromium, etc.), consideration of other COCs is necessary for purposes of evaluating remedies. LADWP's modeling results show significant capture of groundwater east of the North Hollywood West well field from the vicinity of the North Hollywood Central Plume around the former Bendix facility. This plume contains significant amounts of hexavalent chromium, and AOP is not appropriate for treating hexavalent chromium. The Proposed Plan appears to in effect treat water at North Hollywood West for 1,4-dioxane with the collateral damage of dragging hexavalent chromium to the well field. If LADWP is assuming that the Second Interim Remedy will remediate that area, then LADWP should further evaluate the remedy as part of the fate and transport and alternative analysis for all COCs, since it is likely to have an impact on contaminants in the vicinity of the North Hollywood West well field and the area around the Hewitt Site.

Further, LADWP's risk assessment states that COCs other than 1,4-dioxane are present in North Hollywood West wells above risk screening levels, as well as concentrations being observed above state and federal MCLs. Based on this, it is unclear how LADWP can exclude these chemicals from the COCs to be addressed in the Proposed Plan and RI/FS. It is equally unclear what other COCs besides chlorinated solvents should be part of this process since the Proposed Plan and RI/FS do not give a full summary of chemical concentrations and the corresponding risk assessment results. For example, nitrate has historically been above the MCL, and though mitigated through blending, LADWP's remediation plan should be addressing this issue if LADWP is actually trying to remediate groundwater.

LADWP RESPONSE:

In this comment, the reviewer states the Proposed Plan and RI/FS exclude discussion and consideration of other COCs in the vicinity of the North Hollywood West well field, namely TCE and PCE. This is not correct. The RI/FS includes a baseline HHRA that includes discussion and consideration of other COCs in the vicinity of the North Hollywood West well field, including TCE and PCE. Based on the results of the HHRA, LADWP concluded that concentrations of 1,4-dioxane and VOCs in production wells resulted in potential risks from cancer and non-cancer endpoints within the Study Area, which further supports the evaluation of IRAs.

1,4-Dioxane has been measured in groundwater at concentrations exceeding 10 times the NL, both at the NHW production wells and at numerous locations up-gradient of the NHW production wells. This magnitude of exceedance falls outside the levels that permit the water to be served even with blending pursuant to the current Blending Plan and State of California Domestic Water Supply Permit (the "Permit") issued by DDW to LADWP. These levels also exceed the cleanup goal set by EPA at the NL at nearby areas in the SFB (EPA 2009a).

Conversely, the concentration of VOCs and nitrate have not exceeded 10 times the MCL, and therefore have been managed with blending pursuant to the current Blending Plan and State of California Domestic Water Supply Permit issued by DDW to LADWP.

The risk management decision to focus initially on 1,4-dioxane plume threatening the NHW Well Field separately from the more widespread VOC contamination is appropriate for several reasons. First, 1,4-dioxane has exceeded the levels that would allow for blending under the Permit, while VOCs are present at levels that can be managed through blending. Second, the 1,4-dioxane plume is more limited in its spatial distribution than the widespread VOC plume in the area and it is important to limit that migration as soon as possible. This need is made more urgent because 1,4-dioxane requires treatment that is different than the treatment to be used to manage VOCs alone. The further migration of the 1,4-dioxane plume will therefore greatly increase the cost and difficulty of further addressing the plume and further impair the beneficial uses of the basin. Third, 1,4-dioxane is fully miscible in water and therefore travels quickly, posing a continued risk to human health and the environment. This approach is consistent with the NCP, which states in Section 300.430 (a) (ii) (A) that sites should generally be remediated in operable units (OUs) when early actions are necessary or appropriate to achieve significant risk reduction quickly, when phased analysis and response is necessary or appropriate given the size or complexity of the site, or to expedite the completion of total site cleanup.

The concentration of hexavalent chromium in the NHW Well Field production wells has not exceeded the MCL; therefore, DDW has not required action with respect to this constituent. LADWP is evaluating response actions at the Rinaldi-Toluca Well Field, and the potential interactions between this well field and the Second Interim Remedy.

The former Bendix Site (Honeywell) is implementing both groundwater extraction and reinjection, and in situ reduction to control the hexavalent chromium (CrVI) plume from the site. The 100 gpm groundwater extraction and treatment system for in situ treatment includes five active groundwater extraction wells and two treated-water-only injection trenches to provide hydraulic control of the on-site CrVI plume, and two injection trenches are used to reinject the treated water on-site. Operation of the on-site remediation system began in January 2009 and continues to present. In addition, direct injection of calcium polysulfide (CaSx) chemical reductant into the shallow aquifer is used to create a reductive zone that acts as a permeable reactive barrier for on-site groundwater. As reported by Stantec (2016) the areal extent of the on-site CrVI plume in groundwater has been reduced by more than 50% as a result of the pilot testing completed in 2012 and 2013. This same remedial approach of direct injection of chemical reductant into shallow groundwater is used to for off-site CrVI in situ treatment to control the off-site CrVI plume. Reductant solution delivery using this system began on March 27, 2017 (Stantec 2017). Stantec used reactive transport modelling to design the off-site injection remediation system, which is designed to be effective in controlling the off-site CrVI plume from the Bendix site (Stantec 2016). Therefore, the CrVI plume from the former Bendix Site (Honeywell) is not expected to migrate to the NHW Well Field.

LADWP acknowledges that other groundwater contaminants such as VOCs exist in the vicinity of NHW Well Field; however, this IRA focuses on 1,4-dioxane as a risk management strategy because this constituent is posing the most significant impact on the beneficial use of groundwater in accordance with the Los Angeles Regional Water Quality Control Board (LARWQCB) Basin Plan, which conforms with the State of California Antidegradation Policy (i.e., SWRCB Resolution 68-16 and 92-49), an ARAR for this IRA.

A separate interim remedial action is being developed to address the broader detection of VOCs (e.g., tetrachloroethylene [PCE] and trichloroethylene [TCE]) in groundwater in the vicinity of the NHW and Rinaldi-Toluca well fields. The broader detection of VOCs are predominantly located northeast and east of the NHW well field, within the footprint of the Rinaldi-Toluca well field.

F. LADWP's Modeling Is Inadequate for Analysis of the North Hollywood West Well Field

The North Hollywood West well field is outside of the NHOU investigation area (as can be seen in RI/FS Figure 1-1). The AMEC Groundwater Modeling Memorandum (2015) states that the groundwater model was extrapolated outside the investigation area (p. 1, 79). The model used to investigate remediation options for the well field should be constructed to best represent the well field — not extrapolated from the regional model. The AMEC (2015) model was calibrated to groundwater heads and water flux, but not contaminant distributions. The AMEC Groundwater Modeling Memorandum states that the model is not a unique representation of the SFB (p. ES-8). There is no evidence provided in the LADWP RI/FS document or appendices

demonstrating the model can properly reproduce observed contaminant migration in the vicinity of the North Hollywood West well field.

As to the North Hollywood West well field area, as CalMat discussed with LADWP on several occasions, the AMEC model is not properly calibrated and gives a poor representation of water levels and flow directions in the area. It is not a good tool for performing the modeling that LADWP is including in this document. CalMat has collected (and is currently continuing to collect) a large amount of information that should be reviewed before making any judgments on the best alternative for North Hollywood West well field. CalMat has already provided a significant amount of that information to LADWP, but it is not reflected in the modeling work supporting the Proposed Plan.

LADWP RESPONSE:

In this comment, the reviewer suggests that the groundwater model that LADWP used for flow and transport simulations is unreliable in the area for which it was used in the RI/FS. While parameter non-uniqueness and lack of sensitivity of certain parameters are acknowledged, as per AMEC (2015), "despite these uncertainties, the model is a reasonable representation of the SFB groundwater flow system (i.e., groundwater flow direction and gradients) and the resultant hydraulic conductivity distribution spans the estimates derived for the site in prior and recent studies and available in the literature. The overall water balance is realistic and provides a reasonable estimate of aquifer responses to stresses (e.g., pumping and spreading ground recharge)." In addition, the commenter is incorrect in claiming that the modeled area is outside of the North Hollywood OU. The polygon labeled "NHOU investigation area" in RI/FS Figure 1-1 corresponds to the area identified as "San Fernando Valley (Area 1) Superfund Site" in AMEC (2015; Figure 1-1 therein). This area is not the same as the North Hollywood OU Study Area that was the focus of the AMEC (2015) groundwater model update and recalibration. The AMEC (2015) North Hollywood OU study area encompassed the Hewlett Pit as well as the Remediation and Secondary wells of the NHW Well field (e.g., Figure 3-2 in AMEC, 2015). Figure 2-1 in AMEC (2015) illustrates that grid refinement encompassed these NHW wells and the Hewlett Pit. In AMEC (2015), it is stated that "these data were…extrapolated to portions of the model domain beyond the NHOU study area". Therefore the area of the NHW Well field in the AMEC (2015) model was not extrapolated from the regional model.

It is also noted that CalMat presented numerical groundwater simulation results using a similar version of the AMEC model as part of their IRAP (Golder 2016a) and Site Assessment (CSM/HHRA) Report (Golder 2016b). In relation to the model's replication of observed hydraulic head and flow patterns in the vicinity of Hewitt Site, CalMat's IRAP Appendix A (Golder 2016a), states *"[d]espite these limitations, it can still be used as a tool for evaluating pumping scenarios and to guide the selection of pilot test pumping and reinjection locations".* Furthermore, in Appendix T, Section 3.2 of CalMat's Site Assessment (CSM/HHRA) Report (Golder 2016b), it is noted that after their updates to the AMEC 2IR model (including lateral grid refinement, pumping and spreading rates, A-Zone/B-Zone contact elevation and the addition of more groundwater level calibration data), "*the global model calibration statistics were essentially the same between the 2IR model and the May 2016 HHRA model. Further, the models were similar in terms of their local-scale groundwater elevations and flow directions*".

In addition, LADWP has reviewed recent groundwater level data measured in the vicinity of Hewitt Site and NHW Well Field from the EPA database and compared this to the simulated groundwater levels from the calibrated AMEC model. Figure 1 of this Detailed Responses to Comment document presents the simulated hydraulic head distribution in the A-Zone within the NHW transport model domain at the end of the calibration period (this simulated head distribution was used for initial conditions in the forecast model which starts October 1, 2015). Figure 1 also presents the observed water level data from the EPA database using the following methodology and assumptions:

- water level data from the EPA database spans the period of +/- 6 months either side of October 1, 2015;
- at locations where multiple water levels were recorded in the stated time range the recorded water level closest in time to October 1, 2015 was used;
- database entries were omitted where there were notes concerning the existence of a pump in the well; and
- data at NHW production Wells 3790C (NH-22) and 3790G (NH-34) are included, but there is uncertainty regarding potential impacts from pumping at these locations.

Figure 2 of this Detailed Responses to Comment document shows the hydraulic head residuals between simulated heads from the end of the calibrated AMEC model and the EPA groundwater level data (i.e., the difference between the observed and modeled data). As illustrated in Figure 2, groundwater model residuals throughout the NHW transport model domain are predominantly between -11 ft and 2.4 ft with the only exception being at 3790G (NH-34; +25 ft); as mentioned previously, there is uncertainty regarding potential impacts from pumping at this location. Model residuals in the Hewitt Site area are generally between -2.1 to -5.1 ft (simulated heads higher than observed). In the area between the NHW Well Field and the Hewitt Site, model residuals range from -0.2 to 2.4 ft.

Considering the information provided above, the model is sufficiently well calibrated to water level data in the North Hollywood OU study area (encompassing the Hewitt Site and the NHW Remediation and Secondary wells) to simulate interaction of this well field with existing mapped contaminants. Further evidence of AMEC (2015) model calibration to water level data is provided in their Tables 5-1 to 5-3, Figure 5-5 and Appendix G, with these calibration results not re-iterated in the RI/FS Appendix A Groundwater Modelling Summary. Thus, the AMEC model is considered to be reliable for the purposes it was used for in the RI/FS.

With regard to the reviewer’s comment relating to contaminant migration, the RI/FS modelling uses existing mapped contaminant distributions as a starting point for forward looking simulations avoiding uncertainties from modeling historical contaminant migration. Uncertainties in forecast simulation results relating to the input transport parameters were evaluated through sensitivity analyses which were conducted as part of the RI/FS (contrary to the reviewer’s comment), and presented in the ‘Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field’ (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review. This includes an analysis that considers potential conservative and optimistic versions of the RI/FS Plume Case definition and source flux boundary condition assumptions.

G. The Condition of LADWP's Wells Is Not Considered in the Proposed Plan

LADWP's Proposed Plan and RI/FS does not adequately consider the condition of LADWP's existing wells. The wells comprising the North Hollywood West well field date back to the 1960s. They were designed for water production — not remediation. They likely do not meet current well standards. The wells have long screens through the water table and multiple water-bearing zones. An assessment of the wells should be part of the feasibility study, and possible destruction and repair or replacement of wells should be considered as part of the cost estimating and evaluation of alternative effectiveness.

LADWP should be investigating abandonment of poorly functioning wells and poorly constructed wells, as well as construction of deeper wells outside the area most affected by 1,4-dioxane, since it appears that TCE and PCE can be managed much more easily based on LADWP's comments in the Feasibility Study.

LADWP RESPONSE:

In this comment, the reviewer states LADWP's Proposed Plan and RI/FS does not adequately consider the condition of LADWP's existing wells. The RI/FS provides groundwater production well construction details in Table 1-1 and discusses the operational history of the well fields in Section 1.8.Further to this, LADWP has performed an overall assessment of its production wells at NHW and may rehabilitate, modify or replace the three Remediation wells included in the Proposed Plan. Well replacement costs are included in the cost estimate presented in Appendix B.

LADWP operates production wells that are permitted by DDW for drinking water supply, regardless of age or well standards in force at the time of construction. LADWP replaces production wells when they begin to show a loss of capacity, sand production, or casing failure, or otherwise become obsolete.

Most of the older wells in the Whitsett Fields Park area of the NHW Well Field were constructed using cable tool drilling and without a sanitary seal, in accordance with applicable well standards at the time. This applies to wells NH-26, 34, 37, and 43a. However, these wells were also screened relatively shallow, and screened either across the water table, or just below the water table. This is an excellent configuration for capturing contamination from shallow aquifer zones, and also addresses concerns related to fluctuating or declining water levels. Furthermore, wells screened at or just below the water table are unlikely to be a conduit for vertical migration of shallow contaminants to deeper zones, since shallow zone contamination is captured through the shallow wells screens.

The use of existing infrastructure creates clear benefits, particularly in this highly developed area. It provides significant cost savings, significantly improves implementability and optimizes beneficial reuse of impacted groundwater.

H. The Proposed Plan and RI/FS Do Not Clearly Explain the Current Operation of Wells, Blending, and Feasibility of Blending Going Forward

It is CalMat's understanding that a number of North Hollywood West wells identified in the Proposed Plan and RI/FS as shut down or operated on a "limited use" basis have been pumping continuously for several months, including NH-37 and NH-45. Without a hydrograph showing the actual monthly pumping and concentration of COCs to date, appropriate analysis and evaluation cannot be completed. Assuming CalMat is correct and these wells are currently in operation, and that blending is occurring as a method of meeting water quality standards, it is unclear why LADWP presents these wells as shut down. Even if blending is not a long-term option based on permitting or other regulatory restrictions, if water is currently being used from these wells and blending is effectively implemented, LADWP should have factored that into the alternative evaluation.

The Proposed Plan and RI/FS also do not explain why it is permissible for LADWP to use blending to meet required levels for every other COC (especially TCE and PCE), but not 1,4-dioxane. CalMat notes that most wells do not currently meet DDW's limits but the blending point stays well below the notification level for 1,4-dioxane despite other sources of 1,4-dioxane besides the North Hollywood West well field also being blended into the system. Per the RI/FS, there are very few instances of 1,4-dioxane at 10 times the NL level or above. The data in the RI/FS show that the North Hollywood Wells seem to experience brief increases in 1,4-dioxane levels, but then decrease in concentration as the radius of influence of the production well develops over time (as would be expected). LADWP has not explained why it would expect any of the North Hollywood West wells to stay above 10 times the NL for any extended period of time if they were allowed to continue pumping.

LADWP RESPONSE:

In this comment, the reviewer suggests that the RI/FS presents a number of the NHW wells as shut down. . This is not correct. The RI/FS presents that seven wells were removed from service during the period from November 2014 and March 2015, and that the wells have been offline except for temporary testing and other limited use. The RI/FS explains that the RAOs include restoring LADWP's capability to operate its existing NHW Well Field consistent with historical and planned use, and in a flexible manner.

The RI/FS accurately describes that LADWP has implemented a DDW-approved Interim Sampling Plan (LADWP 2015c) to collect contaminant concentration and other water quality data from the NHW production wells to support the implementation of the Blending Plan. Substances detected in production wells at concentrations exceeding MCLs (TCE, PCE, 1,1-DCE) and NLs (1,4-dioxane) were identified as primary contaminants of concern in the Blending Plan. TCE, PCE, 1,1-DCE have been detected at concentrations that can be managed by LADWP through its existing Permit and Blending Plan. However, 1,4-dioxane cannot be managed in this way.The results of the implementation of the Interim Sampling Plan show 1,4-dioxane was detected in water pumped from production wells at concentrations exceeding both the NL of 1 µg/L and the DDW Permit limit of 10 times the NL (e.g., 10 µg/L). As a result of 1,4-dioxane concentrations at the NHW productions wells and the requirements of the Permit and Blending Plan, seven NHW production wells (i.e., NH-23, NH-34, NH 36, NH-37, NH-43A, NH-44 and NH-45) were removed from service between November 2014 and March 2015, which impaired the beneficial use of groundwater.

The production wells were removed from service to prevent 1,4-dioxane concentrations from exceeding the NL at the LADWP blend point down-stream of the NHW Well Field. During this time, other groundwater contaminant concentrations in the NHW Well Field, such as TCE and PCE, were able to be effectively managed by blending water from select production wells. The production wells removed from service were subsequently operated for temporary testing and other limited use.

The removal from service of the seven production wells resulted in a combined loss of more than 24,700 AFY or 65 percent of the total production capacity of the NHW Well Field. The value of this volume of replacement water for the seven production wells at a current wholesale water price of $942 per AF is in excess of $23 million per year.

1,4-Dioxane concentrations exceeding 10 times the DDW NL detected in monitoring wells located up-gradient of the seven production wells indicate that use of the seven production wells would result in elevated concentrations of 1,4-dioxane being detected in the groundwater pumped from these production wells. The 1,4-dioxane groundwater plume also threatens to impact other wells in the NHW well field. Other groundwater contaminants are detected in monitoring wells located up-gradient of the seven production wells; however, none of the contaminants have caused the water extracted by the individual production wells to have an effluent concentration exceeding 10 times its DDW NL or MCL.

In this comment, the reviewer states that LADWP does not explain why it is permissible to use blending to meet required levels for every other COC (especially TCE and PCE), but not 1,4 dioxane. This is not correct. The RI/FS explains that the 1,4-dioxane has exceeded the DDW Permit limit of ten times the NL while other COCs have not exceeded the DDW Permit limit.

SPECIFIC COMMENTS

1. ***RI/FS Section 1, p. 1, ¶ 3*: LADWP states that the RI/FS is based on previously developed information, and "includes new data collected after the completion of the previous studies." Please identify this new data, since much of the data presented in the RI/FS appears to be from 2014 prior to the development of the 2015 RI.**

LADWP RESPONSE:

As noted on p. 12-13 of the RI/FS, the primary sources of groundwater data identified for use were:

- LADWP Laboratory Information Management System (LIMS) database;
- GSIS Database;
- EPA SFV Database;
- EPA Plume Maps; and
- GeoTracker.

Data assessed as part of the RI/FS includes sample analyses records from the following locations (date shown indicates the most recent sample available at the time of RI/FS preparation).

- Hewitt Site monitoring wells MW-3, MW-4, 4899 and 4909FR up to and including Q2 2014;
- Hewitt Site monitoring wells MW-1 up to and including Q4 2015;
- Hewitt Site monitoring wells MW-2, MW-6, MW-7, MW-9 up to and including Q4 2015;
- Hewitt Site monitoring wells for MW-5 and MW-8S up to and including Q1 2016;
- Three clustered monitoring wells at sampling location NH-MW-06 up to and including Q4 2015;
- Three clustered monitoring wells at sampling location NH-MW-11 up to and including Q4 2015;
- Two paired monitoring wells at sampling location NH-MW-05 up to and including Q4 2015;
- Two paired monitoring wells at sampling location RT-MW-06 up to and including Q4 2015;
- Monitoring well NH-VPB-06 up to and including Q3 2015; and
- LADWP production wells up to and including Q2 2016.

In addition, as described in RI/FS Appendix A p. 32, LADWP assessed the vertical distribution of 1,4-dioxane at locations where monitoring wells were completed in both the A-Zone and B-Zone, and this analysis included data from Hewitt Site monitoring wells, focusing on monitoring well pairs within the Hewitt Site and two locations east of NHW Well Field, with the associated data spanning Q4 2015 to Q1 2016. This included monitoring wells EW-1S and EW-1D, MW-5 and MW-5D, MW-8S and MW-8D.

It is also noted that during preparation of the RI/FS, nine CalMat-installed wells located between the NHW Well Field and the Hewitt Site were not found in any of the groundwater monitoring reports available to LADWP (CalMat Groundwater Monitoring Report for 2015 and 2016, on GeoTracker). Four LADWP/EPA monitoring wells (NH-C09-310, NH-MW-06-280, NH-MW-06-580, and NH-MW-06-810) that were identified were included in the data set for plume analysis.

Furthermore, as explained in RI/FS Appendix A p. 40, LADWP evaluated the IRAP for Hewitt Site (Golder 2016a) and the Site Assessment (CSM/HHRA) Report for Hewitt Site (Golder 2016b). These reports were also reviewed by LADWP during preparation of the RI/FS and information contained therein was used as part of the development of the simulated source flux boundary condition implemented for groundwater modeling simulations.

In addition, LADWP has reviewed recent monitoring well data for the Hewitt Site obtained from GeoTracker (collected since the publication of the RI/FS).These new data include sample analyses from Q3 2016 through Q2 2017. The new sampling data includes results from newly installed monitoring wells that were first sampled in Q1 2017. LADWP has evaluated this information and is considering it in the context of this remedial decision. Review of this recent data is presented in Appendix E of the IRAD. This includes a summary of the data collected since the publication of the RI/FS for 1,4-dioxane, and a comparison to the interpolated concentrations at each location for the Plume Case (presented in RI/FS Appendix A) and each Sensitivity Plume Case presented in the 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review. Other recent CalMat reports have also been reviewed as part of the IRAD including the Q1 2017 Quarterly Report (Golder 2017) and Q1 2017 WDR Monitoring Report (Calmat 2017). The recent data and documents reviewed as part of the IRAD is discussed in further detail as relevant in response to specific comments.

2. ***<u>RI/FS Section 1, p. 1, ¶ 3</u>: Please expand on how LADWP's response actions are being coordinated with activities and studies of the EPA, the State and Regional Water Boards, and DDW. The documents are non-specific and CalMat's understanding of the facts is that such coordination is largely absent.***

<u>LADWP RESPONSE:</u>

The coordination of LADWP response actions is documented in the Community Involvement Plan for the NHW Well Field; Appendix A presents a summary of communications from the early 1990's to present. The Community Involvement Plan is available on the LADWP web site, https://www.ladwp.com.

Additionally, on March 29, 2017, LADWP met with State Board's Division of Financial Assistance (DFA) to begin discussion of a TAC for groundwater remediation planning and implementation projects in the SFB that are receiving Proposition 1 funding through the Groundwater Grant Program. The discussion focused on identifying and developing the overarching TAC goals and purpose, a conceptual framework for implementation, expectations during the funding agreement period, and expectations following completion of the project. LADWP is working with DFA on scheduling follow-up meetings to continue developing the concept of the TAC that will also include DDW and LARWQCB.

In addition, quarterly meetings of the San Fernando Valley (SFV) Management Committee are held between stakeholders in the SFB, including LADWP, EPA, LARWQCB, California Department of Toxic Substance Control (DTSC), State Water Resources Control Board –DDW, Upper Los Angeles River Area Watermaster, and the Cities of Los Angeles, Burbank, and Glendale. Typical topics of discussion include updates on individual OUs, basinwide initiatives, and localized soil investigations and cleanups. This venue provides a forum for LADWP to provide project updates for projects in the SFB, including the NHW project, and seek input from regulatory stakeholders. The April 13, 2016, agenda specifically included discussion of the Vulcan/Hewitt Site, and the pending agreement with EPA.

LADWP has been working closely with the LARWQCB to identify potentially responsible parties (PRPs) for contaminant plumes identified subsequent to the 1992 RI. LADWP meets regularly with EPA to coordinate on issues related to PRPs, and has entered into a memorandum of understanding with the LARWQCB, which funds one full-time position to, among other things, assist in identifying PRPs, including those for COCs impacting the groundwater. LADWP will continue to participate in quarterly SFV Management Committee Meetings for the SFV organized by EPA.

Furthermore, the alternative analysis presented in the RI/FS considers current and potential future cleanup efforts by LARWQCB, DDW, DTSC, and EPA in the SFB. As part of the analysis, various pumping plans were developed to account for each cleanup effort as being in-progress, or not yet initiated. The alternatives developed in the RI/FS focused on complementing any on-going or proposed investigations for groundwater cleanup efforts that have oversight by the regulatory agencies.

3. ***RI/FS Section 1.6.5, p. 7*: Notably missing in the water balance are future plans for Indirect Potable Reuse projects in the basin. Modeling shows how sensitive spreading can be on capture zones for the well fields. Since capture zones can be readily impacted by spreading, LADWP should provide information on future IPR projects and the impact on evaluation of alternatives.**

LADWP RESPONSE:

RI/FS Appendix A considers future Indirect Potable Reuse (IPR). Storm Water Capture (SWC) and other recharge projects planned for the basin are incorporated in the pumping plan for the 30 year horizon according to projections provided in the LADWP Urban Water Management Plan (2015). This was done by annually varying recharge at spreading basins within the SFB as part of the groundwater flow and transport modeling simulations according to the Urban Water Management Plan. RI/FS Appendix A Attachment A1 (p.53) provides a summary of the of the spreading basin recharge rates applied in groundwater modeling simulations at each of the current and planned recharge projects. Consequently, effects of planned future groundwater recharge projects are included in the analysis of remedial action performance for the NHW project.

The closest spreading basin to the NHW Well Field is the Tujunga Spreading Grounds, which is over 8,000 feet north of the most northern NHW production well, and is located over 3,000 ft from the projected 10-year and 30-year capture zones presented in RI/FS Figure 1-2. Based on this distance from the NHW Well Field and capture zone, the spreading basins are not anticipated to have a material effect on the analysis of alternatives.

With respect to future plans for IPR, SWC and other projects in the basin, further information can be found in the following documents. Future plans for IPR and stormwater capture using the existing spreading grounds are included in the following documents:

- Los Angeles Groundwater Replenishment Project Fact Sheet is available online at: www.ladwp.com/GWR;

- The Final Los Angeles Groundwater Replenishment Project EIR is available online at: www.ladwp.com/envnotices;
- The Recycled Water Annual Report is available online at: http://www.ladwp.com/recycledwaterreport;
- The 2012 Recycled Water Master Plan is available online at: http://www.ladwp.com/rwmp; and
- The 2015 Urban Water Management Plan is available online at: http://www.ladwp.com/uwmp.

4. ***RI/FS Section 1.6.6, p. 7*: LADWP relies upon the 1992 Remedial Investigation Report (JMM 1992) and 2015 Groundwater Modeling Memorandum (AMEC 2015) to describe the hydrogeology in the vicinity of the North Hollywood West well field. As part of the Hewitt Site investigation since 2014, CalMat has installed a number of well pairs in the A Zone and B Zone, and it is currently installing a number of additional well pairs. In addition, these wells have continuous water level data loggers. LADWP should consider this data.**

LADWP RESPONSE:

In this comment, the reviewer suggests that LADWP should consider data collected by CalMat as part of the Hewitt Site investigation.

For the RI/FS, data in the vicinity of the NHW Well Field was used to the extent that this data was available to LADWP for plume definition as part of fate and transport simulations. In particular, LADWP did utilize data related to the Hewitt Site for groundwater modeling analyses, including samples taken between January 2011 and May 2016 (as stated in RI/FS Appendix A p. 30). This data includes data relating to Hewitt Site and sample analyses records from other monitoring locations as follows (date shown indicates the most recent sample available at the time of RI/FS preparation):

- Hewitt Site monitoring wells MW-3, MW-4, 4899 and 4909FR up to and including Q2 2014;
- Hewitt Site monitoring wells MW-1 up to and including Q4 2015;
- Hewitt Site monitoring wells MW-2, MW-6, MW-7, MW-9 up to and including Q4 2015;
- Hewitt Site monitoring wells for MW-5 and MW-8S up to and including Q1 2016;
- Three clustered monitoring wells at sampling location NH-MW-06 up to and including Q4 2015;
- Three clustered monitoring wells at sampling location NH-MW-11 up to and including Q4 2015;
- Two paired monitoring wells at sampling location NH-MW-05 up to and including Q4 2015;
- Two paired monitoring wells at sampling location RT-MW-06 up to and including Q4 2015;
- Monitoring well NH-VPB-06 up to and including Q3 2015; and
- LADWP production wells up to and including Q2 2016.

In addition, as described in RI/FS Appendix A p. 32, LADWP assessed the vertical distribution of 1,4-dioxane at locations where monitoring wells were completed in both the A-Zone and B-Zone, and this analysis included data from Hewitt Site monitoring wells, focusing on monitoring well pairs within the Hewitt Site and two locations east of NHW Well Field, with the associated data spanning Q4 2015 to Q1 2016. This included monitoring wells EW-1S and EW-1D, MW-5 and MW-5D, MW-8S and MW-8D.

It is also noted that during preparation of the RI/FS, nine CalMat-installed wells located between the NHW Well Field and the Hewitt Site were not found in any of the groundwater monitoring reports available to LADWP (CalMat Groundwater Monitoring Report for 2015 and 2016, on GeoTracker). Four

LADWP/EPA monitoring wells (NH-C09-310, NH-MW-06-280, NH-MW-06-580, and NH-MW-06-810) that were identified were included in the data set for plume analysis.

Furthermore, as explained in RI/FS Appendix A p. 40, LADWP evaluated the IRAP for Hewitt Site (Golder 2016a) and the Site Assessment (CSM/HHRA) Report for Hewitt Site (Golder 2016b). These reports were also reviewed by LADWP during preparation of the RI/FS and information contained therein was used as part of the development of the simulated source flux boundary condition implemented for groundwater modeling simulations.

In addition, LADWP has reviewed recent monitoring well data for the Hewitt Site obtained from GeoTracker (collected since the publication of the RI/FS).These new data include sample analyses from Q3 2016 through Q2 2017. The new sampling data includes results from newly installed monitoring wells that were first sampled Q1 2017. LADWP has evaluated this information and is considering it in the context of this remedial decision. Review of this recent data is presented in Appendix E of the IRAD. This includes a summary of the data collected since the publication of the RI/FS for 1,4-dioxane, and a comparison to the interpolated concentrations at each location for the Plume Case (presented in RI/FS Appendix A) and each Sensitivity Plume Case presented in the 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review. Other recent CalMat reports have also been reviewed as part of the IRAD including CalMat's Q1 2017 Quarterly Report (Golder 2017). Q1 2017 WDR Monitoring Report (Calmat 2017). The recent data and documents reviewed as part of the IRAD is discussed in further detail as relevant in response to specific comments.

With respect to the reviewer's comment in relation to groundwater level data, it is acknowledged that more recent data has been collected since the calibration of the AMEC (2015) model and it is expected that the indicated new data would be utilized in future updates of the EPA (2013) and/or AMEC (2015) models. In addition, LADWP has reviewed recent groundwater level data measured in the vicinity of Hewitt Site and NHW Well Field from the EPA database and compared this to the simulated groundwater levels from the calibrated AMEC model. As explained in response to Comment F above and below in response to Comment 5, the analysis of recent groundwater elevations confirms that the AMEC model is considered to be reliable for the purposes it was used for in the RI/FS. Further details relating to this review are provided as relevant in response to specific comments.

5. ***<u>RI/FS Section 1.6.6, p. 8, ¶ 3</u>: LADWP states that "[t]ime-specific snapshots of groundwater flow patterns are difficult to determine in plan-view in the NHW, because groundwater levels are measured at relatively few monitoring wells in this area at the same time (AMEC 2015)." LADWP should consult the EPA database for the basin-wide monitoring event for groundwater levels performed in 2016 for a recent snap shot of water levels. Also, EPA is coordinating a regular basin-wide monitoring event in April 2017 that should aid in LADWP's evaluation of remedial alternatives.***

LADWP RESPONSE:

The EPA SFV database was consulted as part of the RI/FS and it is acknowledged in RI/FS p.13 that EPA conducts periodic groundwater sampling and analysis for monitoring wells as part of the Groundwater Monitoring Program (GMP).

With respect to the reviewer's comment in relation to groundwater level data, LADWP has reviewed recent groundwater level data measured in the vicinity of Hewitt Site and NHW Well Field from the EPA database and compared this to the simulated groundwater levels from the calibrated AMEC model. Figure 1 of this Detailed Responses to Comments document presents the simulated hydraulic head distribution in the A-Zone within the NHW transport model domain at the end of the calibration period (this simulated head distribution was used for initial conditions in the forecast model which starts October 1, 2015). Figure 1 also presents the observed water level data from the EPA database using the following methodology and assumptions:

- water level data from the EPA database spans the period of +/- 6 months either side of October 1, 2015;
- at locations where multiple water levels were recorded in the stated time range the recorded water level closest in time to October 1, 2015, was used;
- database entries were omitted where there were notes concerning the existence of a pump in the well; and
- data at NHW production Wells 3790C (NH-22) and 3790G (NH-34) are included, but there is uncertainty regarding potential impacts from pumping at these locations.

Figure 2 of this Detailed Responses to Comments document shows the hydraulic head residuals between simulated heads from the end of the calibrated AMEC model and the EPA groundwater level data (i.e., the difference between the observed and modeled data). As illustrated in Figure 2, groundwater model residuals throughout the NHW transport model domain are predominantly between -11 ft and 2.4 ft with the only exception being at 3790G (NH-34; +25 ft); as mentioned previously, there is uncertainty regarding potential impacts from pumping at this location. Model residuals in the Hewitt Site area are generally between -2.1 to -5.1 ft (simulated heads higher than observed). In the area between the NHW Well Field and the Hewitt Site, model residuals range from -0.2 to 2.4 ft.

Considering the information provided above, the model is sufficiently well calibrated to water level data in the North Hollywood OU study area (encompassing the Hewitt Site and the NHW Remediation and Secondary wells) to simulate interaction of this well field with existing mapped contaminants. Further evidence of AMEC (2015) model calibration to water level data is provided in their Tables 5-1 to 5-3, Figure 5-5 and Appendix G, with these calibration results not re-iterated in the RI/FS Appendix A Groundwater Modelling Summary. Thus, the AMEC model is considered to be reliable for the purposes it was used for in the RI/FS.

It is acknowledged that more recent data has been collected since the calibration of the AMEC (2015) model and it is expected that the indicated new data would be utilized in future updates of the EPA (2013) and/or AMEC (2015) models.

6. ***<u>RI/FS Section 1.6.6, p. 7-8</u>: LADWP's discussion of hydrogeology describes limited data and gradient information in the B-zone and throughout the North Hollywood West well field area, mixing the issue of the number of discretely-screened wells with the presence of vertical conduits provided by wells screened over multiple units. CalMat has been actively installing monitoring wells on- and off-site, in the A Zone and B Zone to refine the understanding of these units and gradients. It does not appear that LADWP considered CalMat's data in its flow calculations, which directly hampers the interpretation of remedial system performance and the subsequent selected remedy.***

<u>LADWP RESPONSE:</u>

In this comment, the reviewer suggests that LADWP did not consider data collected by CalMat as part of the Hewitt Site investigation.

For the RI/FS, data in the vicinity of the NHW Well Field was used to the extent that this data was available to LADWP for plume definition. In particular, LADWP did utilize data related to the Hewitt Site for groundwater modeling analyses, including samples taken between January 2011 and May 2016 (as stated in RI/FS Appendix A p.30). This data includes data relating to Hewitt Site and sample analyses records from other monitoring locations as follows (date shown indicates the most recent sample available at the time of RI/FS preparation):

- Hewitt Site monitoring wells MW-3, MW-4, 4899 and 4909FR up to and including Q2 2014;
- Hewitt Site monitoring wells MW-1 up to and including Q4 2015;
- Hewitt Site monitoring wells MW-2, MW-6, MW-7, MW-9 up to and including Q4 2015;
- Hewitt Site monitoring wells for MW-5 and MW-8S up to and including Q1 2016;
- Three clustered monitoring wells at sampling location NH-MW-06 up to and including Q4 2015;
- Three clustered monitoring wells at sampling location NH-MW-11 up to and including Q4 2015;
- Two paired monitoring wells at sampling location NH-MW-05 up to and including Q4 2015;
- Two paired monitoring wells at sampling location RT-MW-06 up to and including Q4 2015;
- Monitoring well NH-VPB-06 up to and including Q3 2015; and
- LADWP production wells up to and including Q2 2016.

In addition, as described in RI/FS Appendix A p. 30-31, LADWP evaluated data from monitoring wells screened in the A-Zone and B-Zone (from analyses carried out between January 2011 and May 2016) as part of the plume definition generated for the RI/FS. Furthermore, as described in RI/FS Appendix A p. 32, LADWP assessed the vertical distribution of 1,4-dioxane at locations where monitoring wells were completed in both the A-Zone and B-Zone, and this analysis included data from Hewitt Site monitoring wells, focusing on monitoring well pairs within the Hewitt Site and two locations east of NHW Well Field, with the associated data spanning Q4 2015 to Q1 2016. Based on the observed vertical concentration distribution, the interpreted initial plume distribution in the upper half of B-Zone was inferred to be 10% of A-Zone concentration and the lower half of B-Zone was inferred to be 1% of A-Zone. RI/FS Appendix A p. 40 also indicates that the IRAP for Hewitt Site (Golder 2016a) and the Site Assessment (CSM/HHRA) Report for Hewitt Site (Golder 2016b) were also reviewed by LADWP during preparation of the RI/FS. CalMat's CSM/HHRA report (Section 6.4.2.1 Golder 2016b) mentioned that in the B-Zone wells, the concentrations of 1,4-dioxane are about one to two orders of magnitude lower than in the A-Zone wells, as observed at the following shallow-deep well pairs:

- EW-1S and EW-1D (210 and 4 µg/L);
- MW-5 and MW-5D (30 and 4.8 µg/L); and
- MW-8S and MW-8D (52 and 0.54 µg/L).

It is also noted that during preparation of the RI/FS, nine CalMat-installed wells located between the NHW Well Field and the Hewitt Site were not found in any of the groundwater monitoring reports available to LADWP (CalMat Groundwater Monitoring Report for 2015 and 2016, on GeoTracker). Four LADWP/EPA monitoring wells (NH-C09-310, NH-MW-06-280, NH-MW-06-580, and NH-MW-06-810) that were identified were included in the data set for plume analysis.

Furthermore, as explained in RI/FS Appendix A p. 40, LADWP evaluated the IRAP for Hewitt Site (Golder 2016a) and the Site Assessment (CSM/HHRA) Report for Hewitt Site (Golder 2016b). These reports were also reviewed by LADWP during preparation of the RI/FS and information contained therein was used as part of the development of the simulated source flux boundary condition implemented for groundwater modeling simulations.

In addition, LADWP has reviewed recent monitoring well data for the Hewitt Site obtained from GeoTracker (collected since the publication of the RI/FS).These new data include sample analyses from Q3 2016 through Q2 2017. The new sampling data includes results from newly installed monitoring wells that were first sampled Q1 2017. LADWP has evaluated this information and is considering it in the context of this remedial decision. Review of this recent data is presented in Appendix E of the IRAD. This includes a summary of the data collected since the publication of the RI/FS for 1,4-dioxane, and a comparison to the interpolated concentrations at each location for the Plume Case (presented in RI/FS Appendix A) and each Sensitivity Plume Case presented in the 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review.

Review of the new data indicates that many monitoring wells and lysimeters do not show a distinct decreasing trend in recent observed concentrations. Moreover a number of monitoring wells and lysimeters show a recent increase and/or significant fluctuation in observed 1,4-dioxane concentrations based on recent sampling events, including monitoring wells MW-25A, MW-25B, MW-26A, MW-5, MW-8S, and lysimeters LW-10 and LW-13S. Review of monitoring data as part of the RI/FS, and more recent data presented in Appendix E of the IRAD, indicates that measured concentration fluctuations of one order of magnitude are not unusual within or near the Hewitt Site (e.g., MW-2, MW-5, MW-8S, MW-15).

This variability is also highlighted in the different interpretations of contoured concentrations at Hewitt Site presented in CalMat's CSM/HHRA report (Golder 2016b) and their 2017 Q1 Quarterly report (Golder 2017). Comparison of CSM/HHRA report Figures 6-7A and 6-7B (Golder 2016b) and 2017 Q1 Quarterly Report Figures 10 and 11 (Golder 2017) indicates significant differences in the presented isoconcentration contours, with the latter indicating a larger 100 µg/L contour in B-Zone than in A-Zone relative to the former which shows only 2 µg/L and 3 µg/L contours in the B-Zone. It is also noted that concentrations monitoring wells MW-25A and MW-25B, as presented in the Q1 2017 WDR Monitoring Report (Calmat 2017), are higher than the data presented in the CalMat 2017 Q1 Quarterly report (Golder 2017).

- For MW-25A, the 2017 Q1 Quarterly report presents a concentration of 190 µg/L (Figure 10) which, based on Geotracker records, was observed in a sample taken on January 3, 2017. CalMat's Q1 2017 WDR Monitoring Report (Calmat 2017) presents another sample from Q1 2017 (taken on February 7, 2017) showing an observed concentration of 750 µg/L in this monitoring well.
- For MW-25B, the 2017 Q1 Quarterly report presents a concentration of 190 µg/L (Figure 11) which, based on Geotracker records, was observed in a sample taken on January 3, 2017. CalMat's Q1 2017 WDR Monitoring Report (Calmat 2017) presents another sample from Q1 2017 (taken on February 7, 2017) showed an observed of 250 µg/L in this monitoring well.

CalMat acknowledges recent increases in 1,4-dioxane concentrations in some monitoring wells in their recent Q1 2017 WDR Monitoring Report (Calmat 2017), stating "*[i]t is unclear whether this increase is related to natural (wet season) or anthropogenic (well field pumping) basin dynamics, further development of the newly installed wells giving a more representative sample, or the pilot testing. As noted in the current conceptual site model (CSM) swings in concentrations attributed to pumping by the Los Angeles Department of Water and Power (LADWP) and other natural basin dynamics, create difficulty in evaluating trends in wells, especially in wells with limited historical data such as the three noted above."* (p. 3). It is worthwhile to note that the recent increases indicate that these higher concentrations are present in the groundwater system and are not artifacts of any of the above processes.

It is due to the aforementioned variability in observed concentrations within individual monitoring locations, coupled with variability in observed 1,4-dioxane trends across the Hewitt Site monitoring data, that an approach was taken to adopt conservatism as a base scenario for the RI/FS (as stated in RI/FS Appendix A p. 49, the plume definition is intended to provide a conservative yet realistic estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field). The approach of using maximum concentration values between January 2011 and May 2016 rather than average values or the most recent data as a base scenario (Plume Case) provides a conservative yet realistic estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field. To address the uncertainty in this approach, sensitivity analyses were carried out to evaluate the effects of the RI/FS Plume Case definition and source flux boundary condition assumptions on transport modeling simulation results. The sensitivity analyses performed as part of the RI/FS transport modeling consider recent (up to Q2 2016) observed concentrations in monitoring wells in the A-Zone, and recent (up to Q2 2016) production well concentrations, as well as the effects of having no Hewitt Site source flux boundary condition assigned in the model. These sensitivity analyses were presented in 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review).

The more recent (Q3 2016 to Q2 2017) monitoring data presented in Appendix E of the IRAD supports the conservative yet realistic approach adopted for RI/FS Plume Case definition and source flux boundary condition assumptions, while the sensitivity analysis provided, which includes the most recent data available at the time of production of the RI/FS, addresses the effect of the conservatism adopted. Although the timeframe required for treatment varies across the RI/FS base case and sensitivity case transport simulations, the results of the sensitivity analyses (Appendix C of the IRAD, provided to CalMat in February 2017 for review, including implementation of source control, plume control, and Second Interim Remedy) and the review of the more recent (Q3 2016 to Q2 2017) monitoring data (Appendix E of the IRAD) do not alter the need for the response action, the conclusion that treatment is forecasted to be necessary at the three NHW production wells included in the Proposed Plan and subsequently the soundness of the alternative proposed in the Proposed Plan.

With respect to the reviewer's comment in relation to groundwater level data, LADWP has reviewed recent groundwater level data measured in the vicinity of Hewitt Site and NHW Well Field from the EPA database and compared this to the simulated groundwater levels from the calibrated AMEC model. Details are provided in response to Comment F and Comment 5 above. This review indicates that the hydraulic head residuals between simulated heads from the end of the calibrated AMEC model and the EPA groundwater level data throughout the NHW transport model domain are predominantly between -11 ft and 2.4 ft with the only exception being at 3790G (NH-34; +25 ft; there is uncertainty regarding potential impacts from pumping at this location). Model residuals in the Hewitt Site area are generally between -2.1 to -5.1 ft (simulated heads higher than observed). In the area between the NHW Well Field and the Hewitt Site, model residuals range from -0.2 to 2.4 ft. Considering the information provided above, the model is sufficiently well calibrated to water level data in the North Hollywood OU study area (encompassing the Hewitt Site and the NHW Remediation and Secondary wells) to simulate interaction of this well field with existing mapped contaminants.

It is acknowledged that more recent data has been collected since the calibration of the AMEC (2015) model and it is expected that the indicated new data would be utilized in future updates of the EPA (2013) and/or AMEC (2015) models.

7. ***RI/FS Section 1.7, p. 10*: Has LADWP performed an overall assessment of the wells as compared to current well standards? We expect that wells installed prior to Bulletin 74-81 would not meet current well standards or be adequate for remediation, and may serve as a potential conduit for vertical migration of contaminants.**

LADWP RESPONSE:

LADWP has performed an overall assessment of its production wells at NHW and is proposing to replace the three Remediation wells included in the Proposed Plan. The well replacement costs are included in the cost estimate presented in RI/FS Appendix B.

LADWP operates production wells that are permitted by DDW for drinking water supply, regardless of age or well standards in force at the time of construction. LADWP replaces production wells when they begin to show a loss of capacity, sand production, or casing failure, or otherwise become obsolete.

Most of the older wells in the Whitsett Fields Park area of the NHW Well Field were constructed using cable tool drilling and without a sanitary seal, in accordance with applicable well standards at the time. This applies to wells NH-26, 34, 37, and 43a. However, these wells were also screened relatively shallow, and screened either across the water table, or just below the water table. This is an excellent configuration for capturing contamination from shallow aquifer zones, and also addresses concerns related to fluctuating or declining water levels. Furthermore, wells screened at or just below the water table are unlikely to be a conduit for vertical migration of shallow contaminants to deeper zones, since shallow zone contamination is captured through the shallow wells screens.

The water table in the groundwater basin (including the NHW area) as noted in the RI/FS p. 7 is generally encountered at approximately 240 to 250 ft bgs (EPA 2009a), although it may be deeper in areas where groundwater is actively pumped. As shown in the following table, the top of screen depth for the older NHW cable-tool wells ranges from 202 ft bgs (NH-34) to 280 ft bgs (NH-43A). Three of the wells (NH-26, NH-43A, NH-37) have a top of screen above the water table (240 ft bgs) and two wells have a top of screen 25 to 40 feet below the water table (NH-36 and 43A, respectively).

Well ID	Year Constructed	Drilling Method	Top of Screen, Depth (ft)	Bottom of Screen, Depth (ft)
NH-26	1959	Cable Tool	220	555
NH-34	1964	Cable Tool	202	720
NH-36	1967	Cable Tool	265	720
NH-37	1968	Cable Tool	230	910
NH-43A	1982	Cable Tool	280	370
NH-44	1984	Reverse Rotary	340	780
NH-45	1884	Reverse Rotary	340	780

8. ***<u>RI/FS Section 1.8, p. 10</u>: LADWP references an Interim Sampling Plan, but it does not appear to be available. We request that you make this plan available for review.***

<u>LADWP RESPONSE:</u>

Comment noted. LADWP prepared an Interim Sampling Plan for groundwater monitoring in the 2-, 5- and 10-year capture zones of the NHW, Rinaldi-Toluca and Tujunga Well Fields, in consultation with the Division of Drinking Water. The April 2015 Interim Sampling Plan is included as Appendix B of the IRAD.

9. ***<u>RI/FS Section 1.8, p. 11, ¶ 1</u>: LADWP states that it removed wells NH-23, NH-24, NH-36. NH-37, NH-43A, NH-44 and NH-45 from service between November 2014 and March 2015. Assuming this is correct, please explain why LADWP only shut the wells down during that time period, and the status of the wells during the 24 months since that time period. This suggests that LADWP based its evaluation of alternatives on a time period that was nearly two years ago. However, data LADWP provided to CalMat indicates that these wells provided 2,393 acre-feet of water to the distribution system during November 2014 through March 2015.[1] In addition, of these seven wells, three wells (NH-34, NH-37, NH-45) have***

provided 4,679 acre-feet of water to the water system during water year 2016.[2] LADWP should revise the RI/FS as needed to accurately reflect actual conditions, including pages 14 and 17, which also erroneously refer only to these wells being removed from service.

[1] Copy of 14-15 WY LADWP Pumping for Hadi.xlsx

[2] Watermaster 15-16 LA.xlsx

LADWP RESPONSE:

As a result of 1,4-dioxane concentrations at the NHW productions wells and the conditions of the Permit and Blending Plan, seven NHW production wells (i.e., NH-23, NH-34, NH-36, NH-37, NH-43A, NH-44 and NH-45) were removed from service between November 2014 and March 2015, reflecting impairment to the beneficial use of groundwater. The production wells were removed from service to prevent 1,4-dioxane concentrations from exceeding the NL at the LADWP blend point down-stream of the NHW Well Field (LADWP 2016), and the wells have been offline except for temporary testing and other limited use.

LADWP has used the impacted production wells on a limited basis for testing, with the understanding that elevated concentrations of 1,4-dioxane detected in monitoring wells located up-gradient of the seven production wells indicates that use of the seven production wells would result in even higher concentrations of 1,4-dioxane being detected in the groundwater pumped from these production wells. The 1,4-dioxane groundwater plume also threatens to impact other wells in the NHW Well Field.

Although not presently in use, these seven wells remain as active status wells under LADWP's DDW permit. This permit requires that active status wells be sampled monthly. However, when these wells are not pumping, and the plume migrates away from the well under ambient groundwater flow conditions, the limited pumping of the wells required to take sample commonly produces results with low or non-detect concentrations of COCs. More extended periods of pumping (weeks or months) typically show that the plume quickly migrates back to the wells when they are pumped. The pumping of NH-34, NH-37, and NH-45 during 2016 noted in the comment verifies the proximity of the plume to the wells.

10. ***RI/FS Section 1.8, p. 11, ¶ 3: LADWP states that "Elevated concentrations of 1,4-dioxane detected in monitoring wells located up-gradient of the seven production wells indicates that use of the seven production wells would result in even higher concentrations of 1,4-dioxane being detected in the groundwater pumped from these production wells." This statement is unsupported and does not seem to correlate with LADWP's modeling, and it does not correlate with the current CSM Golder Associates developed based on extensive data collection at the Hewitt Site since 2014. LADWP should revisit this assessment after looking at current data trends and the most recent assessment of the nature and extent of contamination and release mechanisms.***

LADWP RESPONSE:

In this comment, the reviewer refers to a statement in the RI/FS regarding anticipated future concentration trends in the NHW Well Field, from page 11, paragraph 3 of the RI/FS.

The RI/FS statement is supported by the fate and transport modeling summarized in RI/FS Appendix A. If NHW production wells keep operating, elevated concentrations currently located up-gradient of these production wells are forecasted to migrate toward production wells. This is illustrated in Figure A4-6 of the RI/FS, which shows concentration snapshots and simulated hydraulic head distributions and Figure A4-4 of the RI/FS which shows simulated concentrations in each production well.

For the RI/FS, data in the vicinity of the NHW Well Field was used to the extent that this data was available to LADWP for plume definition. In particular, LADWP did utilize data related to the Hewitt Site for groundwater modeling analyses, including samples taken between January 2011 and May 2016 (as stated in RI/FS Appendix A p. 30). This data includes data relating to Hewitt Site and sample analyses records from other monitoring locations as follows (date shown indicates the most recent sample available at the time of RI/FS preparation):

- Hewitt Site monitoring wells MW-3, MW-4, 4899 and 4909FR up to and including Q2 2014;
- Hewitt Site monitoring wells MW-1 up to and including Q4 2015;
- Hewitt Site monitoring wells MW-2, MW-6, MW-7, MW-9 up to and including Q4 2015;
- Hewitt Site monitoring wells for MW-5 and MW-8S up to and including Q1 2016;
- Three clustered monitoring wells at sampling location NH-MW-06 up to and including Q4 2015;
- Three clustered monitoring wells at sampling location NH-MW-11 up to and including Q4 2015;
- Two paired monitoring wells at sampling location NH-MW-05 up to and including Q4 2015;
- Two paired monitoring wells at sampling location RT-MW-06 up to and including Q4 2015;
- Monitoring well NH-VPB-06 up to and including Q3 2015; and
- LADWP production wells up to and including Q2 2016.

In addition, as described in RI/FS Appendix A p. 30-31, LADWP evaluated data from monitoring wells screened in the A-Zone and B-Zone (from analyses carried out between January 2011 and May 2016) as part of the plume definition generated for the RI/FS. Furthermore, as described in RI/FS Appendix A p. 32, LADWP assessed the vertical distribution of 1,4-dioxane at locations where monitoring wells were completed in both the A-Zone and B-Zone, and this analysis included data from Hewitt Site monitoring wells, focusing on monitoring well pairs within the Hewitt Site and two locations east of NHW Well Field, with the associated data spanning Q4 2015 to Q1 2016. Based on the observed vertical concentration distribution, the interpreted initial plume distribution in the upper half of B-Zone was inferred to be 10% of A-Zone concentration and the lower half of B-Zone was inferred to be 1% of A-Zone. RI/FS Appendix A p. 40 also indicates that the IRAP for Hewitt Site (Golder 2016a) and the Site Assessment (CSM/HHRA) Report for Hewitt Site (Golder 2016b) were also reviewed by LADWP during preparation of the RI/FS. CalMat's CSM/HHRA report (Section 6.4.2.1, Golder 2016b) mentioned that in the B-Zone wells, the concentrations of 1,4-dioxane are about one to two orders of magnitude lower than in the A-Zone wells, as observed at the following shallow-deep well pairs:

- EW-1S and EW-1D (210 and 4 µg/L);
- MW-5 and MW-5D (30 and 4.8 µg/L); and
- MW-8S and MW-8D (52 and 0.54 µg/L).

It is also noted that during preparation of the RI/FS, nine CalMat-installed wells located between the NHW Well Field and the Hewitt Site were not found in any of the groundwater monitoring reports available to LADWP (CalMat Groundwater Monitoring Report for 2015 and 2016, on GeoTracker). Four LADWP/EPA monitoring wells (NH-C09-310, NH-MW-06-280, NH-MW-06-580, and NH-MW-06-810) that were identified were included in the data set for plume analysis.

Furthermore, as explained in RI/FS Appendix A p. 40, LADWP evaluated the IRAP for Hewitt Site (Golder 2016a) and the Site Assessment (CSM/HHRA) Report for Hewitt Site (Golder 2016b). These reports were also reviewed by LADWP during preparation of the RI/FS and information contained therein was used as part of the development of the simulated source flux boundary condition implemented for groundwater modeling simulations.

In addition, LADWP has reviewed recent monitoring well data for the Hewitt Site obtained from GeoTracker (collected since the publication of the RI/FS).These new data include sample analyses from Q3 2016 through Q2 2017. The new sampling data includes results from newly installed monitoring wells that were first sampled Q1 2017. LADWP has evaluated this information and is considering it in the context of this remedial decision. Review of this recent data is presented in Appendix E of the IRAD. This includes a summary of the data collected since the publication of the RI/FS for 1,4-dioxane, and a comparison to the interpolated concentrations at each location for the Plume Case (presented in RI/FS Appendix A) and each Sensitivity Plume Case presented in the 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review.

Review of the new data indicates that many monitoring wells and lysimeters do not show a distinct decreasing trend in recent observed concentrations. Moreover a number of monitoring wells and lysimeters show a recent increase and/or significant fluctuation in observed 1,4-dioxane concentrations based on recent sampling events, including monitoring wells MW-25A, MW-25B, MW-26A, MW-5, MW-8S, and lysimeters LW-10 and LW-13S. Review of monitoring data as part of the RI/FS, and more recent data presented in Appendix E of the IRAD, indicates that measured concentration fluctuations of one order of magnitude are not unusual within or near the Hewitt Site (e.g., MW-2, MW-5, MW-8S, MW-15).

This variability is also highlighted in the different interpretations of contoured concentrations at Hewitt Site presented in CalMat's CSM/HHRA report (Golder 2016b) and 2017 Q1 Quarterly report (Golder 2017). Comparison of CSM/HHRA report Figures 6-7A and 6-7B (Golder 2016b) and 2017 Q1 Quarterly Report Figures 10 and 11 (Golder 2017) indicates significant differences in the presented isoconcentration contours, with the latter indicating a larger 100 µg/L contour in B-Zone than in A-Zone relative to the former which shows only 2 µg/L and 3 µg/L contours in the B-Zone. It is also noted that concentrations in monitoring wells MW-25A and MW-25B, as presented in the Q1 2017 WDR Monitoring Report (Calmat 2017), are higher than the data presented in the CalMat 2017 Q1 Quarterly report (Golder 2017).

- For MW-25A, the 2017 Q1 Quarterly report presents a concentration of 190 µg/L (Figure 10) which, based on Geotracker records, was observed in a sample taken on January 3, 2017. CalMat's Q1 2017 WDR Monitoring Report (Calmat 2017) presents another sample from Q1 2017 (taken on February 7, 2017) showing an observed concentration of 750 µg/L in this monitoring well.

- For MW-25B, the 2017 Q1 Quarterly report presents a concentration of 190 µg/L (Figure 11) which, based on Geotracker records, was observed in a sample taken on January 3, 2017. CalMat's Q1 2017 WDR Monitoring Report (Calmat 2017) presents another sample from Q1 2017 (taken on February 7, 2017) showed an observed of 250 µg/L in this monitoring well.

CalMat acknowledges recent increases in 1,4-dioxane concentrations in some monitoring wells in their recent Q1 2017 WDR Monitoring Report (Calmat 2017), stating "*[i]t is unclear whether this increase is related to natural (wet season) or anthropogenic (well field pumping) basin dynamics, further development of the newly installed wells giving a more representative sample, or the pilot testing. As noted in the current conceptual site model (CSM) swings in concentrations attributed to pumping by the Los Angeles Department of Water and Power (LADWP) and other natural basin dynamics, create difficulty in evaluating trends in wells, especially in wells with limited historical data such as the three noted above."* (p. 3). It is worthwhile to note that the recent increases indicate that these higher concentrations are present in the groundwater system and are not artifcats of any of the above processes.

It is due to the aforementioned variability in observed concentrations within individual monitoring locations, coupled with variability in observed 1,4-dioxane trends across the Hewitt Site monitoring data, that an approach was taken to adopt conservatism as a base scenario for the RI/FS (as stated in RI/FS Appendix A p. 49, the plume definition is intended to provide a conservative yet realistic estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field). The approach of using maximum concentration values between January 2011 and May 2016 rather than average values or the most recent data as a base scenario (Plume Case) provides a conservative yet realistic estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field. To address the uncertainty in this approach, sensitivity analyses were carried out to evaluate the effects of the RI/FS Plume Case definition and source flux boundary condition assumptions on transport modeling simulation results. The sensitivity analyses performed as part of the RI/FS transport modeling consider recent (up to Q2 2016) observed concentrations in monitoring wells in the A-Zone, and recent (up to Q2 2016) production well concentrations, as well as the effects of having no Hewitt Site source flux boundary condition assigned in the model. These sensitivity analyses were presented in 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review).

The more recent (Q3 2016 to Q2 2017) monitoring data presented in Appendix E of the IRAD supports the conservative yet realistic approach adopted for RI/FS Plume Case definition and source flux boundary condition assumptions, while the sensitivity analysis provided, which includes the most recent data available at the time of production of the RI/FS, addresses the effect of the conservatism adopted. Although the timeframe required for treatment varies across the RI/FS base case and sensitivity case transport simulations, the results of the sensitivity analyses (Appendix C of the IRAD, provided to CalMat in February 2017 for review, including implementation of source control, plume control, and Second Interim Remedy) and the review of the more recent (Q3 2016 to Q2 2017) monitoring data (Appendix E of the IRAD) do not alter the need for the response action, the conclusion that treatment is forecasted to be necessary at the three NHW production wells included in the Proposed Plan and subsequently the soundness of the alternative proposed in the Proposed Plan.

With reference to the comment that the RI/FS does not correlate with the current CSM (Golder 2016b) in relation to future release mechanisms and concentrations at the Hewitt Site, CalMat's CSM/HHRA report (Section 8.2, Golder 2016b) mentioned that preliminary calculations for travel times in the unsaturated zone indicated that it would take the wetting front from the base of the waste from 5 to 20 years to reach the water table depending on conditions. The CalMat CSM/HHRA report also indicates that the current crushed base rock/asphalt cap will reduce the introduction of moisture thereby decreasing the driving gradient for transport through the vadose zone starting sometime in the mid-1980s. Thirty years have passed since the mid-1980s and the 1,4-dioxane concentration in monitoring wells (at the time of production of the RI/FS) were still as high as 240 µg/L in MW-15 (Q2 2016). Furthermore, review of more recent monitoring well data obtained from GeoTracker (collected since the publication of the RI/FS; presented in Appendix E of the IRAD), indicates that monitoring well concentrations in the vicinity of Hewitt Site were recently as high as 250 µg/L in MW-25B (Q1 2017), 470 µg/L in MW-26A (Q1 2017) and 750 µg/L in MW-25A (Q1 2017). Assuming travel time of the wetting front from the base of the waste to the water table being 5 to 20 years based on CalMat's presented calculations, most of the contamination in the vadose zone should have reached groundwater since the mid-1980s. If rock/asphalt cap reduces recharge significantly, monitoring wells should show significantly lower concentrations in recent monitoring events because most of contaminant should have reached the water table and leachate infiltration should be limited with reduced recharge. However, many monitoring wells do not show a distinct decreasing trend in recent observed concentrations, whereas some monitoring wells and lysimeters show a recent increase in observed 1,4-dioxane concentrations based on recent sampling events from 2016 and 2017 (including monitoring wells MW-25A, MW-25B, MW-26A, MW-5, MW-8S, and lysimeters LW-10 and LW-13S; Appendix E of the IRAD). Thus, this CalMat data actually supports the inferred constant release of contaminant is reasonable for conservative simulations. The CalMat CMS also states that specific combinations of wells may result in well hydraulic interference and subsequent capture that focuses mass transport in a narrow corridor between the Site and the NHW well field (Section 8.3.1).

Further to this, in the vicinity of NHW Well Field, A zone concentrations at the production wells can be estimated from available data using the flow weighted composite concentration calculations (RI/FS Appendix A p. 33) and with the understanding that most water derived from the production wells originates from the less contaminated B-Zone and deeper units as per the concentration profile presented in CalMat's CSM/HHRA report (Golder 2016b). This analysis shows that 1,4-dioxane concentrations in the A-Zone at production wells can be estimated up to and greater than 200 µg/L (RI/FS Appendix A Figure A4-1).

11. ***<u>RI/FS Section 1.9.1, p. 11</u>: Since the North Hollywood West well field is already located in an Operable Unit called NHOU, this section reads as though LADWP is proposing to create a new operable unit for the North Hollywood West well field. If EPA is not adopting a new operable unit, this section of the RI/FS appears to have no purpose.***

<u>LADWP RESPONSE:</u>

The NHW Well Field is located outside of the North Hollywood OU, which is delineated on Figure 1-1. The NCP states in Section 300.430 (a) (ii) (A) that sites should generally be remediated in OUs when early actions are necessary or appropriate to achieve significant risk reduction quickly, when phased analysis and response is necessary or appropriate given the size or complexity of the site, or to expedite the completion of total site cleanup. Given the size and complexity of the SFB and the need to expedite cleanup, LADWP is currently evaluating a phased analysis and response for each of its 11 well fields in the SFB, including the NHW Well Field (RI/FS Figure 1-1).

For the NHW Well Field, LADWP has defined the OU as the groundwater entering the NHW production wells under active pumping conditions. The source of groundwater entering the NHW production wells can be delineated by developing a pumping plan and using this pumping plan to delineate a potential capture zone. A potential capture zone can then be used to delineate the area of water captured by production wells within a given period of time (e.g., 10-, 30-year capture zone). The area of water captured by production wells within a given period of time is dependent on the volume of water extracted from the production wells during that period, and other factors such as the volume of water extracted from other nearby pumping wells and the volume of water recharged at various local spreading grounds.

The capture zones can be used to delineate the Study Area for the purpose of this RI/FS. The Study Area represents the lateral extent of the NHW OU based on the LADWP pumping plan. In this case, the 10-year capture zone can be used for shorter-term planning and remedial design while the 30-year capture zone can be used for longer-term planning including risk evaluation, fate and transport modeling, and groundwater recharge. The LADWP pumping plan is subject to change based on a number of factors such as supply and demand, climatic conditions, and maintenance activities. The goals of the pumping plan are described in the Sustainable City Plan (City 2015) and the Urban Water Management Plan (LADWP 2015a).

During the scoping phase of the RI/FS, it was determined that early action in the form of an interim response would be appropriate to address the 1,4-dioxane plume at the NHW Well Field. Early action would remove 1,4-dioxane from the groundwater basin, treat the groundwater impacted by 1,4-dioxane, and restore the beneficial uses of water pumped by wells affected or threatened by 1,4-dioxane. One or more additional response actions will be evaluated at a future date to address the broader VOC groundwater plumes that exists in the SFB, including the NHW Well Field area.

12. ***RI/FS Section 1.9.1, p. 12, ¶ 2*: LADWP states that "[o]ne or more additional response actions will be evaluated at a future date to address the broader VOC groundwater plumes that exists in the SFB, including the NHW well field area." LADWP representatives have repeated this at public meetings discussing the Proposed Plan. Given the information provided on LADWP's proposed remedy, we expect that the alternative selected by LADWP (AOP) would treat VOCs, and has been successfully used for treating VOCs at many sites across the country. Given this, it is unclear why any additional response actions would be needed in the North Hollywood West well field. Please provide additional information explaining this statement.**

LADWP RESPONSE:

LADWP acknowledges that other groundwater contaminants such as VOCs exist and pose a risk that will be addressed separately; however, this IRA focuses on 1,4-dioxane as a risk management strategy because this constituent is impacting the beneficial use of groundwater in accordance with the LARWQCB Basin Plan, which conforms with the State of California Antidegradation Policy (i.e., State Water Resources Control Board [SWRCB] Resolution 68-16 and 92-49), an ARAR for this IRA.

The IRA is intentionally focused on addressing the 1,4-dioxane groundwater plume present at the NHW Well Field. The 1,4-dioxane plume has caused the water extracted by the individual production wells to have an effluent concentration exceeding 10 times its DDW NL of 1 μg/L based on chronic health effects, which is prohibited by DDW unless removal treatment is provided. VOCs have not exceeded these levels.

A separate interim remedial action is being developed to address the broader detection of VOCs (e.g., PCE and TCE) in groundwater in the vicinity of the NHW and Rinaldi-Toluca well fields. As explained by the EPA, "[a]n interim action is limited in scope and only addresses areas/media that also will be addressed by a final site/operable unit Record of Decision" (EPA 1991). Please also see response to Comment D, above.

13. ***RI/FS Section 1.9.5, p. 12*: Does LADWP LIMS data undergo data validation per USEPA guidelines? What QA/QC measures are used in collection of samples from LADWP production wells? What is the sampling methodology?**

LADWP RESPONSE:

LADWP production well sampling is conducted by trained and qualified drinking water treatment and distribution operators certified by the SWRCB. Water samples are analyzed by the LADWP Water Quality Laboratory (LIMS), which is ELAP-accredited by the SWRCB to ensure the quality of analytical data used for regulatory purposes, to meet the requirements of the State's drinking water program. The State agencies that monitor the environment (e.g., DDW) use the analytical data from these accredited laboratories. Environmental Laboratory Accreditation Program (ELAP)-accredited laboratories have demonstrated capability to analyze environmental samples using approved methods.

LADWP conducts sampling and analysis of its production wells in accordance with its DDW approved water supply Permit. The LADWP Water Quality Laboratory is ELAP certified for both Chemistry and Microbiology analyses.

Analytical results collected are entered into LADWP's LIMS database and are checked and validated before getting approved and transmitted in electronic format to DDW for review. Sample collection is performed in accordance with the Sampling and Analysis Plan (SAP) developed for the GSIS program (Brown and Caldwell 2015). Quality assurance and quality control (QA/QC) procedures were defined in the GSIS Quality Assurance Project Plan (QAPP; Brown and Caldwell 2015) in accordance with EPA level II protocols.

Validation of analytical data by the LADWP Water Quality Laboratory is conducted in general accordance with the rules outlined in the EPA National Functional Guidelines (NFG) for Superfund

Organic Methods Data Review (EPA 2016a) and NFG for Inorganic Superfund Methods Data Review (EPA 2016b). Data validation provided by the LADWP Water Quality Laboratory includes: evaluating sample receipt conditions and holding times, applicable blank data (method blanks, field blanks, calibration blanks), laboratory duplicates, laboratory control samples, matrix spike/matrix spike duplicates against laboratory-specific control limits, initial calibration and continuing calibration data against method criteria, surrogate recoveries against laboratory-specific control limits, and any other method-specific criteria. Data is subsequently classified as one of the following: (1) acceptable for use without qualifications, (2) acceptable for use with qualifications, and (3) unacceptable for use (i.e., rejected).

Signed laboratory reports are issued by the LADWP Water Quality Laboratory and the QA/QC section of the reports includes the Level II data validation package.

14. ***RI/FS Section 1.9.5, p. 13*: LADWP relies on EPA plume maps that are no longer current or accurate. We recommended that LADWP review the plume maps for the last several quarters from the Hewitt Site. This will aid LADWP in evaluating the current nature and extent of contamination and give a more accurate representation of the plumes (TCE and PCE included) for the modeling.**

LADWP RESPONSE:

In this comment, the reviewer suggests that LADWP should not consider EPA plume maps and should consider data from the last several quarters collected by CalMat as part of the Hewitt Site investigation.

With respect to the use of EPA plume maps to inform assessment of the plume, CalMat has relied on the same approach in previous work. In a letter from Norton Rose Fulbright to LA Regional Water Control Board dated June 24, 2016 (page 3, Comment 4), CalMat indicates "*Groundwater concentrations of 1,4-dioxane were based on EPA's published maps and supplemented with more recent data from site wells*. "

With respect to the consideration data from the last several quarters collected by CalMat as part of the Hewitt Site, for the RI/FS, available data in the vicinity of the NHW Well Field was used to the extent that this data was available to LADWP to develop new 1,4-dioxane distribution maps which were incorporated in fate and transport modeling. In particular, LADWP did utilize data related to the Hewitt Site for groundwater modeling analyses, including samples taken between January 2011 and May 2016 (as stated in RI/FS Appendix A p. 30). This data includes data relating to Hewitt Site and sample analyses records from other monitoring locations as follows (date shown indicates the most recent sample available at the time of RI/FS preparation):

- Hewitt Site monitoring wells MW-3, MW-4, 4899 and 4909FR up to and including Q2 2014;
- Hewitt Site monitoring wells MW-1 up to and including Q4 2015;
- Hewitt Site monitoring wells MW-2, MW-6, MW-7, MW-9 up to and including Q4 2015;
- Hewitt Site monitoring wells for MW-5 and MW-8S up to and including Q1 2016;
- Three clustered monitoring wells at sampling location NH-MW-06 up to and including Q4 2015;
- Three clustered monitoring wells at sampling location NH-MW-11 up to and including Q4 2015;
- Two paired monitoring wells at sampling location NH-MW-05 up to and including Q4 2015;

- Two paired monitoring wells at sampling location RT-MW-06 up to and including Q4 2015;
- Monitoring well NH-VPB-06 up to and including Q3 2015; and
- LADWP production wells up to and including Q2 2016.

In addition, as described in RI/FS Appendix A p. 30-31, LADWP evaluated data from monitoring wells screened in the A-Zone and B-Zone (from analyses carried out between January 2011 and May 2016) as part of the plume definition generated for the RI/FS. Furthermore, as described in RI/FS Appendix A p. 32, LADWP assessed the vertical distribution of 1,4-dioxane at locations where monitoring wells were completed in both the A-Zone and B-Zone, and this analysis included data from Hewitt Site monitoring wells, focusing on monitoring well pairs within the Hewitt Site and two locations east of NHW Well Field, with the associated data spanning Q4 2015 to Q1 2016. Based on the observed vertical concentration distribution, the interpreted initial plume distribution in the upper half of B-Zone was inferred to be 10% of A-Zone concentration and the lower half of B-Zone was inferred to be 1% of A-Zone. RI/FS Appendix A p. 40 also indicates that the IRAP for Hewitt Site (Golder 2016a) and the Site Assessment (CSM/HHRA) Report for Hewitt Site (Golder 2016b) were also reviewed by LADWP during preparation of the RI/FS. CalMat's CSM/HHRA report (Section 6.4.2.1, Golder 2016b) mentioned that in the B-Zone wells, the concentrations of 1,4-dioxane are about one to two orders of magnitude lower than in the A-Zone wells, as observed at the following shallow-deep well pairs:

- EW-1S and EW-1D (210 and 4 µg/L);
- MW-5 and MW-5D (30 and 4.8 µg/L); and
- MW-8S and MW-8D (52 and 0.54 µg/L).

It is also noted that during preparation of the RI/FS, nine CalMat-installed wells located between the NHW Well Field and the Hewitt Site were not found in any of the groundwater monitoring reports available to LADWP (CalMat Groundwater Monitoring Report for 2015 and 2016, on GeoTracker). Four LADWP/EPA monitoring wells (NH-C09-310, NH-MW-06-280, NH-MW-06-580, and NH-MW-06-810) that were identified were included in the data set for plume analysis.

Furthermore, as explained in RI/FS Appendix A p. 40, LADWP evaluated the IRAP for Hewitt Site (Golder 2016a) and the Site Assessment (CSM/HHRA) Report for Hewitt Site (Golder 2016b). These reports were also reviewed by LADWP during preparation of the RI/FS and information contained therein was used as part of the development of the simulated source flux boundary condition implemented for groundwater modeling simulations.

In addition, LADWP has reviewed recent monitoring well data for the Hewitt Site obtained from GeoTracker (collected since the publication of the RI/FS).These new data include sample analyses from Q3 2016 through Q2 2017. The new sampling data includes results from newly installed monitoring wells that were sampled Q1 2017. LADWP has evaluated this information and is considering it in the context of this remedial decision. Review of this recent data is presented in Appendix E of the IRAD. This includes a summary of the data collected since the publication of the RI/FS for 1,4-dioxane, and a comparison to the interpolated concentrations at each location for the Plume Case (presented in RI/FS Appendix A) and each Sensitivity Plume Case presented in the 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review.

Review of the new data indicates that many monitoring wells and lysimeters do not show a distinct decreasing trend in recent observed concentrations. Moreover a number of monitoring wells and lysimeters show a recent increase and/or significant fluctuation in observed 1,4-dioxane concentrations based on recent sampling events, including monitoring wells MW-25A, MW-25B, MW-26A, MW-5, MW-8S, and lysimeters LW-10 and LW-13S. Review of monitoring data as part of the RI/FS, and more recent data presented in Appendix E of the IRAD, indicates that measured concentration fluctuations of one order of magnitude are not unusual within or near the Hewitt Site (e.g., MW-2, MW-5, MW-8S, MW-15).

This variability is also highlighted in the different interpretations of contoured concentrations at Hewitt Site presented in CalMat's CSM/HHRA report (Golder 2016b) and 2017 Q1 Quarterly report (Golder 2017). Comparison of CSM/HHRA report Figures 6-7A and 6-7B (Golder 2016b) and 2017 Q1 Quarterly Report Figures 10 and 11 (Golder 2017) indicates significant differences in the presented isoconcentration contours, with the latter indicating a larger 100 μg/L contour in B-Zone than in A-Zone relative to the former which shows only 2 μg/L and 3 μg/L contours in the B-Zone. It is also noted that concentrations monitoring wells MW-25A and MW-25B, as presented in the Q1 2017 WDR Monitoring Report (Calmat 2017), are higher than the data presented in the CalMat 2017 Q1 Quarterly report (Golder 2017).

- For MW-25A, the 2017 Q1 Quarterly report presents a concentration of 190 µg/L (Figure 10) which, based on Geotracker records, was observed in a sample taken on January 3, 2017. CalMat's Q1 2017 WDR Monitoring Report (Calmat 2017) presents another sample from Q1 2017 (taken on February 7, 2017) showing an observed concentration of 750 µg/L in this monitoring well.
- For MW-25B, the 2017 Q1 Quarterly report presents a concentration of 190 µg/L (Figure 11) which, based on Geotracker records, was observed in a sample taken on January 3, 2017. CalMat's Q1 2017 WDR Monitoring Report (Calmat 2017) presents another sample from Q1 2017 (taken on February 7, 2017) showed an observed of 250 µg/L in this monitoring well.

CalMat acknowledges recent increases in 1,4-dioxane concentrations in some monitoring wells in their recent Q1 2017 WDR Monitoring Report (Calmat 2017), stating "*[i]t is unclear whether this increase is related to natural (wet season) or anthropogenic (well field pumping) basin dynamics, further development of the newly installed wells giving a more representative sample, or the pilot testing. As noted in the current conceptual site model (CSM) swings in concentrations attributed to pumping by the Los Angeles Department of Water and Power (LADWP) and other natural basin dynamics, create difficulty in evaluating trends in wells, especially in wells with limited historical data such as the three noted above."* (p. 3). It is worthwhile to note that the recent increases indicate that these higher concentrations are present in the groundwater system and are not artifcats of any of the above processes.

It is due to the aforementioned variability in observed concentrations within individual monitoring locations, coupled with variability in observed 1,4-dioxane trends across the Hewitt Site monitoring data, that an approach was taken to adopt conservatism as a base scenario for the RI/FS (as stated in RI/FS Appendix A p. 49, the plume definition is intended to provide a conservative yet realistic estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field). The approach of using maximum concentration values (within the period of Jan 2011 to May 2016) rather than average values or the most recent data as a base scenario (Plume Case) provides a conservative yet realistic estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field. To address the uncertainty in this approach, sensitivity analyses were carried out to evaluate the effects of the RI/FS Plume Case definition and source flux boundary condition assumptions on transport modeling simulation results. The sensitivity analyses performed as part of the RI/FS transport modeling consider most recent (up to Q2 2016) observed concentrations in monitoring wells in the A-Zone, and most recent (up to Q2 2016) production well concentrations, as well as the effects of having no Hewitt Site source flux boundary condition assigned in the model. These sensitivity analyses were presented in 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review).

The more recent (Q3 2016 to Q2 2017) monitoring data presented in Appendix E of the IRAD supports the conservative yet realistic approach adopted for RI/FS Plume Case definition and source flux boundary condition assumptions, while the sensitivity analysis provided, which includes the most recent data available at the time of production of the RI/FS, addresses the effect of the conservatism adopted. Although the timeframe required for treatment varies across the RI/FS base case and sensitivity case transport simulations, the results of the sensitivity analyses (Appendix C of the IRAD, provided to CalMat in February 2017 for review, including implementation of source control, plume control, and Second Interim Remedy) and the review of the more recent (Q3 2016 to Q2 2017) monitoring data (Appendix E of the IRAD) do not alter the need for the response action, the conclusion that treatment is forecasted to be necessary at the three NHW production wells included in the Proposed Plan and subsequently the soundness of the alternative proposed in the Proposed Plan.

15 <u>RI/FS Section 1.10, p. 14</u>: Well NH-C09, referred to as the "downgradient well" of the Hewitt Site, had a result over 110 µg/L in 2013, but the maximum concentration before 2013 was 13 µg/L. For the last three quarters, the maximum concentration has been 8.7 µg/L, which makes the 110 µg/L number seem anomalous and inappropriate for use. LADWP should consider the entire data set that is available to them for use.

<u>LADWP RESPONSE:</u>

It is acknowledged that for RI/FS Plume Case definition the value assigned to well NH-C09 was 110 µg/L (RI/FS Appendix A p.55). While it is true that the observed concentration of 110 µg/L at NH-C09 is higher than other values observed at this location, there is no robust justification for discounting this data point, particularly since review of monitoring data as part of the RI/FS, and more recent data presented in Appendix E of the IRAD, indicates that measured concentration fluctuations of one order of magnitude are not unusual within or near the Hewitt Site (e.g., MW-2, MW-5, MW-8S, MW-15). Montioring well MW-06-280 is located downgradient of NH-C09 and has a maximum 1,4-dioxane concentration of 35.9 µg/L observed in July, 2013. With the 1,4-dioxane source location at Hewitt Pit and onsite groundwater concentrations of up to 750 µg/L (2017 Q1 data at MW-25A), the conceptual model indicates that concentrations at NH-C09 would be expected to be higher than MW-06-280 concentrations.

Moreover, presumably the 110 µg/L concentration measured at well NH-C09 in 2013 is still in the aquifer system, even if it has migrated away from the location of well NH-C09. It is due to the variability in observed concentrations within individual monitoring locations, coupled with variability in observed 1,4-dioxane trends across the Hewitt Site monitoring data, that an approach was taken to adopt conservatism as a baseline scenario for the RI/FS (as stated in RI/FS Appendix A p. 49, the plume definition is intended to provide a conservative yet realistic estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field). To address the uncertainty in this approach, sensitivity analyses were carried out to evaluate the effects of the RI/FS Plume Case definition assumptions on transport modeling simulation results. For the two sensitivity plume cases, the interpolated contour interval in the vicinity of NH-C09 was significantly lower (50-100 µg/L), relative to that used in the RI/FS Plume Case interpolated contour interval (100-400µg/L); this information is presented the review of recent data in Appendix E of the IRAD, while the sensitivity analyses were presented in '*Technical Support Information for Transport Modeling in response to comments regarding:* Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review.

Furthermore, review of the more recent (Q3 2016 to Q2 2017) monitoring data indicates that many monitoring wells and lysimeters do not show a distinct decreasing trend in recent observed concentrations. Moreover a number of monitoring wells and lysimeters show a recent increase and/or significant fluctuation in observed 1,4-dioxane concentrations based on recent sampling events, including monitoring wells MW-25A and MW-25B (which are located on the southern boundary of the Hewitt Site), MW-26A, MW-5, MW-8S, and lysimeters LW-10 and LW-13S. Given this variability in observed concentrations in the vicinity of Hewitt Site, and the significant differences in presented isoconcentration contours presented in CalMat's CSM/HHRA report (Figures 6-7A and 6-7B; Golder 2016b) and 2017 Q1 Quarterly Report (Figures 10 and 11; Golder 2017) (with the latter indicating a larger 100 µg/L contour in B-Zone than in A-Zone relative to the former which shows only 2 µg/L and 3 µg/L contours in the B-Zone), the conservative yet realistic approach adopted for RI/FS Plume Case definition remains valid, while the sensitivity analysis provided addresses the effect of the conservatism adopted.

Considering the value of 8.7 µg/L noted in the comment in relation to the approach to plume definition in the RI/FS base case and sensitivity analyses, interpolation in the vicinity NH-C09 would only change the plume definition for RI/FS Sensitivity Case 2 (Figure 11 of Appendix C of the IRAD) which uses recent data. The RI/FS Plume Case and Sensitivity Case 1 both use maximum observed concentrations for the date range considered for the RI/FS, and without robust justification for discounting the observed value of 110 µg/L, this value would still be included to maintain the conservative yet realistic approach adopted for RI/FS.

Use of this value for RI/FS Sensitivity Case 2 would limit the southern extent of the down-gradient plume core in the RI/FS Sensitivity Case 2. However, this change would not significantly alter the results of the forecasted concentrations within production wells as it would have no effect on the values used for interpolation for NHW production wells or Hewitt Site monitoring wells, nor would it affect the implemented source flux boundary condition assumptions.

16. ***<u>RI/FS Section 1.12</u>: This section is misleading in defining risk from groundwater. The cumulative risk as given is helpful, but relative risk from each chemical identified as a COC in the risk assessment should also be given as compared to cancer and non-cancer endpoints. In addition, the established full COCs list should be given, which is a much larger list then included in the RI/FS. These risk values and the complete list of COCs should be used to define the remedial technologies and alternatives tailored to the chemicals that comprise the risk identified for potential receptors.***

<u>LADWP RESPONSE:</u>

The intent of Section 1.12 in the RI/FS was to provide a summary overview of the HHRA results; the HHRA is a separate document. The HHRA supports the need for a response action for 1,4-dioxane. The HHRA also supports the need for a response action for VOCs. Per the risk management approach for this area, LADWP elected to focus initially on the 1,4-dioxane plume. The 1,4-dioxane plume has caused the water extracted by the individual production wells to have an effluent concentration exceeding 10 times its DDW NL of 1 µg/L based on chronic health effects, which is prohibited by DDW unless removal treatment is provided. VOCs have not exceeded 10 times their respectively MCLs. A separate interim remedial action is being developed to address the broader detection of VOCs (e.g., PCE and TCE) in groundwater in the vicinity of the NHW and Rinaldi-Toluca well fields.

17. ***<u>RI/FS Section 1.12.4, p. 16</u>: Although Section 1.12.4 indicates that risk from exposure to 1,4-dioxane falls within EPA's risk management range (1.2E-05 (CTE) and 2.4E-05 (RME)), the RI/FS does not address the primary risk drivers for the production and monitoring wells. 1,4-dioxane is actually in the bottom half of chemicals for cancer risk (lower than PCE and hexavalent chromium) and lower than a number of chemicals for non-cancer risk (e.g., PCE, TCE, cis-1,2- DCE hexavalent chromium, 1,1-DCE). Some specific observations based on the HHRA include the following:***

    a. ***The production well PCE risk is in excess of the EPA acceptable risk range of 1.0E-06 to 1.0E-04 (CTE carcinogenic risk of 2.0E-04; RME carcinogenic risk of 2.1E-04). PCE is the primary risk driver among the COPC's. PCE accounts for the majority of the cumulative carcinogenic risk from exposure to VOCs from the production wells. Furthermore, PCE is the primary non-carcinogenic risk driver for the production wells.***

    b. ***For the monitoring wells, PCE is in excess of the EPA acceptable risk range of 1.0E-06 to 1.0E-04 and is the primary risk driver (CTE carcinogenic risk of 1.4E-04 and an RME carcinogenic risk of 1.5E-04). This accounts for the greater majority of the cumulative carcinogenic risk from exposure to VOCs for the monitoring wells. Furthermore, PCE is the primary non-carcinogenic risk driver for the monitoring wells.***

    c. ***As PCE is the primary risk driver for the production and monitoring wells, with carcinogenic risks 1-2 orders of magnitude greater than those associated with 1,4-dioxane, the conclusions of the risk evaluation in Section 1.13.3 are faulty, stating only that 1,4-dioxane requires remedial actions to address the impacts on groundwater. PCE, and to a lesser extent other VOCs, should be the primary focus of any remedial***

action as they are the primary risk drivers. If the risks from PCE were removed from consideration, the remaining carcinogenic risks in both the production and monitoring wells would fall within acceptable limits.

LADWP RESPONSE:

The interim remedial action is intentionally focused on addressing the 1,4-dioxane groundwater plume present at the NHW Well Field. One or more additional response actions will be evaluated at a future date to address the broader VOC groundwater plume that exists in the area at NHW and Rinaldi-Toluca well fields. As explained by the EPA, "[a]n interim action is limited in scope and only addresses areas/media that also will be addressed by a final site/operable unit Record of Decision" (EPA 1991). As explained in more detail in response E above, the commenter is conflating risk assessment and risk management. The risk management decision to focus initially on 1,4-dioxane is technically sound, appropriate and consistent with the NCP.

For the purpose of the RI/FS report, the NHW OU is defined as the groundwater entering the NHW groundwater production wells based on the capture zones presented in Figure 1-2. Thus, RAOs were developed to address the groundwater entering the NHW groundwater production wells, the potential contaminants in the groundwater, the use of the groundwater for domestic purposes, and the potential exposure routes including ingestion, inhalation and dermal contact with groundwater containing contaminant concentrations exceeding numerical or risk-based cleanup goals. This interim remedial action is developed for the 1,4-dioxane plume impacting the NHW Well Field. The 1,4-dioxane plume has caused the water extracted by the individual production wells to have an effluent concentration exceeding 10 times its DDW NL of 1 µg/L based on chronic health effects, which is prohibited by DDW unless removal treatment is provided. VOCs have not exceeded 10 times their respectively MCLs. A separate interim remedial action is being developed to address the broader detection of VOCs (e.g., PCE and TCE) in groundwater in the vicinity of the NHW and Rinaldi-Toluca well fields.

18 <u>RI/FS Section 2.1, p. 18</u>: It does not appear that LADWP has developed risk-based cleanup goals, instead using the notification level. A "risk-based" goal is often not the same as an NL or MCL. Please clarify how LADWP developed the "risk-based" cleanup goals. Also, please explain why LADWP has not developed "risk-based" goals for other COCs, as a risk-based goal is different than a permit requirement.

LADWP RESPONSE:

LADWP identified Applicable Relevant and Appropriate Requirements (ARARs) and To-Be-Considered documents TBCs, and preliminary cleanup goals (Preliminary Cleanup Goals) for the interim remedial action. LADWP set preliminary cleanup goals for the interim remedial action to address the 1,4-dioxane plume equal to the California NL. As discussed in response to Fulbright comment 9, above, the use of the NL for 1,4-dioxane as a cleanup level is appropriate given its identification as a TBC, the method that EPA used to calculate the Excess Cancer Risk (ECR) for drinking water that underlies the NL (which is comparable to a domestic water end use), and the fact that the risk range using that NL is within that which is appropriate for a CERCLA response action. NLs are health based advisory levels for chemicals in drinking water that are established for chemicals for which there are no formal regulatory standards (MCLs). The 1,4-dioxane NL was established by the SWRCB DDW when 1,4-

dioxane was found in and threatened drinking water sources. The EPA set a Health Advisory Level at 0.35 µg/L based on an ECR of 1 x 10^{-6}. Once EPA established that risk level, DDW established a NL for drinking water at 1 µg/L. NLs set for drinking water in the 10^{-6} range are an appropriate metric for cleanup levels given the similar risk range to MCLs and CERCLA response actions where the beneficial use of the groundwater to be remediated includes domestic use. During the public comment period, LADWP did not receive any information to indicate that less stringent cleanup levels are appropriate.

EPA also used a cleanup criteria of MCLs (where available) and California NL (where MCLs are not available such as for 1,4-dioxane) at the North Hollywood Operable Unit (NHOU), which is a superfund site in this same groundwater basin as the NHW Well Field. In the 2009 Focused FS for that action, EPA observed that in the absence of MCLs, the state drinking water notification levels have been considered as goals for extracted groundwater. Since an RAO for this response action is to restore the beneficial use of the groundwater and for domestic purposes, it appropriate to apply the NL as a cleanup level in the absence of an MCL for 1,4-dioxane.

For groundwater that would be served as potable water as part of the interim remedy, LADWP developed additional preliminary cleanup goals based on applicable California MCLs, and those values are appropriate since that treated water would be served for domestic use. Such water must meet MCLs in order to be served for domestic use.

19. ***RI/FS Section 3.2.2, Alternate Water Supply, p. 26*: Why does LADWP exclude installation of wells or redevelopment of other well fields as part of the alternative water supply analysis? For example, could new wells located west of the existing Tujunga well field, where the risk of contamination is decreased, be a feasible and cost-effective alternative? Similarly, new wells in the North Hollywood West well field screened in deeper portions of the aquifer and out of the area of contamination also appear to be feasible and cost-effective. It appears LADWP dismissed this alternative without an adequate basis.**

LADWP RESPONSE:

The RI/FS was developed to protect human health and the environment by reducing the potential for exposure to 1,4-dioxane in groundwater at concentrations exceeding its NL of 1 µg/L; limit the migration of 1,4-dioxane in groundwater in the vicinity of the NHW Well Field at concentrations that prevent the beneficial use of the SFB; remove 1,4-dioxane from groundwater in the vicinity of the NHW Well Field to maintain the beneficial uses of the SFB and restore the aquifer to the extent practicable; and restore LADWP's capability to operate its existing NHW Well Field consistent with historic and planned use of the NHW Well Field in a flexible manner. The installation of new wells in uncontaminated areas of the SFB does not address these objectives. Further, it should be noted that the Rinaldi Toluca and Tujunga well fields were originally sited in the early 1990s for exactly the purpose the reviewer describes (i.e., to find areas of the basin un-impacted by contamination) however the new wells subsequently also captured groundwater contamination from upgradient sources. Trying to avoid contamination, rather than addressing its presence through active remedial action, has therefore been demonstrated to be a wholly unsuccessful strategy. Installing and connecting new wells to the water system is difficult from an implementation standpoint, is not cost effective and has not been successful in the past in this area given the conditions of the basin.

20. <u>RI/FS Section 3.2.3, Hydraulic Control Using Existing Groundwater Production Wells, p. 28, ¶ 1</u>: LADWP states: "The boundaries of groundwater flow towards the production well within a given time period is referred to as a capture zone. Hydraulic control using select production wells can be used to reduce the migration of 1,4-dioxane in the vicinity of the NHW well field, and reduce the likelihood of exposure to 1,4-dioxane." Due to the length of LADWP well screen intervals and lack of data demonstrating where water enters the screen intervals, please explain how LADWP knows that the existing production wells will be able to contain the COC plumes, especially as opposed to new targeted interceptor wells.

<u>LADWP RESPONSE:</u>

Evidence of plume containment is provided through detailed fate and transport modelling presented in RI/FS Appendix A. As explained in the RI/FS and in these RTC, LADWP evaluated shallow extraction wells at the screening stage but did not carry that approach forward as an alternative because shallow extraction wells would not be able to prevent 1,4-dioxane from entering the NHW Well Field production wells, as 1,4-dioxane at the production wells have been detected at levels exceeding Cleanup Goals. Implementation of targeted interceptor wells would require time to conduct studies, obtain permits, and construct conveyance and recharge systems, delaying the ultimate remediation of groundwater. Additionally, relative cost would be high due to the effort required to complete the design, permitting, and construction of the conveyance and recharge system; and the requirement to replace the treated potable water returned to the aquifer with an alternate water supply. The DDW would likely prohibit the direct domestic use of the treated water if 1,4-dioxane concentrations in that treated water are relatively high with respect to the DDW NL or MCL, which is more likely to occur in shallow extraction wells located in the core of the 1,4-dioxane plume.

Further to this, LADWP has performed an overall assessment of its production wells at NHW and is proposing to replace the three Remediation wells included in the Proposed Plan. The well replacement costs are included in the cost estimate presented in RI/FS Appendix B.

LADWP operates production wells that are permitted by DDW for drinking water supply, regardless of age or well standards in force at the time of construction. LADWP replaces production wells when they begin to show a loss of capacity, sand production, or casing failure, or otherwise become obsolete.

Most of the older wells in the Whitsett Fields Park area of the NHW Well Field were constructed using cable tool drilling and without a sanitary seal, in accordance with applicable well standards at the time. This applies to wells NH-26, 34, 37, and 43a. However, these wells were also screened relatively shallow, and screened either across the water table, or just below the water table. This is an excellent configuration for capturing contamination from shallow aquifer zones, and also addresses concerns related to fluctuating or declining water levels. Furthermore, wells screened at or just below the water table are unlikely to be a conduit for vertical migration of shallow contaminants to deeper zones, since shallow zone contamination is captured through the shallow wells screens.

21. ***RI/FS Section 3.2.3, Hydraulic Control Using Existing Groundwater Production Wells, p. 29, ¶ 2: LADWP states "DDW would likely prohibit the direct domestic use of the treated water if the 1,4- dioxane concentration in that treated water are relatively high with respect to the DDW NL or MCL, which is more likely to occur in shallow extraction wells located in the core of the 1,4- dioxane plume." This reflects dismissal of remediation technologies and approaches without a valid technology review. If the treated water (assuming source control will be in place) meets preliminary cleanup goals, and is properly monitored and blended into the North Hollywood West well field water supply upgradient of exposure points, there is no valid reason for DDW to preclude using the treated water for domestic use. LADWP has itself noted that "This option has been proven to be implementable and cost-effective in the Southern California region for similarly impaired groundwater." (p. 31). Given that the volume of groundwater extracted via shallow extraction wells would be far less than that pumped from the "remediation" production wells (likely by an order of magnitude), there are other viable options for the treated water other than direct domestic use, such as reinjection to help facilitate plume management and recharge of the aquifer.***

LADWP RESPONSE:

The comment quoted here appears to be referring to the RI/FS Section 3.2.3 Hydraulic Control Using New Shallow Extraction Wells.

The migration of 1,4-dioxane in the vicinity of the NHW Well Field could be reduced by drawing groundwater toward new shallow groundwater extraction wells and away from existing production wells and downgradient water resources. The new shallow groundwater extraction wells could be installed at locations within the 1,4-dioxane plumes between the source areas and the down-gradient production well receptors to form a hydraulic barrier to limit further migration of 1,4-dioxane. The shallow extraction wells would not be able to prevent 1,4-dioxane from entering the NHW Well Field production wells, as 1,4-dioxane at the production wells has been detected at levels exceeding Cleanup Goals already. The water pumped from shallow extraction wells would receive aboveground treatment.

Implementation would require time to conduct studies, obtain permits, and construct conveyance and recharge systems, delaying the ultimate remediation of groundwater. Additionally, relative cost would be high due to the effort required to complete the design, permitting, and construction of the conveyance and recharge system; and the requirement to replace the treated potable water returned to the aquifer with an alternate water supply.

The water from shallow source area extraction wells may be too contaminated to be reliably treated and provided for direct domestic use. Also, the potential risk to hydraulic control using new shallow extraction wells was eliminated in the development of remedial alternatives, as this approach would not be effective at capturing the portion of the 1,4-dioxane groundwater plume located between shallow extraction wells and the existing production wells. Thus, a system using shallow extraction wells does not eliminate the need for treatment of the NHW production wells impacted by 1,4-dioxane, and may not be able to overcome the influence of nearby production well pumping at varying rates.

The comparative analysis of groundwater recharge versus direct domestic use is addressed in the response to Comment 22, below.

22. ***RI/FS Section 3.2.4, Groundwater Recharge, p. 31*: LADWP eliminated groundwater recharge from consideration due to "recontamination in the subsurface." It is understood that re-injection of water could result in some recontamination, but if the goal is remediation, and not just development of a water treatment project, LADWP should properly consider this option. There are a number of advantages to reinjection, such as development of hydraulic barriers and "enhanced groundwater flushing" that should be further considered. Resurgence of Pump and Treat Solutions: Directed Groundwater Recirculation (Arcadis 2015) provides some of the benefits of such a remedial option.**

LADWP RESPONSE:

The groundwater recharge option involves the conveyance and injection of treated water into groundwater basins, or conveyance and discharge to local spreading basins for subsequent infiltration and aquifer recharge. This option would not be an effective use of treated water given the need to treat the water to drinking water standards prior to groundwater recharge, and its subsequent potential for recontamination in the subsurface. The implementation of groundwater recharge can be considered inefficient from a groundwater management perspective. In the case of groundwater pumping to the surface at a hydraulic barrier, treatment to drinking water standards, reinjection into the subsurface, re-pumping to the surface at nearby production wells, treatment to drinking water standards, and direct domestic use, the groundwater would be handled multiple times to accomplish the same outcome as direct domestic use of water produced by production wells. That approach would not be a cost effective solution as required by the NCP. Further, changes in groundwater flow pattern in response to changes in groundwater production well pumping would create significant challenges to the success of a hydraulic barrier located in the vicinity of production wells.

23. ***RI/FS Section 3.2.5, p. 32*: LADWP excludes in situ treatment from consideration based on the depth and distribution of 1,4-dioxane and hydrogeology of the North Hollywood West well field. Recent investigations in wells between the Hewitt Site and the North Hollywood West well field show a limited vertical distribution of the mass of 1,4-dioxane. If this continues to be observed with the new wells CalMat is installing, an in situ barrier in the A Zone and top of the B Zone, where most of the contaminant mass resides, could be developed in front of the North Hollywood West well field to degrade COCs to less than 10 times the NL or MCL. Then LADWP could blend for any residual mass that entered the production wells.**

LADWP RESPONSE:

In situ treatment action is unlikely to be effective in treating 1,4-dioxane given the depth and distribution of 1,4-dioxane, and the hydrogeology of the NHW Well Field area. 1,4-dioxane is detected in groundwater at depths exceeding 200 feet below groundwater surface and is distributed in a plume that is greater than 1,000 feet wide in an urban environmental setting, presenting certain challenges to the implementability of an in situ treatment action. Further, the physical and chemical properties and behavior of 1,4-dioxane in groundwater creates challenges for its capture and treatment in an in situ treatment action. 1,4-dioxane is miscible in water, which renders it highly mobile; also, it has been shown not to readily biodegrade in the environment. It is weakly retarded by sorption to aquifer materials and may migrate rapidly in groundwater, ahead of other contaminants (EPA 2014). Given the proximity of the 1,4-dioxane plume relative to the NHW Well Field and the groundwater flow pattern across the general area as a result of pumping, the 1,4-dioxane contaminant plume would continue to be drawn toward and captured by production wells. Changes in groundwater flow pattern in response to changes in groundwater production well pumping would create significant challenges to the success of an in situ barrier.

In contrast, ex situ treatment is highly reliable and provides the greater certainty that the 1,4-dioxane will be captured and treated, and that the beneficial use of the pumped water would be restored and RAOs met.

24. ***RI/FS Section 4, p. 34-36*: The descriptions of Alternative 1 and Alternative 2 are not realistic, and ultimately, they are ostensibly the same alternative. If no remediation occurred, one would assume LADWP would proceed as it has for the last four years with respect to 1,4-dioxane, and for many years before that due to TCE, PCE, and nitrate. The operational program seems to have included well shutdown if contaminants approach 10 times the NL, blending, and the use of MWD water to supplement if needed. As discussed in other areas of these comments, the current operational program along with on-site treatment at the Hewitt Site may be sufficient for 1,4-dioxane remediation and should be evaluated as an alternative.**

LADWP RESPONSE:

EPA guidance (EPA 1988a) requires that Alternative 1 (a No Action alternative) be considered and compared to the action alternatives. For Alternative 2, LADWP would implement institutional actions including engineering and administrative controls to mitigate direct exposure pathways to protect human health in compliance with ARARs and TBCs. Institutional actions would include blending, alternate pumping plans, alternate water supply, monitoring, and groundwater use restrictions as defined in RI/FS Report. Alternative 2 is implementable from a technical and institutional standpoint; however, the water the City imports is a decreasingly reliable source due to increasing uncertainties in seasonal availability, environmental conditions, and political influences (LADWP 2015a). In addition, DDW has indicated that LADWP will not be able to rely on blending in the future, particularly for synthetic or emerging contaminants such as 1,4-dioxane, which would further limit the options for this alternative. The long-term implementability of this alternative thus faces greater risks. Potential risks to human health and the environment would remain. The alternative would not reduce the toxicity, mobility, or volume of contaminated groundwater.

25. ***RI/FS Section 4.1.3, Groundwater Production Wells, p. 37-38*: It appears that LADWP based its determination of remediation wells versus secondary wells solely on the groundwater modeling, which AMEC states is unreliable in this area of the NHOU. For example, can LADWP explain why NH-43A has consistently exhibited the highest concentration of 1,4-dioxane, even with pumping from the "remediation" wells occurring over the last several years, contrary to what the LADWP modeling has predicted? It is unclear why LADWP would consider that a secondary well, since it would appear to be most effective at mass removal. On the other hand, NH-45 is generally in the range of 1-2 µg/L and seems to**

decrease over time as it is used for production (decreasing to non-detect levels during pumping in 2016). It is unclear why LADWP would consider it a primary remediation well. LADWP should explain this rationale and why the modeling does not appear to match the observed trends in concentrations.

LADWP RESPONSE:

In this comment, the reviewer suggests that the groundwater model which LADWP used for flow and transport simulations is unreliable in the area for which it was used in the RI/FS.

Like all models, the AMEC model has some uncertainties. While parameter non-uniqueness and lack of sensitivity of certain parameters are acknowledged, as per AMEC (2015), "despite these uncertainties, the model is a reasonable representation of the SFB groundwater flow system (i.e., groundwater flow direction and gradients) and the resultant hydraulic conductivity distribution spans the estimates derived for the site in prior and recent studies and available in the literature. The overall water balance is realistic and provides a reasonable estimate of aquifer responses to stresses (e.g., pumping and spreading ground recharge)." In addition, the polygon labeled "NHOU investigation area" in RI/FS Figure 1-1 corresponds to the area identified as "San Fernando Valley (Area 1) Superfund Site" in AMEC (2015; Figure 1-1 therein). This area is not the same as the North Hollywood OU Study Area that was the focus of the AMEC (2015) groundwater model update and recalibration. The AMEC (2015) North Hollywood OU study area encompassed the Hewitt Pit as well as the remediation and Secondary wells of the NHW Well field (e.g., Figure 3-2 in AMEC 2015). Figure 2-1 in AMEC (2015) illustrates that grid refinement encompassed these NHW wells and the Hewitt Pit. In AMEC (2015), it is stated that "these data were…extrapolated to portions of the model domain beyond the NHOU study area". Therefore, the area of the NHW Well field in the AMEC (2015) model was not extrapolated from the regional model.

It is also noted that CalMat presented numerical groundwater simulation results using a similar version of the AMEC model as part of their IRAP (Golder 2016a) and Site Assessment (CSM/HHRA) Report (Golder 2016b). In relation to the model's replication of observed hydraulic head and flow patterns in the vicinity of Hewitt Site, CalMat's IRAP Appendix A (Golder 2016a), states *"[d]espite these limitations, it can still be used as a tool for evaluating pumping scenarios and to guide the selection of pilot test pumping and reinjection locations".* Furthermore, in Appendix T, Section 3.2 of CalMat's Site Assessment (CSM/HHRA) Report (Golder 2016b), it is noted that after their updates to the AMEC 2IR model (including lateral grid refinement, pumping and spreading rates, A-Zone/B-Zone contact elevation and the addition of more groundwater level calibration data), "*the global model calibration statistics were essentially the same between the 2IR model and the May 2016 HHRA model. Further, the models were similar in terms of their local-scale groundwater elevations and flow directions*".

In addition, LADWP has reviewed recent groundwater level data measured in the vicinity of Hewitt Site and NHW Well Field from the EPA database and compared this to the simulated groundwater levels from the calibrated AMEC model. Figure 1 presents the simulated hydraulic head distribution in the A-Zone within the NHW transport model domain at the end of the calibration period (this simulated head distribution was used for initial conditions in the forecast model which starts October 1, 2015). Figure 1 of this Detailed Responses to Comments document also presents the observed water level data from the EPA database using the following methodology and assumptions:

- water level data from the EPA database spans the period of +/- 6 months either side of October 1, 2015;
- at locations where multiple water levels were recorded in the stated time range the recorded water level closest in time to October 1, 2015 was used;
- database entries were omitted where there were notes concerning the existence of a pump in the well; and
- data at NHW Production Wells 3790C (NH-22) and 3790G (NH-34) are included, but there is uncertainty regarding potential impacts from pumping at these locations.

Figure 2 of this Detailed Responses to Comments document shows the hydraulic head residuals between simulated heads from the end of the calibrated AMEC model and the EPA groundwater level data (i.e., the difference between the observed and modelled data). As illustrated in Figure 2, groundwater model residuals throughout the NHW transport model domain are predominantly between -11 ft and 2.4 ft with the only exception being at 3790G (NH-34; +25 ft); as mentioned previously, there is uncertainty regarding potential impacts from pumping at this location. Model residuals in the Hewitt Site area are generally between -2.1 to -5.1 ft (simulated heads higher than observed). In the area between the NHW Well Field and the Hewitt Site, model residuals range from -0.2 to 2.4 ft.

Considering the information provided above, the model is sufficiently well calibrated to water level data in the North Hollywood OU study area (encompassing the Hewitt Site and the NHW Remediation and Secondary wells) to simulate interaction of this well field with existing mapped contaminants. Further evidence of AMEC (2015) model calibration to water level data is provided in their Tables 5-1 to 5-3, Figure 5-5 and Appendix G, with these calibration results not re-iterated in the RI/FS Appendix A Groundwater Modelling Summary. Thus, the AMEC model is considered to be reliable for the purposes it was used for in the RI/FS.

Further to this, the reviewer also suggests that LADWP relied only on groundwater modeling for categorization of production wells as remediation or secondary. However, significant historical data from production and monitoring wells underpins the fate and transport modeling upon which the categorizations were based. For example, the Plume Case, Sensitivity Plume Cases and source flux boundary condition implemented were generated on the basis of actual groundwater of 1,4-dioxane concentration data. LADWP will continue to review new data that are being collected and consider that information as part of the remedial design and remedial action phases of work.

With respect to the reviewer's comment that *"NH-43A has consistently exhibited the highest concentration of 1,4-dioxane, even with pumping from the "remediation" wells occurring over the last several years"*, this statement in inaccurate. Whilst NH-43A has had the highest recorded concentration of 1,4-dioxane in the NHW Well Field (35.2 µg/L in 2015), this detection occurred during a time period when the northen \`remediation wells\`were not pumping due to 1,4-dioxane exceedances and wells south of NH-43A were producing. The groundwater production at these southern wells (NH-22 and NH-26) likely pulled the plume southwards towards NH-43A.

For the date range analyzed for the RI/FS (January 2011 to May 2016), other wells have had higher maximum 1,4-dioxane concentrations during calendar year 2014 (NH-37 was 15.1 µg/L and NH-34 was 3.2 µg/L whereas NH-43A was 1.2 µg/L) and during calendar year 2016 (NH-37 was 16.1 µg/L whereas NH-43A was 12.3 µg/L). It is also noted that between November 2015 and January 2016, NH-

43A was inactive and showed a decreasing trend in observed 1,4-dioxane concentrations (from 35.2 µg/L in November 2015 to 12.3 µg/L in January 2016) whereas well NH-37 to the north, which was pumping during this period, showed an increasing trend in observed 1,4-dioxane concentrations (from <0.5 µg/L in November 2015 to a maximum of 9.3 µg/L in January 2016). Well NH-37 is closer to the source and plume core relative to NH-43A, therefore, the noted decreasing trend in NH-43A is in response to active pumping at nearby wells which capture more of the 1,4-dioxane plume. This response of production wells to pumping in other adjacent production wells is replicated in the fate and transport forecast modeling results. As these trends show, concentrations can fluctuate significantly within months in response to the pumping at any individual well at NHW; therefore, historical concentration variation was not the major criterion for selecting a primary Remediation well. Rather, wells located close to the potential source and the mapped plume were selected based on fate and transport simulation results to maximize containment and removal of contaminant through the combined cone of depression of the selected wells.

Further to this, one of the reasons for the highest historical observed concentration in NH-43A is the shorter screen interval. The screen interval of NH-43A is approximately 285 ft. Screen intervals of other wells located north of NH-43A are longer, i.e. screen interval of NH-44 is approximately 440 ft, NH-45 is approximately 440 ft, NH-36 is approximately 465 ft, NH-34 is approximately 518 ft and NH-37 is approximately 680 ft. The bottom of these wells screen is therefore significantly lower than NH-43A and cleaner water derived from the Deep Unit will dilute overall well concentrations. Therefore, NH-43A concentration was high due to relatively low dilution in this well.

26. ***RI/FS Section 4.1.3, p. 38, ¶ 3*: If the simulated concentration is between 2 and 4 µg/L at the start of pumping, and then a maximum of 8 µg/L (understanding some wells will be above 10 times the NL at times early in system startup), what is the justification for this Proposed Project? LADWP's projections do not even effectively incorporate the impact of on-site containment and treatment at the Hewitt Site, future remediation between the Hewitt Site and the North Hollywood West well field, or future remediation at the North Hollywood East well field, which will significantly reduce these numbers. Would a concentration at 2-4 µg/L or even 8 µg/L be detected after blending? Is there not already water entering the blending point in that range of concentrations?**

LADWP RESPONSE:

The combined 1,4-dioxane concentration from the Remediation wells is simulated to be between 2 to 4 µg/L for the first two years of remediation. This concentration range is the combined concentration of 1,4-dioxane from the three Remediation wells. The 1,4-dioxane concentration from some of the individual Remediation wells is expected to be significantly higher. For example, the maximum concentration in Remediation well NH-37 is projected from transport modelling to be approximately 25 µg/L, that is, 25 times the NL of 1 µg/L. The combined 1,4-dioxane concentration from the Remediation wells is simulated to increase to a maximum of approximately 8 µg/L after two years of Remediation well pumping. Pumping of Secondary wells is proposed to commence after two years of Remediation well pumping at 10,287 AFY and would continue each year from then onward.

The delay in Secondary well pumping relative to Remediation well pumping is intended to allow time for the NHW Remediation wells to initiate capture of the up-gradient contaminant plume that is anticipated to migrate towards the NHW Well Field, with the intent of reducing contaminant migration toward Secondary (and Preferred) wells. This pumping plan has the potential to reduce the size of the groundwater treatment facility as groundwater fate and transport modeling indicates the Secondary wells should not contain 1,4-dioxane concentration exceeding the NL after two years of Remediation well pumping. The combined 1,4-dioxane concentration from the Remediation wells is simulated to decrease through time, and is expected to decrease below the NL of 1 μg/L after 13 years of remediation.

Previous 1,4-dioxane concentrations in production wells has prevented blending, and DDW has indicated that LADWP will not be able to rely on blending in the future, particularly for synthetic or emerging contaminants such as 1,4-dioxane.

The reviewer suggests the LADWP's analysis does not account for source control. Source control was evaluated and included in the possible scenarios evaluated in RI/FS Appendix A, including remediation at the Hewitt Site and the CCC of the North Hollywood OU 2IR. It is important to note that there are no remedial action plans or remedial designs for source control or downgradient plume control remedies in the vicinity of the NHW IRA approved by the State. Proposed or hypothetical actions by third parties were considered in the Interim RI/FS; as described in Appendix A Section A4.3, (with transport results for these scenarios summarized in Appendix A Section A4.4). However, the level of uncertainty in the execution of these actions required LADWP to consider the implications for the beneficial use at the NHW Well Field, should the third party remedies not proceed, not proceed in a timely manner, or not be effective. Additional detail regarding the impact of third party source or plume control on the NHW IRA was provided to CalMat in February 2017 in a document titled "Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD).The Proposed Plan will protect human health and the environment by reducing the potential for exposure to 1,4-dioxane in groundwater at concentrations exceeding its NL of 1 μg/L; limit the migration of 1,4-dioxane in groundwater in the vicinity of the NHW Well Field at concentrations that prevent the beneficial use of the SFB; remove 1,4-dioxane from groundwater in the vicinity of the NHW Well Field to maintain the beneficial uses of the SFB and restore the aquifer to the extent practicable; and restore LADWP's capability to operate its existing NHW Well Field consistent with historic and planned use of the NHW Well Field in a flexible manner.

27. <u>RI/FS Section 5.4, p. 47-51</u>: LADWP should provide definitions for the terms "poor", "fair" and "good," since it is difficult to determine how and if they are being consistently applied to the evaluation of alternatives.

<u>LADWP RESPONSE:</u>

In this section of the RI/FS, the relative performance of each alternative is evaluated in relation to the two threshold and five primary balancing criteria. The comparative analysis identifies the advantages and disadvantages of each alternative to assist LADWP in choosing a preferred remedial alternative. The alternatives are evaluated and assigned qualitative ratings of poor, fair, and good. These qualitative ratings are used by EPA in feasibility studies as synonymous with the terms low, moderate, and high.

28. ***<u>RI/FS Figures 1-2 and 1-3</u>: These maps are missing a number of monitoring wells. These well locations are available through Geotracker and the USEPA database for use.***

<u>LADWP RESPONSE:</u>

In this comment, the reviewer suggests some known monitoring wells are not presented in Figure 1-2 (the RI/FS does not contain a Figure 1-3, contrary to the reviewer's comment).

The reviewer is correct that not all known monitoring wells in the extent of Figure 1-2 are shown. The rationale for this is that, although 144 monitoring wells were identified within the NHW Well Field capture zone, as described in the data summary provided in the Baseline HHRA p. 6-7, queries were carried out to select monitoring wells for assessment based on various criteria including date of samples (only samples taken between January 2011 and August 2016 were assessed).

The resultant datasets based on the queries listed in the Baseline HHRA p. 6-7 and used to conduct statistical analysis, comprised 70 monitoring wells (as well as 14 production wells) which were selected for assessment.

It should also be noted that due to the scale of the map presented in Figure 1-2, some well locations overlap; where this occurs a number is provided in brackets on Figure 1-2 indicating the number of monitoring well at the relevant location.

29. ***<u>RI/FS Figure 1-2</u>: It appears in the ten-year North Hollywood West well field capture zone that the majority of the wells in the southern Rinaldi-Toluca well field are not projected as pumping.***

    Please confirm if that is correct. It also appears that on the 30-year North Hollywood West well field capture zone, the capture zone extends nearly to the Burbank Airport. This does not seem plausible if the Rinaldi-Toluca well field is pumping. Please explain how the capture zones will look at the 10-year and 30-year time frames with the Rinaldi-Toluca well field actively pumping. This is critical to understanding how these capture zones will respond in the evaluation of alternatives.

<u>LADWP RESPONSE:</u>

The 10-year capture zone presented in RI/FS Figure 1-2 includes pumping of six Rinaldi-Toluca production wells; the two most southern wells are active, the next seven wells to the north are inactive as a result of the current and expected continued contamination. The 30-year capture zone presented in RI/FS Figure 1-2 includes pumping of all 15 Rinaldi-Toluca production wells.

The 30-year Rinaldi-Toluca Well Field capture zone, which has pumping from all Rinaldi-Toluca production wells, includes the area immediately north of the 30-year NHW Well Field capture zone and extends further towards Burbank Airport.

For the 10-year capture zone, if more Rinaldi-Toluca production wells were pumping it is likely that the NHW Well Field 10-year capture zone would not extend as far to the north-east (in the direction of the Rinaldi-Toluca Well Field). The difference between the 10-year and 30-year NHW Well Field capture zones provides an analogous representation of the effects of greater pumping at the Rinaldi-Toluca production wells on the NHW Well Field capture zone.

It is acknowledged that understanding the relationship of pumping at NHW Well Field relative to the Rinaldi-Toluca Well Field is important to evaluating the capture of the 1,4-dioxane in the vicinity of Hewitt Site and NHW Well Field. Using the proposed NHW Remediation wells to initiate capture of the up-gradient 1,4-dioxane plume that is anticipated to migrate towards the NHW Well Field is intended to reduce 1,4-dioxane migration toward other NHW production wells and the Rinaldi-Toluca production wells and to prevent further migration down-gradient of the NHW Well Field.

30. <u>RI/FS Figure 1-3</u>: It appears from the figure that for the selected alternative, both the 10-year and 30-year capture zones primarily capture water west of the 1,4-dioxane plume, with the 30-year capture zone addressing very little of the 1,4-dioxane plume. Please confirm these capture zones are correct.

<u>LADWP RESPONSE:</u>

Contrary to the reviewers comment, the RI/FS does not contain a Figure 1-3.

The comment may be referring to RI/FS Figure 1-2 or Figure 4-1; if so, these capture zones are correct and represent the 10-year and 30-year capture zones of the entire NHW Well Field for the simulated forecast pumping conditions. These capture zones encompass the majority of the 1,4-dioxane plume and the source zone at the Hewitt Site. Some of the water west of the 1,4-dioxane plume at the extent of the 10-year and 30-year capture zone pass through the Hewitt Site simulated source area and/or the off-site 1,4-dioxane plume prior to capture by the NHW production wells.

Furthermore, the capture zones include Secondary and Preferred production wells, which are not selected for treatment as part of the Proposed Plan (the definition of these well categories is provided in the RI/FS, p. 37-38).

<u>31. RI/FS APPENDIX A – GROUNDWATER MODELING SUMMARY</u>:

31. a. The basis of the groundwater capture calculations is a numerical model that has not been shown to effectively simulate observed groundwater conditions near the Hewitt Site or within the North Hollywood well field for October 2015 conditions. Since this is the "starting point" for all future calculations of groundwater withdrawals, capture, and contaminant concentrations the model's ability to provide representative remedial alternatives is also uncertain.

<u>LADWP RESPONSE:</u>

In this comment, the reviewer suggests that the groundwater model which LADWP used for flow and transport simulations is not shown to replicate recent observed groundwater elevations in the area for which it was used in the RI/FS. LADWP does not agree with this comment.

While parameter non-uniqueness and lack of sensitivity of certain parameters are acknowledged, as per AMEC (2015), “despite these uncertainties, the model is a reasonable representation of the SFB groundwater flow system (i.e., groundwater flow direction and gradients) and the resultant hydraulic conductivity distribution spans the estimates derived for the site in prior and recent studies and available in the literature. The overall water balance is realistic and provides a reasonable estimate of aquifer responses to stresses (e.g., pumping and spreading ground recharge).” In addition, the polygon labeled “NHOU investigation area” in RI/FS Figure 1-1 corresponds to the area identified as “San Fernando Valley (Area 1) Superfund Site” in AMEC (2015; Figure 1-1 therein). This area is not the same as the North Hollywood OU Study Area that was the focus of the AMEC (2015) groundwater model update and recalibration. The AMEC (2015) North Hollywood OU Study Area that was the focus of model update and recalibration encompassed the Hewitt Pit as well as the Remediation and Secondary wells of the NHW Well field (e.g., Figure 3-2 in AMEC 2015). Figure 2-1 in AMEC (2015) illustrates that grid refinement encompassed these NHW wells and the Hewitt Pit. In AMEC (2015), it is stated that “these data were…extrapolated to portions of the model domain beyond the NHOU study area”. Therefore the area of the NHW Well field in the AMEC (2015) model was not extrapolated from the regional model.

It is also noted that CalMat presented numerical groundwater simulation results using a similar version of the AMEC model as part of their IRAP (Golder 2016a) and Site Assessment (CSM/HHRA) Report (Golder 2016b). In relation to the model’s replication of observed hydraulic head and flow patterns in the vicinity of Hewitt Site, CalMat’s Appendix A (Golder 2016b), states *“[d]espite these limitations, it can still be used as a tool for evaluating pumping scenarios and to guide the selection of pilot test pumping and reinjection locations”.* Furthermore, in Appendix T, Section 3.2 of CalMat’s Site Assessment (CSM/HHRA) Report (Golder 2016b), it is noted that after their updates to the AMEC 2IR model (including lateral grid refinement, pumping and spreading rates, A-Zone/B-Zone contact elevation and the addition of more groundwater level calibration data), “*the global model calibration statistics were essentially the same between the 2IR model and the May 2016 HHRA model. Further, the models were similar in terms of their local-scale groundwater elevations and flow directions*”.

In addition, LADWP has reviewed recent groundwater level data measured in the vicinity of Hewitt Site and NHW Well Field from the EPA database and compared this to the simulated groundwater levels from the calibrated AMEC model. Figure 1 of this Detailed Responses to Comments document presents the simulated hydraulic head distribution in the A-Zone within the NHW transport model domain at the end of the calibration period (this simulated head distribution was used for initial conditions in the forecast model which starts October 1, 2015). Figure 1 also presents the observed water level data from the EPA database using the following methodology and assumptions:

- water level data from the EPA database spans the period of +/- 6 months either side of October 1, 2015;

- at locations where multiple water levels were recorded in the stated time range the recorded water level closest in time to October 1, 2015 was used;
- database entries were omitted where there were notes concerning the existence of a pump in the well; and
- data at NHW production Wells 3790C (NH-22) and 3790G (NH-34) are included, but there is uncertainty regarding potential impacts from pumping at these locations.

Figure 2 of this Detailed Responses to Comments document shows the hydraulic head residuals between simulated heads from the end of the calibrated AMEC model and the EPA groundwater level data (i.e., the difference between the observed and modelled data). As illustrated in Figure 2, groundwater model residuals throughout the NHW transport model domain are predominantly between -11 ft and 2.4 ft with the only exception being at 3790G (NH-34; +25 ft); as mentioned previously, there is uncertainty regarding potential impacts from pumping at this location. Model residuals in the Hewitt Site area are generally between -2.1 to -5.1 ft (simulated heads higher than observed). In the area between the NHW Well Field and the Hewitt Site, model residuals range from -0.2 to 2.4 ft.

Considering the information provided above, the model is sufficiently well calibrated to water level data in the North Hollywood OU study area (encompassing the Hewitt Site and the NHW Remediation and Secondary wells) to simulate interaction of this well field with existing mapped contaminants. Further evidence of AMEC (2015) model calibration to water level data is provided in their Tables 5-1 to 5-3, Figure 5-5 and Appendix G, with these calibration results not re-iterated in the RI/FS Appendix A Groundwater Modelling Summary. Thus, the AMEC model is considered to be reliable for the purposes it was used for in the RI/FS.

31. b. The model version noted in Appendix A (2IR_2015-2045_CCC-Option1_v10.gwv) is inconsistent with the final AMEC document cited. Version10 of the model does not represent the modifications made prior to finalizing the Groundwater Modeling Memorandum. The version10 model used for these analyses by LADWP contains known and documented errors including erroneous locations for North Hollywood West wells (Figure 1).

LADWP RESPONSE:

Comment noted. The model version citation was incorrect. The third sentence of RI/FS Appendix A p. 2, paragraph 1 should state "The model version used was named ~~*2IR_2015-2045_CCC-Option1_v10.gwv*~~ *2015SFV_1981-2014_Cal_v11.gwv*".

31. c. Starting particles for simulations of pumping and plume capture exclude pertinent data in the vicinity of the North Hollywood West well field that CalMat presented to LADWP over the past several years. For example, LADWP is still using 2014 plume maps with limited inclusion of recent data in its evaluation of the extent of 1,4-dioxane. LADWP is also using maximum values rather than average values or the most recent data, which is resulting in significant overestimations of 1,4-dioxane mass downgradient from the

Hewitt Site. LADWP also mixes data sets instead of using current comprehensive snap shots of plume dimensions (see Sections 1.9.5-1.9.6).

LADWP RESPONSE:

In this comment, the reviewer suggests that groundwater simulations only rely upon EPA plume maps (which incorporate data up to 2014) and do not incorporate recent observed concentration data.

However, RI/FS Appendix A p. 11 indicates particle tracking analysis (which uses EPA plume maps) was used to perform *initial qualitative* categorization of wells. Subsequent fate and transport modeling which was used for *detailed quantitative* assessment, along with professional judgement (RI/FS Appendix A, p. 15) does incorporate significant historical data from production and monitoring wells as explained in RI/FS Section A4.1. The *initial qualitative* categorization (based on particle tracking) was revised based on the detailed transport modeling simulations and analyses.

It is recognized in RI/FS Appendix A p. 14-15 that evaluation of particle tracking assumes transport via advection only, with no attenuation, retardation or degradation mechanisms being represented in the simulation and that may result in overestimation of concentrations captured by production wells. As a result, particle tracking analysis was used to perform initial qualitative testing of 1,4-dioxane plume capture for various remedial alternative concepts for the RI/FS with subsequent fate and transport modeling being used for more detailed quantitative assessment. This allowed for more efficient qualitative testing of various remedial alternative concepts (and associated pumping plan refinement) from the outset (RI/FS Appendix Section A3), with subsequent detailed quantitative evaluation and forecasting being carried out on the relevant selected remedial alternative concept, incorporating simulation of solute transport (advection, dispersion) attenuation and retardation processes (as discussed in RI/FS Appendix Section A4).

With reference to data included in the plume definition for fate and transport modeling, for the RI/FS, data in the vicinity of the NHW Well Field was used to the extent that this data was available to LADWP for plume definition as part of fate and transport simulations. In particular, LADWP did utilize data related to the Hewitt Site for groundwater modeling analyses, including samples taken between January 2011 and May 2016 (as stated in RI/FS Appendix A p. 30). This data includes data relating to Hewitt Site and sample analyses records from other monitoring locations as follows (date shown indicates the most recent sample available at the time of RI/FS preparation):

- Hewitt Site monitoring wells MW-3, MW-4, 4899 and 4909FR up to and including Q2 2014;
- Hewitt Site monitoring wells MW-1 up to and including Q4 2015;
- Hewitt Site monitoring wells MW-2, MW-6, MW-7, MW-9 up to and including Q4 2015;
- Hewitt Site monitoring wells for MW-5 and MW-8S up to and including Q1 2016;
- Three clustered monitoring wells at sampling location NH-MW-06 up to and including Q4 2015;
- Three clustered monitoring wells at sampling location NH-MW-11 up to and including Q4 2015;
- Two paired monitoring wells at sampling location NH-MW-05 up to and including Q4 2015;
- Two paired monitoring wells at sampling location RT-MW-06 up to and including Q4 2015;
- Monitoring well NH-VPB-06 up to and including Q3 2015; and
- LADWP production wells up to and including Q2 2016.

In addition, as described in RI/FS Appendix A p. 30-31, LADWP evaluated data from monitoring wells screened in the A-Zone and B-Zone (from analyses carried out between January 2011 and May 2016) as part of the plume definition generated for the RI/FS. Furthermore, as described in RI/FS Appendix A p. 32, LADWP assessed the vertical distribution of 1,4-dioxane at locations where monitoring wells were completed in both the A-Zone and B-Zone, and this analysis included data from Hewitt Site monitoring wells, focusing on monitoring well pairs within the Hewitt Site and two locations east of NHW Well Field, with the associated data spanning Q4 2015 to Q1 2016. Based on the observed vertical concentration distribution, the interpreted initial plume distribution in the upper half of B-Zone was inferred to be 10% of A-Zone concentration and the lower half of B-Zone was inferred to be 1% of A-Zone. RI/FS Appendix A p. 40 also indicates that the IRAP for Hewitt Site (Golder 2016a) and the Site Assessment (CSM/HHRA) Report for Hewitt Site (Golder 2016b) were also reviewed by LADWP during preparation of the RI/FS. CalMat's CSM/HHRA report (Section 6.4.2.1 Golder 2016b) mentioned that in the B-Zone wells, the concentrations of 1,4-dioxane are about one to two orders of magnitude lower than in the A-Zone wells, as observed at the following shallow-deep well pairs:

- EW-1S and EW-1D (210 and 4 μg/L);
- MW-5 and MW-5D (30 and 4.8 μg/L); and
- MW-8S and MW-8D (52 and 0.54 μg/L).

It is also noted that during preparation of the RI/FS, nine CalMat-installed wells located between the NHW Well Field and the Hewitt Site were not found in any of the groundwater monitoring reports available to LADWP (CalMat Groundwater Monitoring Report for 2015 and 2016, on GeoTracker). Four LADWP/EPA monitoring wells (NH-C09-310, NH-MW-06-280, NH-MW-06-580, and NH-MW-06-810) that were identified were included in the data set for plume analysis.

Furthermore, as explained in RI/FS Appendix A p. 40, LADWP evaluated the IRAP for Hewitt Site (Golder 2016a) and the Site Assessment (CSM/HHRA) Report for Hewitt Site (Golder 2016b). These reports were also reviewed by LADWP during preparation of the RI/FS and information contained therein was used as part of the development of the simulated source flux boundary condition implemented for groundwater modeling simulations.

In addition, LADWP has reviewed recent monitoring well data for the Hewitt Site obtained from GeoTracker (collected since the publication of the RI/FS).These new data include sample analyses from Q3 2016 through Q2 2017. The new sampling data includes results from newly installed monitoring wells that were first sampled Q1 2017. LADWP has evaluated this information and is considering it in the context of this remedial decision. Review of this recent data is presented in Appendix E of the IRAD. This includes a summary of the data collected since the publication of the RI/FS for 1,4-dioxane, and a comparison to the interpolated concentrations at each location for the Plume Case (presented in RI/FS Appendix A) and each Sensitivity Plume Case presented in the 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review.

Review of the new data indicates that many monitoring wells and lysimeters do not show a distinct decreasing trend in recent observed concentrations. Moreover a number of monitoring wells and lysimeters show a recent increase and/or significant fluctuation in observed 1,4-dioxane concentrations based on recent sampling events, including monitoring wells MW-25A, MW-25B, MW-26A, MW-5, MW-8S, and lysimeters LW-10 and LW-13S. Review of monitoring data as part of the RI/FS, and more recent data presented in Appendix E of the IRAD, indicates that measured concentration fluctuations of one order of magnitude are not unusual within or near the Hewitt Site (e.g., MW-2, MW-5, MW-8S, MW-15).

This variability is also highlighted in the different interpretations of contoured concentrations at Hewitt Site presented in CalMat's CSM/HHRA report (Golder 2016b) and 2017 Q1 Quarterly report (Golder 2017). Comparison of CSM/HHRA report Figures 6-7A and 6-7B (Golder 2016b) and 2017 Q1 Quarterly Report Figures 10 and 11 (Golder 2017) indicates significant differences in the presented isoconcentration contours, with the latter indicating a larger 100 µg/L contour in B-Zone than in A-Zone relative to the former which shows only 2 µg/L and 3 µg/L contours in the B-Zone. It is also noted that concentrations monitoring wells MW-25A and MW-25B, as presented in the Q1 2017 WDR Monitoring Report (Calmat 2017), are higher than the data presented in the CalMat 2017 Q1 Quarterly report (Golder 2017).

- For MW-25A, the 2017 Q1 Quarterly report presents a concentration of 190 µg/L (Figure 10) which, based on Geotracker records, was observed in a sample taken on January 3, 2017. CalMat's Q1 2017 WDR Monitoring Report (Calmat 2017) presents another sample from Q1 2017 (taken on February 7, 2017) showing an observed concentration of 750 µg/L in this monitoring well.
- For MW-25B, the 2017 Q1 Quarterly report presents a concentration of 190 µg/L (Figure 11) which, based on Geotracker records, was observed in a sample taken on January 3, 2017. CalMat's Q1 2017 WDR Monitoring Report (Calmat 2017) presents another sample from Q1 2017 (taken on February 7, 2017) showed an observed of 250 µg/L in this monitoring well.

CalMat acknowledges recent increases in 1,4-dioxane concentrations in some monitoring wells in their recent Q1 2017 WDR Monitoring Report (Calmat 2017), stating "*[i]t is unclear whether this increase is related to natural (wet season) or anthropogenic (well field pumping) basin dynamics, further development of the newly installed wells giving a more representative sample, or the pilot testing. As noted in the current conceptual site model (CSM) swings in concentrations attributed to pumping by the Los Angeles Department of Water and Power (LADWP) and other natural basin dynamics, create difficulty in evaluating trends in wells, especially in wells with limited historical data such as the three noted above."* (p. 3). It is worthwhile to note that the recent increases indicate that these higher concentrations are present in the groundwater system and are not artifacts of any of the above processes.

It is due to the aforementioned variability in observed concentrations within individual monitoring locations, coupled with variability in observed 1,4-dioxane trends across the Hewitt Site monitoring data, that an approach was taken to adopt conservatism as a base scenario for the RI/FS (as stated in RI/FS Appendix A p. 49, the plume definition is intended to provide a conservative yet realistic estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field). The approach of using maximum concentration values (between January 2011 and May 2016) rather than average values or the most recent data as a base scenario (Plume Case) provides a conservative yet realistic estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field. To address the uncertainty in this approach, sensitivity analyses were carried out to evaluate the effects of the RI/FS

Plume Case definition and source flux boundary condition assumptions on transport modeling simulation results. The sensitivity analyses performed as part of the RI/FS transport modeling consider recent (up to Q2 2016) observed concentrations in monitoring wells in the A-Zone, and recent (up to Q2 2016) production well concentrations, as well as the effects of having no Hewitt Site source flux boundary condition assigned in the model. These sensitivity analyses were presented in 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review).

The more recent (Q3 2016 to Q2 2017) monitoring data presented in Appendix E of the IRAD supports the conservative yet realistic approach adopted for RI/FS Plume Case definition and source flux boundary condition assumptions, while the sensitivity analysis provided, which includes the most recent data available at the time of production of the RI/FS, addresses the effect of the conservatism adopted. Although the timeframe required for treatment varies across the RI/FS base case and sensitivity case transport simulations, the results of the sensitivity analyses (Appendix C of the IRAD, provided to CalMat in February 2017 for review, including implementation of source control, plume control, and Second Interim Remedy) and the review of the more recent (Q3 2016 to Q2 2017) monitoring data (Appendix E of the IRAD) do not alter the need for the response action, the conclusion that treatment is forecasted to be necessary at the three NHW production wells included in the Proposed Plan and subsequently the soundness of the alternative proposed in the Proposed Plan.

31. d. LADWP has dismissed numerical simulations of additional remedial activities in the basin, including Second Interim Remedy alternatives 4b and CCC at the North Hollywood East well field, and on-site plume containment at the Hewitt Site, even though incorporating these activities would indicate a much smaller treatment plant and a shorter remediation period (if any). Ignoring remedial activities that are currently under Regional Board and EPA orders, and completing calculations that project conditions for 30 years in the future, grossly overestimate the mass of 1,4-dioxane that will be treated at the proposed water treatment facility.

LADWP RESPONSE:

Source control was evaluated and included in the possible scenarios evaluated, including remediation at the Hewitt Site and the CCC North Hollywood OU 2IR. It is important to note that there are no remedial action plans or remedial designs for source control or downgradient plume control remedies in the vicinity of the NHW IRA approved by the State. Proposed or hypothetical actions by third parties were considered in the RI/FS (as described in Appendix A Section A4.3, with transport results for these scenario summarized in Appendix A Section A4.4). However, the level of uncertainty that these actions will proceed required LADWP to consider the implications for groundwater production at the NHW Well Field, should the third party remedies not proceed, not proceed in a timely manner, or not be effective.

Additional detail regarding the transport model simulation results for scenarios including the remediation at the Hewitt Site and the CCC North Hollywood OU 2IR was provided to CalMat in February 2017 in a document titled 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well

Field' (Appendix C of the IRAD). These results were summarized in Appendix A Section A4.4. Appendix C of the IRAD (previously provided to CalMat in February 2017) also presented results from a sensitivity analysis carried as part of the RI/FS evaluating the impact of source assumptions on the remedy with and without a source flux boundary condition and with varying source flux parameterizations. This analysis concludes that the treatment remedy is necessary even with source control to remediate the plume and restore the beneficial use of the basin.

Hydraulic control with new shallow wells and treatment was also considered in the RI/FS but was screened out for several reasons. The reasons included ineffectiveness of capturing the portion of the 1,4-dioxane plumes between shallow extraction wells and the NHW production wells, in which case treatment at production wells is still needed, and the effectiveness of shallow extraction wells which may not be able to overcome the hydraulic influence of nearby production well pumping. Further, this approach would require a longer time to implement for studying, obtaining permits, constructing conveyance and recharge systems, and designing and constructing treatment. Again, fate and transport modeling of this option showed that treatment would still be necessary even with source control and new shallow extraction wells located between Hewitt Site and the NHW Well Field, albeit with a reduced timeframe required for treatment (depending on if and when the wells are installed). A summary of this analysis is provided in a document titled 'Additional Scenario Simulation for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix D of the IRAD). LADWP will continue to monitor progress on other actions and make adjustments to the response action as appropriate.

In relation to simulated future release mechanisms and condition at the Hewitt Site being simulated for 30 years, CalMat's CSM/HHRA report (Section 8.2, Golder 2016b) mentioned that preliminary calculations for travel times in the unsaturated zone indicated that it would take the wetting front from the base of the waste from 5 to 20 years to reach the water table depending on conditions. The CalMat CSM/HHRA report also indicates that the current crushed base rock/asphalt cap will reduce the introduction of moisture thereby decreasing the driving gradient for transport through the vadose zone starting sometime in the mid-1980s. Thirty years have passed since mid-1980s and the 1,4-dioxane concentration in monitoring wells (at the time of production of the RI/FS) were still as high as 240 µg/L in MW-15 (Q2 2016). Furthermore, review of more recent monitoring well data obtained from GeoTracker (collected since the publication of the RI/FS; presented in Appendix E of the IRAD), indicates that monitoring well concentrations in the vicinity of Hewitt Site were recently as high as 250 µg/L in MW-25B (Q1 2017), 470 µg/L in MW-26A (Q1 2017) and 750 µg/L in MW-25A (Q1 2017). Assuming travel time of the wetting front from the base of the waste to the water table being 5 to 20 years based on CalMat's presented calculations, most of the contamination in the vadose zone should have reached groundwater since the mid-1980s. If rock/asphalt cap reduces recharge significantly, monitoring wells should show significantly lower concentrations in recent monitoring events because most of contaminant should have reached the water table and leachate infiltration should be limited with reduced recharge. However, many monitoring wells and lysimeters do not show a distinct decreasing trend in recent observed concentrations, whereas some monitoring wells and lysimeters show a recent increase in observed 1,4-dioxane concentrations based on recent sampling events from 2016 and 2017 (including monitoring wells MW-25A, MW-25B, MW-26A, MW-5, MW-8S, and lysimeters LW-10 and LW-13S; Appendix E of the IRAD). Thus, this CalMat data actually supports the inferred constant release of contaminant is reasonable for conservative simulations.

31. e. LADWP's simulations inactivate wells with estimated concentrations above the 1 µg/L DDW notification level for 1,4-dioxane. The methodology for estimating the concentrations at each well is flawed. Particles were assigned a "concentration value" based on a starting location, but there is no indication that concentrations of the particles were adjusted to reflect mixing along the flow path, or flux-dependent concentrations at production wells. LADWP's operational records show that LADWP will continue to utilize water supply from wells with concentrations at and above the NL, as long as demonstrated concentrations at blending points meet water quality criteria for drinking water. LADWP's permit states that a well will be removed from service when the effluent reaches a concentration ten times its maximum NL (Section 1.8, p. 10); however, model simulations inactivated the wells at the NL. The resulting simulations underestimate the water available to LADWP, and falsely increase the apparent need for water treatment. Table 1-2 indicates that the majority of North Hollywood West production wells have rarely exceeded DDW's 10-times-NL threshold.

LADWP RESPONSE:

With respect to the first part of the question regarding the methodology for estimating the concentrations at each well with particles, RI/FS Appendix A p. 11 indicates particle tracking analysis was used to perform *initial qualitative* categorization of wells. Subsequent fate and transport modeling being used for *detailed quantitative* assessment, along with professional judgement (RI/FS Appendix A, p. 15). The *initial qualitative* categorization was revised based on the detailed transport modeling simulations and analyses. The detailed flow and transport simulation results consider *"mixing along the flow path and flux-dependent concentrations in the productions wells"* in the final determination of concentrations at production wells presented in the RI/FS.

With response to the second part of the question regarding historic well operations and blending, the synthetic chemical 1,4-dioxane cannot be managed by LADWP through its existing Permit and Blending Plan and is therefore the focus of the RI/FS. (RI/FS, Section 1.8, third paragraph). Previous 1,4-dioxane concentrations in production wells have prevented blending, and DDW has indicated that LADWP will not be able to rely on blending in the future, particularly for synthetic or emerging contaminants such as 1,4-dioxane.

It is noted that, while some of the western NHW production wells have not had detected concentrations of 1,4-dioxane, there have been 81 exceedances of the NL for 1,4-dioxane in NHW production wells between the period January 2011 and August 2016.

31. f. Particle-based approaches to capture zone delineation should consider screen penetration into each modeling layer, and the need to vertically refine the model accordingly, to avoid inaccurate averaging of pathlines used for these calculations.

LADWP RESPONSE:

Particle tracking analysis to develop capture zones did allow for consideration of screen penetration by releasing particles across multiple model layers, to account for the multi-layer penetration of the NHW production wells. Thus particle traces originating in different model layers were assessed as part of capture zone development.

Further to this, RI/FS Appendix A p. 11 indicates that particle tracking analysis was used to perform *initial qualitative* categorization of wells (as described in RI/FS Appendix A Section A3.2). Subsequent fate and transport modeling being used for *detailed quantitative* assessment, along with professional judgement (RI/FS Appendix A, p. 15). The *initial qualitative* categorization was revised based on the detailed transport modeling simulations and analyses. Fate and transport modelling incorporated vertical and lateral model grid refinement and well screen penetration into each modeling layer in the *detailed quantitative* assessment.

31. g. The approach described by LADWP in Section A3.2 for selection of remediation wells does not adequately consider the effectiveness of the wells in capturing the 1,4-dioxane plume. In addition, it also assumes a continuous source of 1,4-dioxane far afield from the known source locations that does not reflect recent data. These two factors, along with the plan to use production wells as remediation wells, leads to poor and inefficient capture of the plume. To demonstrate this, the probability of capture for the selected remediation wells (NH-34, NH-37, and NH-45) was computed for simulation years 3, 5 and 10 for both the A-zone (Figures 2, 3 and 4) and the B-zone (Figures 5, 6 and 7) using the regional model files LADWP supplied to CalMat. In many instances, the likelihood of capture of known areas of 1,4-dioxane contamination are very small, and the majority of water captured is from areas with other known contaminants (TCE, PCE, Cr, etc.). For example, see Figures 3 and 6 for well NH-37. There is little to no capture for areas known to have significant concentrations of 1,4-dioxane. NH-45 shows similar poor results for capture of 1,4-dioxane (Figures 4 and 7). Well NH-34 is the only well that appears to provide capture in the area of interest. Because two of three wells will not result in limited capture of 1,4-dioxane impacted water, the treatment facility is grossly over-sized for this purpose.

LADWP RESPONSE:

RI/FS Appendix A p. 11 indicates that particle tracking analysis was used to perform *initial qualitative* categorization of wells (as described in RI/FS Appendix A Section A3.2). Subsequent fate and transport modeling being used for *detailed quantitative* assessment, along with professional judgement (RI/FS Appendix A, p. 15). The *initial qualitative* categorization was revised based on the detailed transport modeling simulations and analyses. The detailed flow and transport simulation results consider *"mixing along the flow path and flux-dependent concentrations in the productions wells"* in the final determination of concentrations at production wells presented in the RI/FS.

In addition, the transport simulations do consider know source locations (the Hewitt Site); as discussed in RI/FS Appendix A p.40, flux boundary conditions with prescribed concentrations were assigned over the local topographic lows of the base of the Hewitt Site where leachate sources are assumed to have accumulated (based on information presented in the IRAP for Hewitt Site [Golder 2016a] and the Site Assessment [CSM/HHRA] Report for Hewitt Site [Golder 2016b]). Appendix C of the IRAD (provided to CalMat in February 2017) also presented results from a sensitivity analysis carried as part of the RI/FS evaluating the impact of source assumptions on the remedy with and without a source flux boundary condition and with varying source flux parameterizations. This analysis concludes that the treatment remedy is necessary even with source control to remediate the plume and restore the beneficial use of the basin.

Contrary to the statement in the comment, the present probability of capture plots do show capture of higher concentration areas of the Plume Case 1,4-dioxane distribution. Further to this, the chosen presentation format in which probability of particle capture in the unrefined regional model is presented for selected Remediation wells *individually* is misleading. Capture of the 1,4-dioxane plume was refined through *combined* operation of the Remediation wells using the refined local scale flow and transport model. Therefore a *combined* (cumulative) capture zone for these wells should be analyzed. Of course well NH-34 being located furthest north of the Remediation wells will have a capture zone that overlaps greatest with the 1,4-dioxane plume and the capture zones of remaining wells will align to the south of the NH-34 capture zone.

31. h The contribution of water from each zone in the aquifer was also evaluated using the regional model files provided by LADWP. Laboratory data indicates that the vast majority of the 1,4- dioxane mass resides near the top of the water table, predominately in the A-zone. However, when the model is run for the proposed remediation wells, it shows that more than 60% of the total well inflow for wells NH-34 and NH-45 comes from the C-zone aquifer (Figure 8). Only about 10% of the water is pulled from the A-zone for each well. For well NH-37, the results show that almost 80% of the water comes from the C and D zones of the aquifer. Using these production wells as remediation wells leads to inflated costs for pumping of water, and a grossly oversized treatment facility, since most of the water (approximately 90%) is not impacted with 1,4-dioxane.

<u>LADWP RESPONSE:</u>

Observed concentrations of 1,4-dioxane across the A-Zone and B-Zone were considered in the RI/FS groundwater modeling, with dilution of the 1,4-dioxane plume over the screened interval of production wells being accounted for in the plume definition for fate and transport modeling. NHW production well data has shown that 1,4-dioxane is already present at the screened intervals above the NL, which is projected to continue as the plume moves toward the well field. Dilution of the 1,4-dioxane plume over the screened interval of production wells has not sufficiently decreased the concentration to levels acceptable for drinking water. For example, the noted decreasing trend in 1,4-dioxane concentrations in production well NH-45 during Q1 and Q2 2016 is accompanied by an overall increasing trend during the same period for NH-34 and NH-37 (which were also pumping). Wells NH-34 and NH-37 are closer to the source and plume core relative to NH-45, therefore the noted decreasing trend in NH-45 is in response to active pumping at nearby wells which capture more of the 1,4-dioxane plume. This response of production wells to pumping in other adjacent production wells is replicated in the fate and transport forecast modeling results. Fate and transport modeling was applied to various pumping scenarios, including the concept of treating only three wells as dedicated Remediation wells that run throughout the year, to minimize the number of wells that require treatment by focusing the plume.

Production well data water quality collected during well field pumping was used in fate and transport modeling, combined with monitoring well data from depth-discreet levels. Concentrations in the individual wells may have varied in the past due to pumping patterns of production wells to meet water supply needs. The Proposed Plan will be effective at capturing and treated the 1,4-dioxane plume over a wide range of concentrations.

The Proposed Plan will be effective over a wide range of concentrations, will protect human health and the environment by reducing the potential for exposure to 1,4-dioxane in groundwater at concentrations exceeding its NL of 1 µg/L; limit the migration of 1,4-dioxane in groundwater in the vicinity of the NHW Well Field at concentrations that prevent the beneficial use of the SFB; remove 1,4-dioxane from groundwater in the vicinity of the NHW Well Field to maintain the beneficial uses of the SFB and restore the aquifer to the extent practicable; and restore LADWP's capability to operate its existing NHW Well Field consistent with historic and planned use of the NHW Well Field in a flexible manner.

31. i. This particle-based modeling approach resulted in significantly over-estimating the quantity of supplemental water required for purchase from MWD for the Alternative Scenario 2. The likelihood of particle capture by the North Hollywood West well field will be directly influenced by remedial activities at the Hewitt Site, the area between the Hewitt Site and the North Hollywood West well field, and the North Hollywood East well field. Neglecting these remedial activities when assessing capture may significantly overestimate the duration of particle capture by North Hollywood West wells. Note that both the 5- and 10-year capture zones are within the areas that are subject to Regional Board and USEPA orders.

<u>LADWP RESPONSE:</u>

Source control was evaluated and included in the possible scenarios evaluated, including remediation at the Hewitt Site and the CCC of the North Hollywood OU 2IRin the transport modelling results. It is important to note that there are no remedial action plans or remedial designs for source control or downgradient plume control remedies in the vicinity of the NHW IRA approved by the State. Proposed or hypothetical actions by third parties were considered in the RI/FS (as described in Appendix A Section A4.3, with transport results for these scenario summarized in Appendix A Section A4.4). However, the level of uncertainty in the execution of these actions required LADWP to consider the implications for groundwater production at the NHW Well Field, should the third party remedies not proceed, not proceed in a timely manner, or not be effective. For this reason, they were not included in the analyses of Alternative Scenario 2.

Additional detail regarding the transport model simulation results for scenarios including the remediation at the Hewitt Site and the CCC North Hollywood OU 2IR was provided to CalMat in February 2017 in a document titled 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD). These results were summarized in Appendix A Section A4.4. Appendix C of the IRAD (provided to CalMat in February 2017) also presented results from a sensitivity analysis carried as part of the RI/FS evaluating the impact of source assumptions on the remedy with and without a source flux boundary condition and with varying source flux parameterizations. This analysis concludes that the treatment remedy is necessary even with source control to remediate the plume and restore the beneficial use of the basin.

Using this analysis as a proxy for the overarching effect of remedial actions by third parties in the vicinity of NHW Well Field, simulation results indicate that the duration of treatment (or analogously the duration of water required for purchase from MWD for the Alternative Scenario 2) is not significantly reduced as a result of proposed or hypothetical remedial actions by third parties (as indicated by result summarized in RI/FS Table A4-5).

31. j. A uniform porosity value of 0.15 is inconsistent with knowledge of the heterogeneity observed in geophysical logs collected throughout the basin. The coarser-grained unconsolidated sediments in the North Hollywood West well field area are specifically discussed in Section 1.66 (p. 7) of the RI/FS.

LADWP RESPONSE:

It is acknowledged and agreed that considerable variations in porosity are to be expected in the basin. However, simplifying assumptions regarding porosity do not affect assessments regarding remedial system effectiveness. They may affect assessments regarding the duration (period) over which remediation may be needed.

31. k. The RI/FS provides insufficient detail regarding the addition of layers to the model for transport model simulations. No information is included to document hydraulic parameters assigned to these newly-created layers; nor are there any results presented to demonstrate that the water balance and overall performance of the model is acceptable for the intended use.

LADWP RESPONSE:

As per RI/FS Appendix A p. 36, for the local-scale transport model, each regional model layer was divided into five sub-layers and the grid size was refined to 50 ft by 50 ft. Hydraulic parameters for the subdivided layers (five layers for each original layer in regional model) are identical as those for the original layer in the regional model.

With regard to the comment relating to water balance and overall performance, as stated in RI/FS Appendix A Section A4.2.1, to verify that the flow outcome obtained from the sub domain transport model matched with the calibrated regional flow model, time-series data for simulated hydraulic head at selected assessment locations across the sub-domain were compared (RI/FS Appendix A Figure A4 3). As stated in RI/FS Appendix A p. 36, results showed that the simulated heads for the transport model match the heads obtained from the regional model. In addition, a comparison of water balance between the transport model and the same sub-domain area of the regional model is provided in RI/FS Appendix A p. 39. The comparison of water balance between the transport model and the same sub-domain area of the regional model shows that imbalances for both models are negligible (less than 0.1%). The flux through constant head boundaries in the Refined 2IR Transport Model were also comparable to the areal flow crossing the edge of the same sub-domain in regional model. Most of the water balance components show a reasonable match between the two models (RI/FS Appendix A Table A4 4).

31. l. Based on the model files received from LADWP, the numerical flow model used for the sub- domain area models was MODFLOW-NWT. This flow code was then coupled with MT3DMS to compute solute concentrations. The selected numerical modeling codes used in this manner have been shown by others to erroneously balance mass when the water table is changing. Recent publications by the USGS document these errors and

provide a replacement transport code (MT3D-USGS) to use in conjunction with MODFLOW-NWT. In summary, flow simulations by LADWP in the sub-domain area models result in a significant water table decline and are therefore incompatible with the transport code used for the RI/FS analysis.

Analysis of a small test area located approximately 500 ft southeast from the modeled source indicates that significant mass is not being accounted for in the model. Mass balance discrepancies encountered at this test location include:

1. Extremely poor overall total mass balance: Mass balance error in total mass during 200 days of simulated time if projected out for the entire simulation period may result in thousands of percent of mass balance error in local areas by the end of the 30 years simulated.

2. Mass retained in dry cells: Concentrations were noted in dry cells immediately prior to rewetting of the cells. Projections based on the small test area suggest 50 kg of mass inflow from dry cells over the 30 simulated years across the projected plume may be possible.

3. Omission of mass at wet cells with low saturation: There is a potential for the modeling code to exclude hundreds of mg of mass flowing to or from wet cells of sufficiently low saturation from mass flux calculations. This may lead to tens of kilograms of unaccounted mass across the plume over the 30 years simulated.

Mass may also erroneously accumulate at wet cells that are adjacent to dry cells as evident by dramatic fluctuations in the chemographs (concentration plotted against time) for locations along the water table. This is a documented symptom of mass balance errors when using MT3DMS in combination with MODFLOW-NWT (Bedekar and Tonkin, 2011).[3] Because dry cells remain active in MODFLOW-NWT, a groundwater flow field is computed across dry cells. The transport model (MT3DMS) then uses this flow field without being instructed on the treatment of dry cells. Systems in which the water table fluctuates and crosses model layers, such as LADWP model, are particularly susceptible to these mass balance errors. Solutions are available for correctly representing and accounting for these mass flux differences (Bedekar et al., 2016) and need to be implemented for this simulation.[4]

[3] Bedekar, V., Tonkin, M., 2011. The Dry Cell Problem: Simulation of Solute Transport with MT3DMS, MODFLOW and More 2011, June 5-8, Golden, Colorado.

[4] Bedekar, Vivek, Morway, E.D., Langevin, C.D., and Tonkin, Matt, 2016. MT3D-USGS version 1: A U.S. Geological Survey release of MT3DMS updated with new and expanded transport capabilities for use with MODFLOW: U.S. Geological Survey Techniques and Methods 6-A53, 69 p., http://dx.doi.org/10.3133/tm6A53.

LADWP RESPONSE:

The commenter observes that the MT3DMS code has shortcomings when used in conjunction with MODFLOW-NWT. LADWP was aware of these issues and in the RI/FS addressed these shortcomings through the source specification as follows.

As illustrated in Bedekar et al. (2016), the use of MT3DMS in conjunction with MODFLOW-NWT may lead to an accumulation of mass in the unsaturated zone (Figure 5 in their report) in the case of a surficial contaminant source. When MT3D-USGS is used instead, the mass anomaly in the unsaturated zone disappears and instead more mass is allowed to enter the saturated zone (Figure 6 in their report). Hence the use of MT3DMS would lead to an underestimation of plume mass compared to MT3D-USGS unless manual corrections are applied in the specification of the contaminant source. In the case of the NHW RI/FS, an iterative approach was used to apply source flux concentrations in deeper layers as additional layers become unsaturated due to a lowering of the regional water table. This approach is readily apparent from the model files that were provided by LADWP and addresses the problem of mass accumulation in the unsaturated zone and underestimation of mass reaching the water table. Therefore, the comment regarding the significance of shortcomings of the MT3DMS code when used in conjunction with MODFLOW-NWT were mitigated via the approach taken during RI/FS fate and transport modeling, as outlined above.

In addition, detailed comments made by the reviewer regarding mass balance calculations for a small test area 500 ft from the modelled source are provided but no details or evidence is offered regarding the basis of these calculations; therefore, no further response can be provided.

31. m. LADWP provided documentation that the specified-head boundary conditions for the sub-domain model were consistent with the 2IR model. However, there is no evidence provided that the boundary conditions are consistent with the modified pumping rates applied to the sub-domain transport models.

LADWP RESPONSE:

No further changes to specified-head boundary conditions were made between the model used for particle tracking and the sub-domain transport model. For each sub-domain transport model simulation, a regional model simulation was carried out first using the modified pumping rates for the relevant Alternative Scenario. These simulation results were then used to develop the time-varying specified head boundary conditions applied to the sub-domain transport model simulation for the relevant Alternative Scenario. Therefore, the local scale model BCs are consistent with the regional model and any modified pumping rates and the results of the transport simulations are not changed by the comment regarding boundary condition assignments applied to the sub-domain transport models.

31. n. Poor transport model performance is suggested by simulated mass balance errors (approximately 1%) for the entire sub-domain model that are approximately equal to the initial mass used to describe the 1,4-dioxane plume. In other words, the potential calculation error within the transport model is approximately equal to the entire mass of initial 1,4-dioxane in the plume.

LADWP RESPONSE:

It is not clear how the value cited by the reviewer regarding mass balance error of "approximately 1%" was calculated or what it represents; no details or evidence is offered regarding the basis of these calculations.

Furthermore, the reviewer states "the potential calculation error within the transport model is approximately equal to the entire mass of initial 1,4-dioxane in the plume". This conclusion requires the simulated mass of 1,4-dioxane to be estimated. However, it is unclear how this conclusion was developed given reviewer comment 31.q.10. which suggests the simulated mass of 1,4-dioxane cannot be calculated due to insufficient information in the RI/FS in relation to thickness of contaminated zones: "[t]he initial mass of 1,4-dioxane in the model cannot be compared to previous estimates based on measured data because the RI/FS documentation is insufficient to determine the thickness of the assumed contaminated zone." These two conclusions result in a contradiction and no details or evidence is offered regarding the basis of these conclusions; therefore, no further response can be provided.

31. o. Locations considered by LADWP for possible Hewitt Site injection and extraction wells do not follow best practices for design of pump-and-treat systems. Consequently, interpretations on the effectiveness of these wells to limit mass release to the aquifer and subsequent 1,4- dioxane concentrations in North Hollywood West production wells are not based on sound technical approaches.

LADWP RESPONSE:

Hewitt Site injection and extraction wells are in the pilot-scale testing stage. A relatively simple pump-and-treat system was assumed in the RI/FS modelling due to limited available information on the planned full-scale source control system at Hewitt Site, and in particular, the absence of a remedial action plan or remedial design for Hewitt Site. The assumptions relating to simulated extraction and reinjection at Hewitt Site include:

- extraction in proximity to simulated source locations to remove the contaminant source;
- extraction at boundaries of Hewitt Site with the aim of preventing further off-site migration of contamination; and
- reinjection occurring in an up-gradient location of the site where no source is simulated to reduce the likelihood of uncontrolled spreading of contamination towards the Rinaldi-Toluca Well Field.

These assumptions were considered adequate for the objective of assessing the effects of other potential future remediation efforts by Third Parties on the NHW Well Field remedial alternatives. Uncertainties in simulated third party remediation are discussed in RI/FS Appendix A p. 49 in relation to scenarios incorporating North Hollywood OU CCC remediation and Hewitt Site source control which have assumed pumping rates. At the time of preparation of the RI/FS and this response, there is considerable uncertainty relating to future Third Party remediation plans in the vicinity of NHW Well Field, including pumping locations, rates and duration. To address the uncertainty in this approach, Appendix C of the IRAD (provided to Calmat in February 2017) presented results from a sensitivity analysis carried as part of the RI/FS evaluating the impact of source assumptions on the remedy with and without a source flux boundary condition and with varying source flux parameterizations. This analysis concludes that the treatment remedy at NHW is necessary even with source control to remediate the plume and restore the beneficial use of the basin.

It is noted that the simulated source control at Hewitt Site implemented in the relevant RI/FS scenarios, utilized groundwater extraction and reinjection rates of approximately 1,900 AFY (RI/FS Appendix A p. 41). This is approximately 1,177 gallons per minute (gpm), which is significantly greater than the following:

- The rates applied for simulations of pilot-scale testing reported in CalMat's IRAP (Golder 2016a).
  - The IRAP report indicates modelled groundwater extraction rates at 50 gpm for a system with three extraction wells and 25 gpm for a system with two extraction wells.
- The actual flow rates of pilot-scale testing at site.
  - CalMat's Q1 2017 WDR Monitoring Report (Calmat 2017) states were "[t]he flow rate through the system during 1Q17 started at 10 gpm through March 13, 2017, and then was increased to 15 gpm through the end of 1Q17." The pilot system consists of one pumping well , EW-2.

31. p. Some groundwater concentrations reported for the A Zone are based on leachate lysimeters representing locally-perched water. The highest groundwater concentrations observed at the Hewitt Site are 590 µg/L, not 850 µg/L reported in Appendix A page 40. Leachate should not be misused as an equivalent groundwater concentration.

<u>LADWP RESPONSE:</u>

The reviewer is correct; the value of 850 µg/L was derived from a reported lysimeter sample result. The final sentence of RI/FS Appendix A p. 40, paragraph 2 should state "The prescribed concentration in the constant flux source was set at the maximum observed ~~monitoring well~~ <u>lysimeter</u> concentration (in this area) of 850 µg/L."

However, the context of use for this value as set out in the cited page (RI/FS Appendix A p.40) is not for generating assumed groundwater concentrations but for generation of the assumed prescribed concentration for the constant flux boundary for which the use of lysimeter data is appropriate. As stated in RI/FS Appendix A p.40, the prescribed concentration in the constant flux source for the simulations presented in the RI/FS was set at 850 µg/L. This clarification does not alter the relevant assumption for the assigned constant flux source and therefore does not affect the model simulation results in any way.

It is also noted that review of more recent monitoring data obtained from GeoTracker (collected since the publication of the RI/FS; presented in **Appendix E of the IRAD**), indicates that the maximum observed groundwater monitoring well concentration in the vicinity of Hewitt Site is 750 µg/L in MW-25A (Q1 2017) along the southern edge of the Hewitt Pit property at a screened interval of 262.5 to 302.0 ft bgs. The maximum observed 1,4-dioxane concentration from a lysimeter is 1,400 µg/L at LW-14.

31. q. The contaminant distribution throughout the North Hollywood West well field and Hewitt Site was created based on numerous unproven assumptions and older data. Some of these errors include:

31. q. 1. That the highest-ever observed concentration at each monitoring well and production well occur simultaneously throughout the San Fernando basin (i.e., worst-case historical results presented as a snap shot of current conditions). This is in direct contrast to well- documented monitoring data that clearly indicate the transient nature of the plume concentrations and significantly lower concentration values south of Sherman Way than shown.

LADWP RESPONSE:

Maximum concentration values (between January 2011 and May 2016) rather than average values or the most recent data were utilized as a base scenario (Plume Case) with intention to generate a conservative estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field. It is due to the *"transient nature of the plume concentrations"* as stated in the comment that an approach was taken to adopt conservatism as a base scenario. Review of monitoring well data as part of the RI/FS Study Area and evaluation of more recent monitoring well and lysimeter data obtained from GeoTracker (collected since the publication of the RI/FS; presented in Appendix E of the IRAD), it is apparent that many monitoring wells do not show a distinct decreasing trend in recent observed concentrations. Moreover a number of monitoring wells and lysimeters show a recent increase and/or significant fluctuation in observed 1,4-dioxane concentrations based on recent sampling events, including monitoring wells MW-25A, MW-25B, MW-26A, MW-5, MW-8S, and lysimeters LW-10 and LW-13S. To address the sensitivity of transport modeling results to the Plume Case definition assumptions, sensitivity analyses were also performed as part of the RI/FS transport modeling to consider recent observed concentrations in monitoring wells in the A-Zone, and recent production well concentrations; the sensitivity analysis results are presented in 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review.

In addition, CalMat's CSM/HHRA report (Section 8.2, Golder 2016) mentioned that preliminary calculations for travel times in the unsaturated zone indicated that it would take the wetting front from the base of the waste from 5 to 20 years to reach the water table depending on conditions. The CalMat CSM/HHRA report also indicates that the current crushed base rock/asphalt cap will reduce the introduction of moisture thereby decreasing the driving gradient for transport through the vadose zone starting sometime in the mid-1980s. Thirty years have passed since the mid-1980s and the 1,4-dioxane concentration in monitoring wells (at the time of production of the RI/FS) were still as high as 240 μg/L in MW-15 (Q2 2016). Furthermore, review of more recent monitoring well data obtained from GeoTracker (collected since the publication of the RI/FS; presented in Appendix E of the IRAD), indicates that monitoring well concentrations in the vicinity of Hewitt Site were recently as high as 250 μg/L in MW-25B (Q1 2017), 470 μg/L in MW-26A (Q1 2017) and 750 μg/L in MW-25A (Q1 2017). Assuming travel time of the wetting front from the base of the waste to the water table being 5 to 20 years based on Calmat's calculation, most of the contamination in the vadose zone should have reached groundwater since the mid-1980s. If rock/asphalt cap reduces recharge significantly, monitoring wells should show significantly lower concentrations in recent monitoring events because most of contaminant should have reached the water table and leachate infiltration should be limited with reduced recharge. However, many monitoring wells do not show a distinct decreasing trend in recent observed concentrations, whereas some monitoring wells and lysimeters show a recent increase in observed 1,4-dioxane concentrations based on recent sampling events from 2016 and 2017 (including monitoring wells MW-25A, MW-25B, MW-26A, MW-5, MW-8S, and lysimeters LW-10 and LW-13S; **Appendix E of the IRAD**).

31. q. 2. The extent of 1,4-dioxane concentrations greater than 400 µg/L is inconsistent with observed groundwater monitoring data.

LADWP RESPONSE:

The Plume Case was generated based on maximum observed concentrations between January 2011 and May 2016. Two monitoring wells showed maximum observed concentration higher than 400 µg/L in this time period. For the RI/FS plume definition data date range (January 2011 to May 2016; RI/FS Appendix A p. 30), the maximum observed concentration at MW-2 was 440 µg/L in July 2013 and at MW-4 was 590 µg/L in July 2013 (Historical Summary of Groundwater Monitoring Results for Emerging Contaminants in Q4 2015 HP Monitoring Report). The observed concentration of 240 µg/L (June 2015) of MW-5 located about 280 ft south of MW-2 was also utilized as part of the interpretation of the 400 µg/L contour line for the base scenario Plume Case.

Further to this, review of more recent monitoring well data obtained from GeoTracker (collected since the publication of the RI/FS; presented in Appendix E of the IRAD), indicates that monitoring well concentrations along the south boundary of Hewitt Site in 2017 Q1 were as high as 750 µg/L in MW-25A (Q1 2017) in the A-Zone and 250 µg/L in MW-25B in the B-Zone. Along the northern edge, the 2017 Q1 1,4-dioxane concentration data at MW-26A was 470 µg/L.

To address the sensitivity of transport modeling results to the Plume Case definition assumptions, sensitivity analyses were also performed as part of the RI/FS transport modeling to consider recent observed concentrations in monitoring wells in the A-Zone, and recent production well concentrations; the sensitivity analysis results are presented in 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review.

31. q. 3. Production well water quality data reflect a steady-state hydraulic and contaminant distribution such that concentrations reflect hydraulic conductivity-weighted contributions from the entire well screen. Monitoring field sheets LADWP provided to CalMat indicate that some wells are purged for relatively short time periods prior to sampling after long periods of being inactive. As a result, these monitoring data are not reliable indicators of production-scale concentrations. Prior to making these assumptions, LADWP should collect confirmatory data, including vertical flow logs and vertical profiles of 1,4-dioxane concentrations; demonstrate relative contributions of existing well screens; and provide evidence of a steady-state capture zone.

LADWP RESPONSE:

For the RI/FS plume definition data date range (January 2011 to May 2016; RI/FS Appendix A p. 30), the maximum concentration of 1,4-dioxane at production wells NH-26, NH-34, NH-37, and NH-45 were observed during periods of sustained pumping within these wells. In addition, production well data water quality collected during well field pumping was used in fate and transport modeling, combined with monitoring well data from depth-discreet levels. Concentrations in the individual wells may have varied in the past due to pumping patterns of production wells to meet water supply needs.

31. q. 4. The basis for a continuous flux boundary condition with a prescribed concentration at the Hewitt Site is unsupported by transport simulations. Simulations should be provided that demonstrate source-release assumptions that are consistent with observed groundwater concentrations throughout the North Hollywood West capture zone and well field.

LADWP RESPONSE:

In the transport model simulation, simulated dilution will occur in groundwater surrounding the flux boundary condition and simulated concentrations in groundwater decreases significantly. For example, in RI/FS Appendix A Figure A4-6, simulated concentration snapshots for later years (year 15 and 20) when concentration are mainly derived from the source (not from initial concentration), simulated concentrations in groundwater are less than approximately 300 µg/L. In addition, simulated concentrations presented in the RI/FS provided reasonable ranges comparable to observed values. In the Hewitt Site area, simulated concentrations can be as high as 580 µg/L in early times (concentration snapshot at year 5 in RI/FS Appendix A Figure A4-6) which are comparable to the maximum observed concentrations at the Hewitt Site included concentrations of 220 µg/L (in MW-5), 440 µg/L (in MW-2) and 590 µg/L (in MW-4). Further to this, review of more recent monitoring well data obtained from GeoTracker (collected since the publication of the RI/FS; presented in Appendix E of the IRAD), indicates that monitoring well concentrations in the vicinity of Hewitt Site were as high as 250 µg/L in MW-25B (Q1 2017), 470 µg/L in MW-26A (Q1 2017) and 750 µg/L in MW-25A (Q1 2017).

The simulated concentrations therefore reasonably match with observed data. Hence, the results of the transport simulations are not changed by the comment regarding continuous flux boundary condition.

Furthermore, the sensitivity of transport modeling results to the source flux boundary condition assumptions was evaluated via sensitivity analyses performed as part of the RI/FS transport modeling; the sensitivity analysis results are presented in 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review.

31. q. 5. The assumption of a continuous high-concentration flux of 1,4-dioxane to groundwater for 30 years is not realistic given CalMat's published IRAP and compliance with Regional Board ordered work.

LADWP RESPONSE:

The source term is intended to provide a conservative yet realistic estimate of release of contaminant. As discussed in of RI/FS Appendix A Section A5, source conditions in the vicinity of Hewitt Site are not well known.

Total estimated mass of 1,4-dioxane at Hewitt Site was 679 kg and large portion (more than 60 %) distributed in landfill unsaturated waste (Site Assessment [CSM/HHRA] Report for Hewitt Site [Golder 2016b]). The report also mentioned that this initial estimate to be order of magnitude because of the limited data set. Considering slow mechanism of infiltration through unsaturated zone and uncertainty in estimated mass, a release time period of 30 years can be considered a conservative yet realistic estimate.

In terms of future release mechanisms and concentrations at the Hewitt Site, CalMat's CSM/HHRA report (Section 8.2, Golder 2016b) mentioned that preliminary calculations for travel times in the unsaturated zone indicate that it would take the wetting front from the base of the waste from 5 to 20 years to reach the water table depending on conditions. The CalMat CSM/HHRA report also indicates that the current crushed base rock/asphalt cap will reduce the introduction of moisture thereby decreasing the driving gradient for transport through the vadose zone starting sometime in the mid-1980s. Thirty years have passed since mid-1980s and the concentration of monitoring well (at the time of production of the RI/FS) were still as high as 240 µg/L in MW-15 (Q2 2016). Further to this, review of more recent monitoring well data obtained from GeoTracker (collected since the publication of the RI/FS; presented in Appendix E of the IRAD), indicates that monitoring well concentrations in the vicinity of Hewitt Site were as high as 250 µg/L in MW-25B (Q1 2017), 470 µg/L in MW-26A (Q1 2017) and 750 µg/L in MW-25A (Q1 2017). Assuming travel time of the wetting front from the base of the waste to the water table being 5 to 20 years based on CalMat's presented calculations, most of the contamination in the vadose zone should have reached groundwater since mid-1980s. If rock/asphalt cap reduces recharge significantly, monitoring wells should show significantly lower concentrations in recent monitoring events because most of contaminant should have reached the water table and leachate infiltration should be limited with reduced recharge. However, many monitoring wells do not show a distinct decreasing trend in recent observed concentrations, whereas some monitoring wells and lysimeters show a recent increase and in observed 1,4-dioxane concentrations based on recent sampling events from 2016 and 2017 (including monitoring wells MW-25A, MW-25B, MW-26A, MW-5, MW-8S, and lysimeters LW-10 and LW-13S; Appendix E of the IRAD). Thus, this CalMat data actually supports the inferred constant release of contaminant is reasonable for conservative simulations.

Furthermore, the sensitivity of transport modeling results to the source flux boundary condition assumptions was evaluated via sensitivity analyses performed as part of the RI/FS transport modeling. This included a simulation with no source flux boundary condition assigned in the model, and another with the continuous source flux values reduced by a factor of 2. These sensitivity analysis results are presented in 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review.

31. q. 6. While we agree that B Zone concentrations of 1,4-dioxane are significantly lower than A Zone concentrations, we disagree with the assumptions and methodology for modeling the B Zone. Distributing an equal concentration of 1,4-dioxane over an unknown thickness of the B Zone is impossible to evaluate and compare to measured data. The mass shown greatly overestimates the likely mass contained in the B Zone.

LADWP RESPONSE:

The methodology used for generating plume for the B-Zone is based on the ratio of concentration between A-Zone and B-Zone due to limited number of wells in B-Zone. This ratio is a relative number which is not related to thickness of the aquifer.

In addition, as described in RI/FS Appendix A p. 30-31, LADWP evaluated data from monitoring wells screened in the A-Zone and B-Zone (from analyses carried out between January 2011 and May 2016) as part of the plume definition generated for the RI/FS. Furthermore, as described in RI/FS Appendix A p. 32, LADWP assessed the vertical distribution of 1,4-dioxane at locations where monitoring wells were completed in both the A-Zone and B-Zone, and this analysis included data from Hewitt Site monitoring wells, focusing on monitoring well pairs within the Hewitt Site and two locations east of NHW Well Field, with the associated data spanning Q4 2015 to Q1 2016. Based on the observed vertical concentration distribution, the interpreted initial plume distribution in the upper half of B-Zone was inferred to be 10% of A-Zone concentration and the lower half of B-Zone was inferred to be 1% of A-Zone. RI/FS Appendix A p. 40 also indicates that the IRAP for Hewitt Site (Golder 2016a) and the Site Assessment (CSM/HHRA) Report for Hewitt Site (Golder 2016b) were also reviewed by LADWP during preparation of the RI/FS. CalMat's CSM/HHRA report (Section 6.4.2.1, Golder 2016b) mentioned that in the B-Zone wells, the concentrations of 1,4-dioxane are about one to two orders of magnitude lower than in the A-Zone wells, as observed at the following shallow-deep well pairs:

- EW-1S and EW-1D (210 and 4 µg/L);
- MW-5 and MW-5D (30 and 4.8 µg/L); and
- MW-8S and MW-8D (52 and 0.54 µg/L).

31. q. 7. Focusing all of the Hewitt Site recharge into two topographic low areas reflecting the base of mining activities may result in unrealistic local recharge without supporting evidence.

LADWP RESPONSE:

As shown in RI/FS Appendix A Figure A4-6, simulated continuous recharge into two topographic low areas in the Hewitt Site does not generate an unrealistic head build-up in the area where the continuous flux boundary condition was simulated.

Also, as discussed in RI/FS Appendix A p.40, flux boundary conditions with prescribed concentrations were assigned over the local topographic lows of the base of the Hewitt Site where leachate sources are assumed to have accumulated (based on information presented in the IRAP for Hewitt Site [Golder 2016a] and the Site Assessment [CSM/HHRA] Report for Hewitt Site [Golder 2016b]). The topography of the base of the former landfill indicates drainage along this surface towards the two areas used to represent the simulated flux boundary condition (also based information presented in the on IRAP for Hewitt Site [Golder 2016a] and the Site Assessment [CSM/HHRA] Report for Hewitt Site [Golder 2016b]). The sensitivity to the specified flux was evaluated in 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review. Treatment is still required when the source flux was simulated to be 50% lower than the Alternative 3-1 in the RI/FS.

31. q. 8. LADWP should provide model results showing simulated groundwater elevations and contaminant distributions compared to measured values.

LADWP RESPONSE:

Modeled results of simulated groundwater elevations and contaminant distributions were presented in RI/FS Appendix A Figure A4-6. However, these results cannot be compared with measured values because the local transport model is for future forecast not for history matching.

31. q. 9. Concentration isopleths (100-200, 50-100, and 10-50 µg/L) shown in Figure A4-1 grossly overestimate the concentration of 1,4-dioxane south of Sherman Way and directly disagree with measured concentrations in monitoring wells.

LADWP RESPONSE:

Concentration isopleths in RI/FS Appendix A Figure 4A-1 represent plume generated based on maximum observed concentration at wells screened in the A-Zone.

Maximum concentration values between January 2011 and May 2016 rather than average values or the most recent data were utilized as a base scenario (Plume Case) with intention to generate a conservative estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field. It is due to the *"transient nature of the plume concentrations"* that an approach was taken to adopt conservatism as a base scenario. Review of monitoring well data as part of the RI/FS Study Area and evaluation of more recent monitoring well and lysimeter data obtained from GeoTracker (collected since the publication of the RI/FS; presented in Appendix E of the IRAD), it is apparent that many monitoring wells do not show a distinct decreasing trend in recent observed concentrations. Moreover a number of monitoring wells and lysimeters show a recent increase and/or significant fluctuation in observed 1,4-dioxane concentrations based on recent sampling events, including monitoring wells MW-25A, MW-25B, MW-26A, MW-5, MW-8S, and lysimeters LW-10 and LW-13S.

To address the sensitivity of transport modeling results to the Plume Case definition assumptions, sensitivity analyses were also performed as part of the RI/FS transport modeling to consider recent observed concentrations in monitoring wells in the A-Zone, and recent production well concentrations; the sensitivity analysis results are presented in 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review.

31. q. 10. The initial mass of 1,4-dioxane in the model cannot be compared to previous estimates based on measured data because the RI/FS documentation is insufficient to determine the thickness of the assumed contaminated zone.

LADWP RESPONSE:

The initial Plume Case described in RI/FS was generated based on maximum concentration values rather than average values or the most recent data with intention to generate a conservative estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field. However, the cited "previous estimates" of mass were based observed concentration in Q1 2016 (CalMat CSM/HHRA; Golder 2016b). Therefore, it is acknowledged that the mass the simulated Plume Case presented in the RI/FS could be higher than the mass estimated in CSM/HHRA (2016).

This variability is also highlighted in the different interpretations of contoured concentrations at Hewitt Site presented in CalMat's CSM/HHRA report (Golder 2016b) and their 2017 Q1 Quarterly report (Golder 2017). Comparison of CSM/HHRA report Figures 6-7A and 6-7B (Golder 2016b) and 2017 Q1 Quarterly Report Figures 10 and 11 (Golder 2017) indicates significant differences in the presented isoconcentration contours, with the latter indicating a larger 100 µg/L contour in B-Zone than in A-Zone relative to the former which shows only 2 µg/L and 3 µg/L contours in the B-Zone. It is also noted that concentrations monitoring wells MW-25A and MW-25B, as presented in the Q1 2017 WDR Monitoring Report (Calmat 2017), are higher than the data presented in the CalMat 2017 Q1 Quarterly report (Golder 2017).

- For MW-25A, the 2017 Q1 Quarterly report presents a concentration of 190 µg/L (Figure 10) which, based on Geotracker records, was observed in a sample taken on January 3, 2017. CalMat's Q1 2017 WDR Monitoring Report (Calmat 2017) presents another sample from Q1 2017 (taken on February 7, 2017) showing an observed concentration of 750 µg/L in this monitoring well.
- For MW-25B, the 2017 Q1 Quarterly report presents a concentration of 190 µg/L (Figure 11) which, based on Geotracker records, was observed in a sample taken on January 3, 2017. CalMat's Q1 2017 WDR Monitoring Report (Calmat 2017) presents another sample from Q1 2017 (taken on February 7, 2017) showed an observed of 250 µg/L in this monitoring well.

The sensitivity of transport modeling results to the Plume Case definition assumptions were assessed as part of the RI/FS transport modeling to consider recent observed concentrations in monitoring wells in the A-Zone, and recent production well concentrations. The related sensitivity analysis results are presented in 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review.

The transport model files provided by LADWP during the public comment period contain the simulated initial plume definition and the area and layer thickness of the model cells to which the initial plume was applied is readily apparent from these files.

31. q. 11. Specified concentration units in model input files are pounds per cubic foot which are in disagreement with provided documentation.

LADWP RESPONSE:

The unit names entered by the user are used in MT3DMS for indicative purposes only, and do not affect the model simulation results in any way. These units do not affect the simulated or presented results.

31. q. 12. The sub-area transport model source release functions result in greater than 40% increase in aquifer 1,4-dioxane mass during the first three years of the simulation. This is inconsistent with observed data.

LADWP RESPONSE:

A relatively large release of 1,4-dioxane mass can be added in the system with simulated Hewitt Site source boundary condition. This increase in mass in the aquifer needs to be considered with mass leaving the Hewitt Site footprint. Mass leaving Hewitt Site can be similar to mass released from the source. Mass leaving the Hewitt Site can be seen in the concentration distribution figures for A-Zone and B-Zone (Figure 6-7A and B in CSM/HHRA; Golder 2016b). In addition, as presented in the previous response, the 2017 Q1 Quarterly Report Figures 10 and 11 (Golder 2017) indicates significant larger presented isoconcentration contours, with larger 100 µg/L contour in B-Zone than in A-Zone relative to the CSM/HHRA (Golder 2016b) which shows only 2 µg/L and 3 µg/L contours in the B-Zone. It is also noted that concentrations monitoring wells MW-25A and MW-25B, as presented in the Q1 2017 WDR Monitoring Report (Calmat 2017), are higher than the data presented in the 2017 Q1 Quarterly report (Golder 2017).

31. q. 13. Hydraulic and transport parameters used in the model are based on a basin-scale calibration to heads and fluxes. Given the 50 foot x 50 foot grid implemented in the model, the simplified representation of properties has not been shown to adequately represent flow and transport processes at the model scale. Additionally, no parameter sensitivity or uncertainty analysis was completed, despite the AMEC (2015) report stating that the model parameters are non-unique and insensitive (i.e., not informed by data included in the regional model calibration). For a treatment system with a $100M cost, this does not reflect a reasonable standard of care to evaluate alternative numerical models and agreement of the model to measured data.

LADWP RESPONSE:

In this comment, the reviewer suggests insufficient care has been taken to verify the performance of the refined model, which LADWP used for transport simulations in the RI/FS.

As stated in RI/FS Appendix A Figure A4 3, in order to verify that the flow outcome obtained from the sub-domain transport model matched with the regional flow model, time-series data for simulated hydraulic head at selected assessment locations across the sub-domain were compared. As presented in RI/FS Appendix A p. 36, results showed that the simulated heads for the transport model match the heads obtained from the regional model. In addition, a comparison of water balance between the transport model and the same sub-domain area of the regional model is provided in RI/FS Appendix A p. 39. The comparison of water balance between the transport model and the same sub-domain area of the regional model shows that imbalances for both models are negligible (less than 0.1%). The flux through constant head boundaries in the Refined 2IR Transport Model were also comparable to the areal flow crossing the edge of the same sub-domain in regional model. Most of the water balance components show a reasonable match between the two models (RI/FS Appendix A Table A4 4). Thus, the RI/FS clearly shows that the refined sub domain model adequately replicates the calibrated regional model results.

Furthermore, while parameter non-uniqueness and lack of sensitivity of certain parameters are acknowledged, as per AMEC (2015), "despite these uncertainties, the model is a reasonable representation of the SFB groundwater flow system (i.e., groundwater flow direction and gradients) and the resultant hydraulic conductivity distribution spans the estimates derived for the site in prior and recent studies and available in the literature. The overall water balance is realistic and provides a reasonable estimate of aquifer responses to stresses (e.g., pumping and spreading ground recharge)."

In addition, LADWP has reviewed recent groundwater level data measured in the vicinity of Hewitt Site and NHW Well Field from the EPA database and compared this to the simulated groundwater levels from the calibrated AMEC model. Figure 1 presents the simulated hydraulic head distribution in the A-Zone within the NHW transport model domain at the end of the calibration period (this simulated head distribution was used for initial conditions in the forecast model which starts October 1, 2015). Figure 1 also presents the observed water level data from the EPA database using the following methodology and assumptions:

- water level data from the EPA database spans the period of +/- 6 months either side of October 1, 2015;
- at locations where multiple water levels were recorded in the stated time range the recorded water level closest in time to October 1, 2015 was used;
- database entries were omitted where there were notes concerning the existence of a pump in the well; and
- data at NHW production Wells 3790C (NH-22) and 3790G (NH-34) are included, but there is uncertainty regarding potential impacts from pumping at these locations.

Figure 2 shows the hydraulic head residuals between simulated heads from the end of the calibrated AMEC model and the EPA groundwater level data (i.e., the difference between the observed and modelled data). As illustrated in Figure 2, groundwater model residuals throughout the NHW transport model domain are predominantly between -11 ft and 2.4 ft with the only exception being at 3790G (NH-34; +25 ft); as mentioned previously, there is uncertainty regarding potential impacts from pumping at this location. Model residuals in the Hewitt Site area are generally between -2.1 to -5.1 ft (simulated heads higher than observed). In the area between the NHW Well Field and the Hewitt Pit, model residuals range from -0.2 to 2.4 ft.

Considering the information provided above, the model is sufficiently well calibrated to water level data in the North Hollywood OU study area (encompassing the Hewitt Site and the NHW Remediation and Secondary wells) to simulate interaction of this well field with existing mapped contaminants. Further evidence of AMEC (2015) model calibration to water level data is provided in their Tables 5-1 to 5-3, Figure 5-5 and Appendix G, with these calibration results not re-iterated in the RI/FS Appendix A Groundwater Modelling Summary. Thus, the AMEC model is considered to be reliable for the purposes it was used for in the RI/FS.

It is also noted that CalMat presented numerical groundwater simulation results using a similar version of the AMEC model as part of their IRAP (Golder 2016a) and Site Assessment (CSM/HHRA) Report (Golder 2016b). In relation to the model's replication of observed hydraulic head and flow patterns in the vicinity of Hewitt Site, CalMat's IRAP Appendix A (Golder 2016a), states *"[d]espite these limitations,* *it can still be used as a tool for evaluating pumping scenarios and to guide the selection of pilot test pumping and reinjection locations".* Furthermore, in Appendix T, Section 3.2 of CalMat's Site Assessment (CSM/HHRA) Report (Golder 2016b), it is noted that after their updates to the AMEC 2IR model (including lateral grid refinement, pumping and spreading rates, A-Zone/B-Zone contact elevation and the addition of more groundwater level calibration data), "*the global model calibration statistics were essentially the same between the 2IR model and the May 2016 HHRA model. Further, the models were similar in terms of their local-scale groundwater elevations and flow directions*".

The RI/FS modelling also uses existing mapped contaminant distributions as a starting point for forward looking simulations avoiding uncertainties from modeling historical contaminant migration. Contrary to the statement in the comment, parameter sensitivity / uncertainy analyses were conducted. Uncertainties in forecast simulation results relating to the input transport parameters were evaluated through sensitivity analyses which were conducted as part of the RI/FS (contrary to the reviewer's comment), and presented in the 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD) which was provided to CalMat in February 2017 for review.

31. r. The errors in the sub-area transport model when combined with the issues associated with comment 31g result in unreliable calculations and interpretations of the efficacy of the LADWP's selected remediation wells. To demonstrate this, the probability of capture for the selected remediation wells (NH-34, NH-37, and NH-45) was computed for simulation years 3, 5 and 10 for the base of the A Zone (Figures 9, 10 and 11) and the middle of the B Zone (Figures 12, 13, and 14). In many instances, the likelihood of capture of known areas of 1,4- dioxane contamination are very small, and the majority of water captured is from areas with other known contaminants (TCE, PCE, Cr, etc.). For example, see Figures 10 and 13 for well NH-37, there is little to no capture for A Zone areas known to have significant concentrations of 1,4-dioxane. NH-45 shows similar poor results for capture of 1,4 - dioxane (Figures 11 and 14). Well NH-34 is the only well that appears to provide capture in the area of interest. Because two of three wells will not result in efficient capture of 1,4-dioxane impacted water for much of the simulation period and the calculations are suspect because of mass errors and boundary condition assignments, the reliability of the RI/FS calculations and alternatives analysis do not support the interpretations and conclusions in the document.

<u>LADWP RESPONSE:</u>

The chosen presentation format in which probability of capture is presented for selected Remediation wells *individually* is misleading. Capture of the 1,4-dioxane plume was refined through *combined* operation of the Remediation wells. Therefore a *combined* (cumulative) capture zone for these wells should be analyzed. Of course well NH-34 being located furthest north of the Remediation wells will have a capture zone that overlaps greatest with the 1,4-dioxane plume and the capture zones of remaining wells will align to the south of the NH-34 capture zone.

With regard to the comments relating to mass balance calculations, please see response to Comment 31.I.

In relation to the comment regarding boundary condition assignments, no further changes to specified-head boundary conditions were made between the model used for particle tracking and the sub-domain transport model. For each sub-domain transport model simulation, a regional model simulation was carried out first using the modified pumping rates for the relevant Alternative Scenario. These simulation results were then used to develop the time-varying specified head boundary conditions applied to the sub-domain transport model simulation for the respective Alternative Scenario. Therefore, the local scale model BCs are consistent with the regional model and any modified pumping rates and the results of the transport simulations are not changed by the comment regarding boundary condition assignments applied to the sub-domain transport models.

32. SPECIFIC COMMENTS: SECTION 32. RI/FS APPENDIX B – DETAILED COST ESTIMATES:

32. a. In general, the lack of supporting back-up data in the RI/FS makes the cost estimate difficult to understand and accept as a valid estimate. Every item that is costed as "lump sum" should have some indication of what it includes and what unit costs were applied to arrive at the lump sum. LADWP does not provide a flow schematic of the treatment system to evaluate completeness or redundancy. There is also no indication of chemical usage to ensure effective treatment of all COCs that will be introduced into the system. The lack of simple back-up makes evaluation of the unit costs for these items impossible. From "A Guide to Developing and Documenting Cost Estimates during the Feasibility Study" (as used by LADWP and referenced in Table B-1):

> ***Quantity calculations used to support a cost estimate should be adequately documented. Supporting information can include boring logs, chemical analysis results, and scaled drawings… Assumptions used to estimate quantities should be clearly presented.***

LADWP RESPONSE:

The analysis of costs presented in the FS is intended to enable an analysis of relative costs of the alternatives presented. These alternatives include a "Pump and Treat and Distribute" alternative to "No Action" and "Alternative Water Supply" alternatives – so the estimate was intended to be a conceptual representation of treatment compared to non-treatment. It would be premature to lock in a precise number of granular activated carbon vessels or the precise length of pipe and electrical conduit, for example. The level of detail is appropriate for this purpose.

Chemical analysis of the groundwater and scaled drawings of a possible treatment concept are included in the FS. Although many of the plant components are grouped into "lump sum" costs, the list of components, for example, may include UV AOP reactors, hydrogen peroxide storage tanks, control, electrical service, spill containment and safety equipment, piping, as well as the delivery, installation, testing and commissioning.

32. b. No vendor quotes (referenced in Table B-1) were provided. From "A Guide to Developing and Documenting Cost Estimates during the Feasibility Study":

> ***Quotes from vendors or construction contractors can provide costs that are more site-specific in nature than costs taken from standard guides and references. These quotes usually include contractor markups and are usually provided as a total cost rather than categorized as labor, equipment, or materials. If possible, more than one vendor quote should be obtained.***

LADWP RESPONSE:

We agree with the EPA Guide that vendors and construction contractors can be good sources of cost information. In this case, this construction cost estimate was derived not only from vendor information, but also from past LADWP construction experience and past construction experience of its consultants.

32. c. No indication of contractor markups, overhead, profit are provided. From "A Guide to Developing and Documenting Cost Estimates during the Feasibility Study":

> ***The source of cost data can dictate how, or if, markups should be applied. For example, a vendor or contractor quote may include overhead and profit (i.e., "burdened"), whereas a unit price taken from a standard cost estimating guide may not (i.e., "non-burdened").***

LADWP RESPONSE:

Contractor markups, overhead cost and profit for construction were indeed factored into the cost estimate, as suggested by the EPA Guide, to reflect the total cost that is greater than the price of purchasing pieces of equipment.

32. d. Many of the unit costs appear to be grossly over-estimated (e.g., $1.074 million for a new extraction pump; $2.148 million for a replacement well; $538/square foot for an industrial building for the UV building; $2.151 million for a well control building; $6.8 million for a backwash storage tank). The lack of quantities, dimensions, etc. make evaluation of individual items impossible.

LADWP RESPONSE:

The costs are common for municipal construction:

- a complete production well pump replacement may include well rehabilitation, pump replacement, repair to casing during construction, and replacement of wellhead piping which in total can be in the range of $0.5M to over $1M;
- a replacement well typically costs $2M or more;
- $538 per square foot is not unusual for an industrial building aesthetically compatible with surrounding athletic fields and park, with rooms for electrical, controls, parts storage and chemical storage, and the safety and maintenance features; and
- the size and materials of backwash storage was unknown at the conceptual stage and needed to be conservatively estimated.

32. e. Although presented in the Notes to Table B-1, LADWP does not identify the reasoning behind the selection of and use of contingencies in the table. Whereas one contingency was in the mid-range of values (bid contingency), one contingency was at the very high

end (scope contingency). LADWP does not present the application of either or both to the unit costs in the table and therefore cannot be evaluated. From "A Guide to Developing and Documenting Cost Estimates during the Feasibility Study":

> ***Contingency is factored into a cost estimate to cover unknowns, unforeseen circumstances, or unanticipated conditions that are not possible to evaluate from the data on hand at the time the estimate is prepared.***

LADWP RESPONSE:

The EPA Guide suggests a bid contingency range of 10 to 20%. The reason for choosing a mid-range value of 15% was because construction cost volatility has been moderate.

The EPA Guide suggests a scope contingency range of 15 to 35%. A high value of 30% was chosen because this conceptual level cost estimate cannot anticipate possible unknowns such as soil conditions, backwash and purge storage volumes, electrical service requirements, waste discharge requirements, modifications to existing well pumps and piping, exact capacity and sizing of treatment equipment, staging area and temporary facilities, connections to existing piping.

32. f. Aside from the AOP treatment system, the remedy is a replacement of an existing system and should not have significant uncertainty.

LADWP RESPONSE:

Construction at an existing facility actually poses more uncertainty and requires more cost and coordination than at a "greenfield" site.

32. g. LADWP does not provide an explanation for the selection of and use of the "escalation factor." LADWP should explain the basis for the escalation factor and why it applies to every item. No information is provided to indicate how recent or old any of the assumed costs are and why they should or should not be subject to this contingency.

LADWP RESPONSE:

The conceptual costs were estimated in 2016, with the expectation that a remediation facility would be constructed in the future. The escalation rate reflects a 3% inflation rate applied to the midpoint of the proposed schedule. This is for all construction costs, assuming half of the costs may be incurred before the 1.5 year midpoint, and half of the costs may be incurred later.

32. h. If the contingencies are used for each item, then the total contingency approaches 70% (e.g., 1.3 x 1.15 x 1.13 = 1.69). In effect, the gross overuse of contingency has inflated the cost more than the +50% accuracy of the estimate identified in the Introduction to Section B.1. In essence, the costing table has assumed a 69% uncertainty to a remedy that has been reported to be 50% accurate.

LADWP RESPONSE:

This level contingency and uncertainty gives a conservative estimate for comparison to the "No Action" and the "Alternate Water Supply" alternatives, and was shown to still be lower cost than either of those alternatives. LADWP will be delighted if the actual cost is less than this estimate.

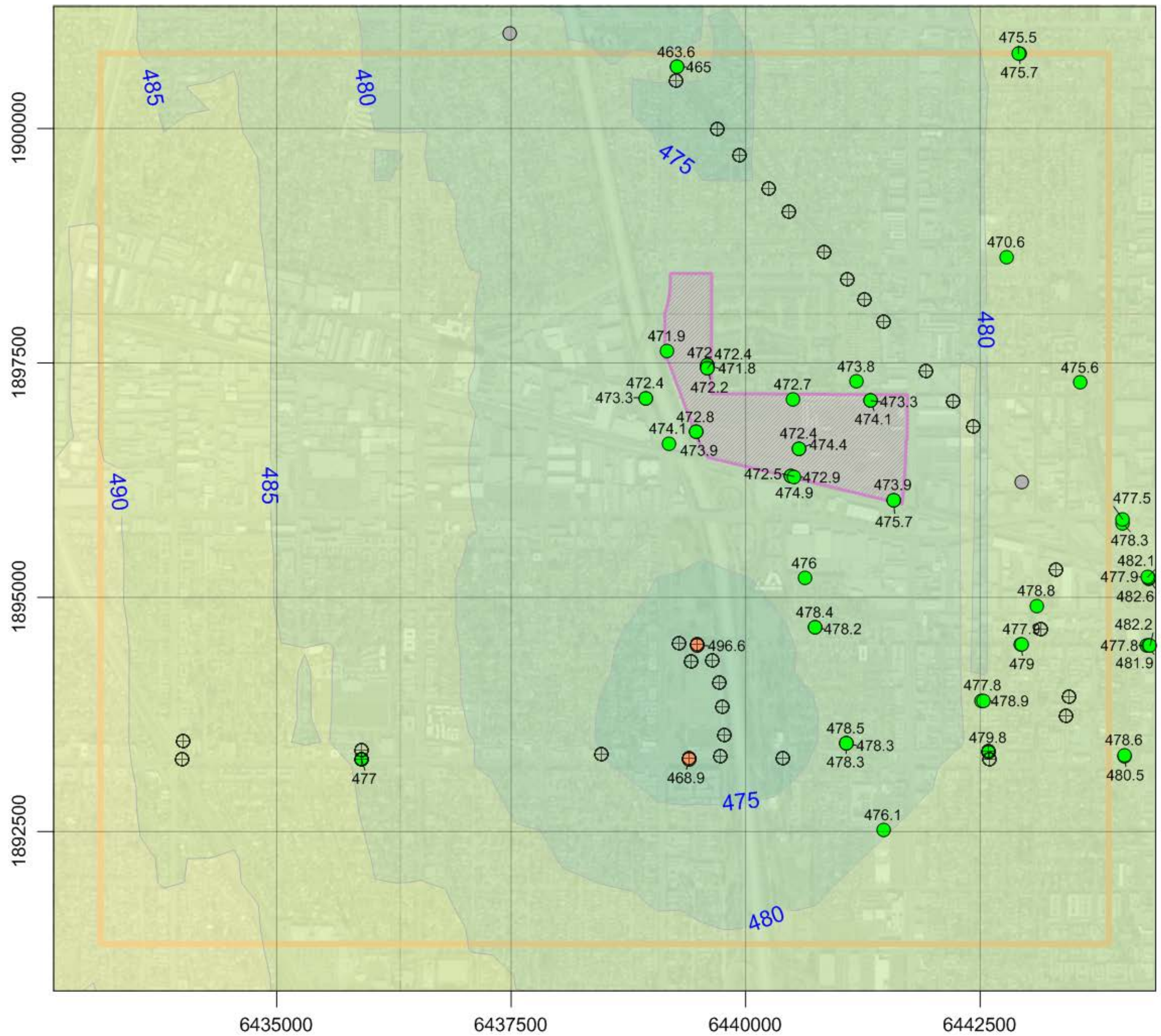


Figure 1: Simulated hydraulic head distribution in the A-Zone within the NHW transport model domain at the end of the AMEC historical model and observed water level data from the EPA database

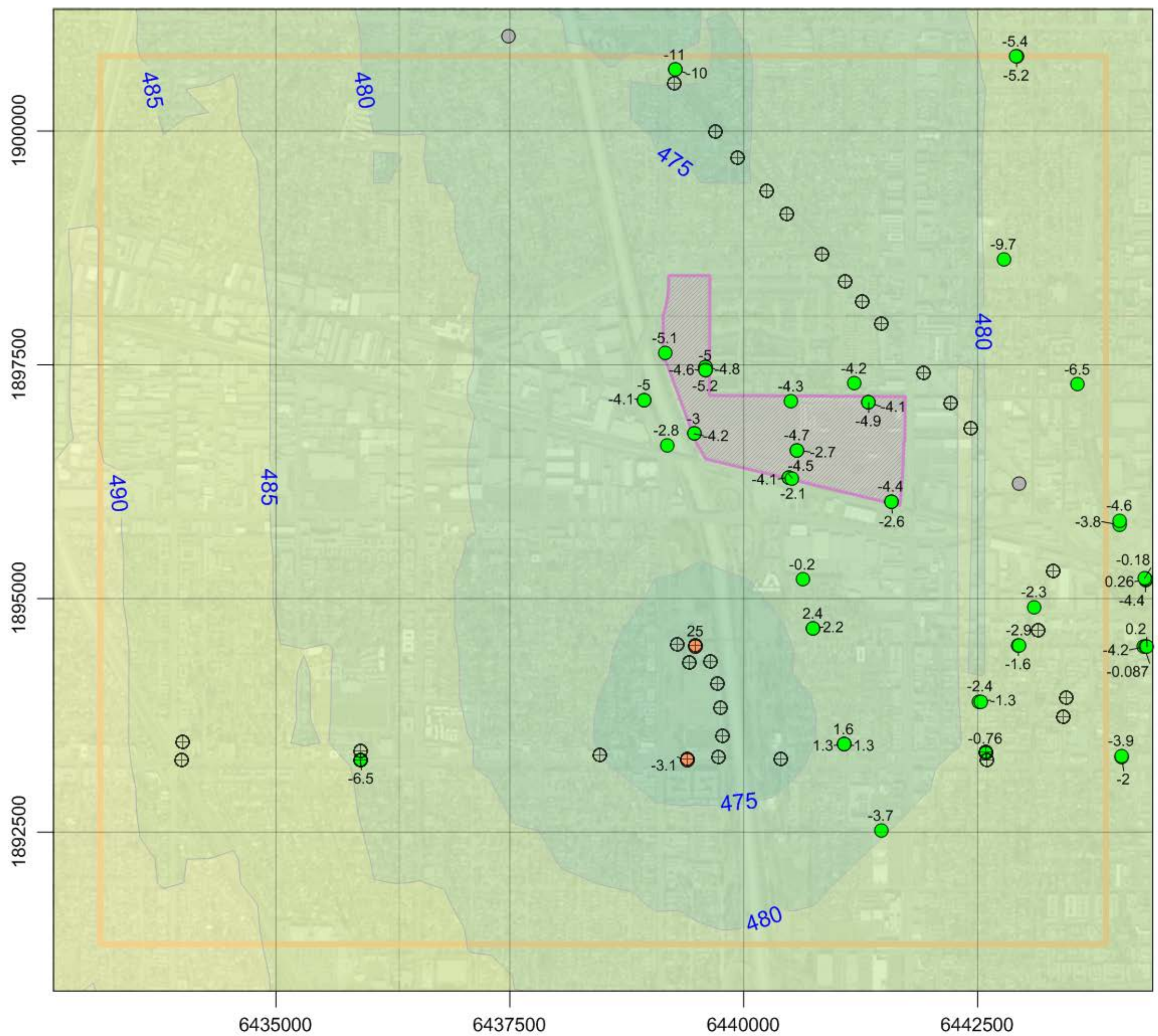


Figure 2: Simulated hydraulic head distribution in the A-Zone within the NHW transport model domain at the end of the AMEC historical model and hydraulic head residuals relative to observed water level data from the EPA database

Los Angeles Department of Water & Power

NHW IRAD

Appendix B

Interim Sampling Plan

Owners Agent San Fernando Basin Groundwater Remediation

Prepared for:

City of Los Angeles
Department of Water and Power
111 North Hope Street
Los Angeles, California 90012

Submitted by:

Hazen and Sawyer (Hazen) under Agreement No. 47329-5 (Owner's Agent for the SFB Remediation)

Prepared by:

WorleyParsons

INTERIM SAMPLING PLAN

CENTRALIZED TREATMENT OPERATION

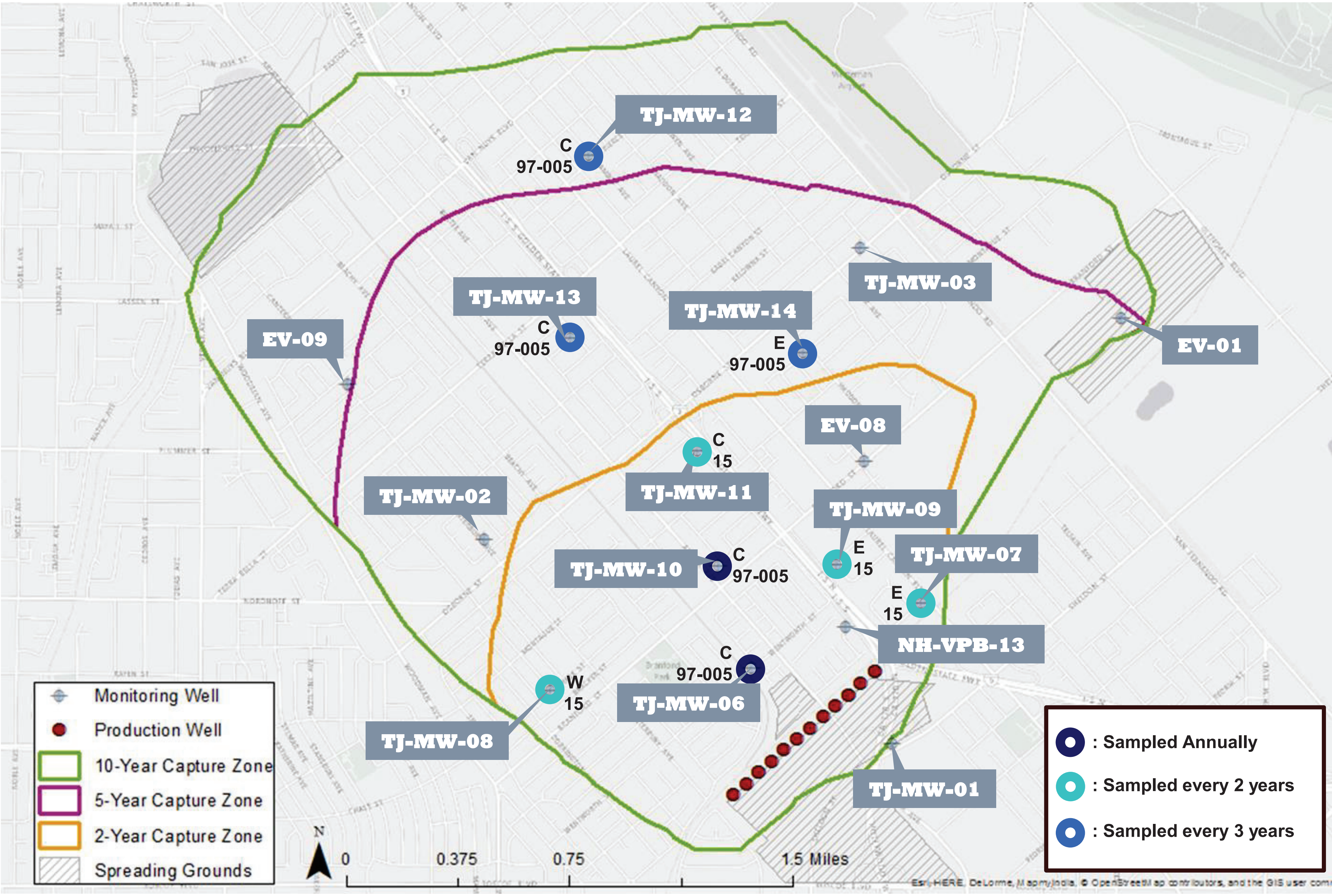
Groundwater Remediation - Water Quality

Los Angeles Department of Water and Power

April 2015

NOTE: This plan and the number of constituents may change in the future.

TUJUNGA



NOTE: This plan and the number of constituents may change in the future.

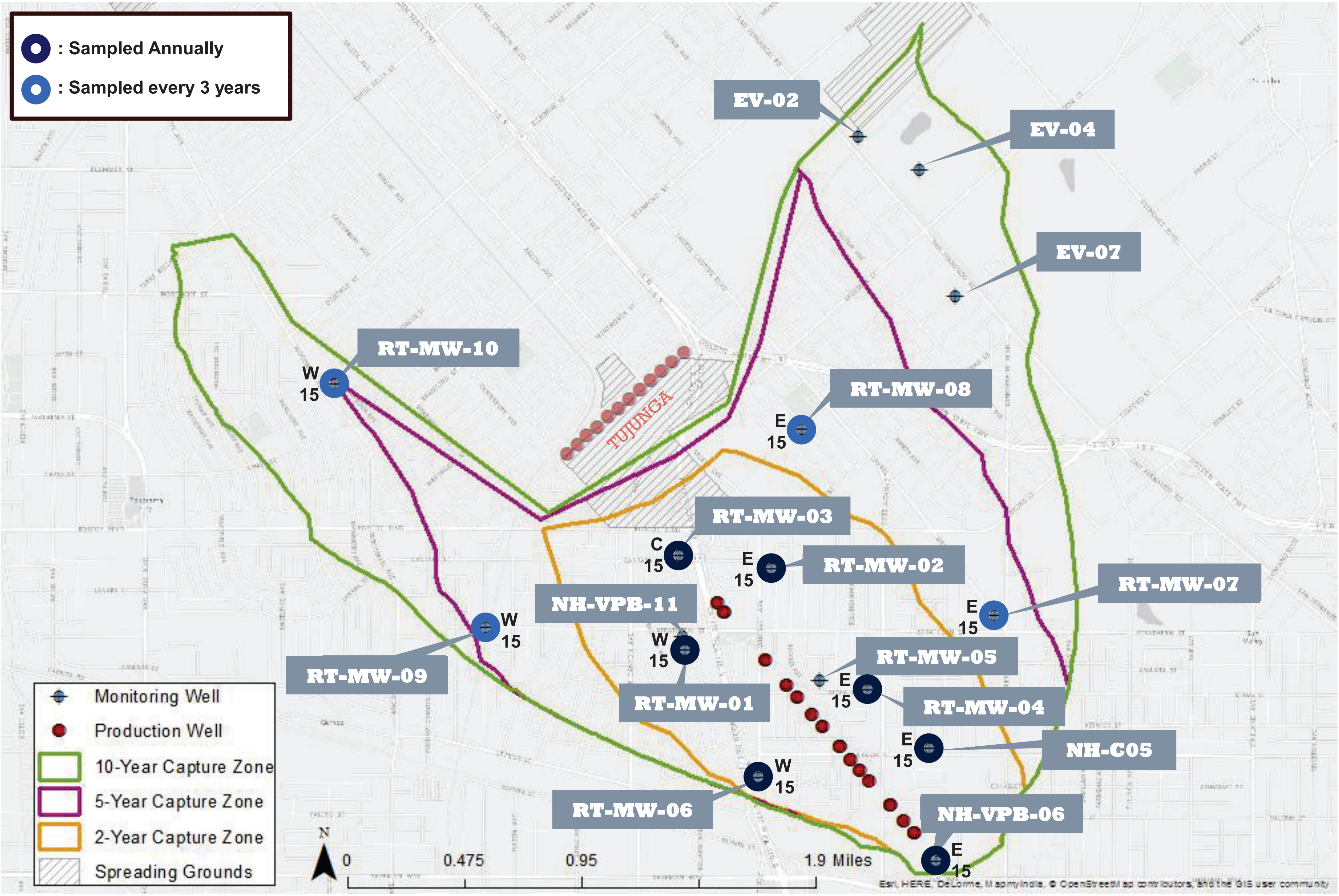
TUJUNGA Sampling Frequency

Wellfield	Capture Zone	Monitoring Well	2015	2016	2017	2018	2019	2020 (Jan-June)	2020 (July-Dec)
Tujunga	2	TJ-MW-08-390		Y		Y		X	X
		TJ-MW-08-530		Y		Y		X	X
		TJ-MW-08-820		Y		Y		X	X
		TJ-MW-06-400	X	X	X	X	X	X	X
		TJ-MW-06-570	X	X	X	X	X	X	X
		TJ-MW-06-860	X	X	X	X	X	X	X
		TJ-MW-10-440	X	X	X	X	X	X	X
		TJ-MW-10-560	X	X	X	X	X	X	X
		TJ-MW-10-860	X	X	X	X	X	X	X
		TJ-MW-11-440		Y		Y		X	X
		TJ-MW-11-560		Y		Y		X	X
		TJ-MW-11-900		Y		Y		X	X
		TJ-MW-07-420		Y		Y		X	X
		TJ-MW-07-600		Y		Y		X	X
		TJ-MW-07-860		Y		Y		X	X
		TJ-MW-09-580		Y		Y		X	X
		TJ-MW-09-850		Y		Y		X	X
	5	TJ-MW-13-460			X			X	
		TJ-MW-13-670			X			X	
		TJ-MW-13-910			X			X	
		TJ-MW-14-460			X			X	
		TJ-MW-14-580			X			X	
		TJ-MW-14-900			X			X	
	10	TJ-MW-12-490			X			X	
		TJ-MW-12-590			X			X	
		TJ-MW-12-910			X			X	

Note: X = Short List for 97-005
Y = All 21 Constituents

NOTE: This plan and the number of constituents may change in the future.

RINALDI TOLUCA



NOTE: This plan and the number of constituents may change in the future.

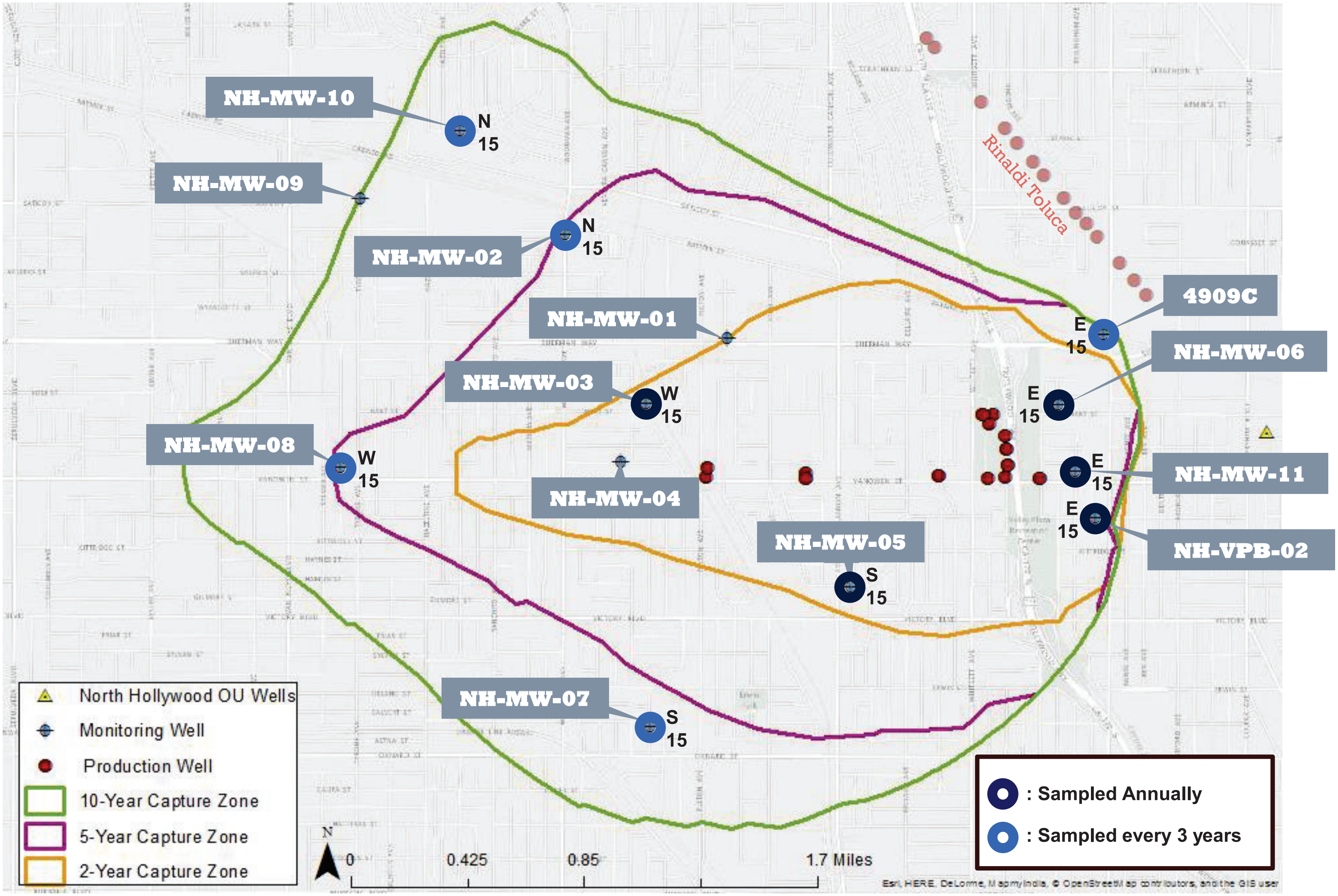
RINALDI TOLUCA Sample Frequency

Wellfield	Capture Zone	Monitoring Well	2015	2016	2017	2018	2019	2020 (Jan-June)	2020 (July-Dec)
Rinaldi Toluca	2	RT-MW-06-310	Y	Y	Y	Y	Y	X	X
		RT-MW-06-510	Y	Y	Y	Y	Y	X	X
		RT-MW-06-710	Y	Y	Y	Y	Y	X	X
		RT-MW-01-370	Y	Y	Y	Y	Y	X	X
		RT-MW-01-630	Y	Y	Y	Y	Y	X	X
		RT-MW-01-780	Y	Y	Y	Y	Y	X	X
		RT-MW-03-380	Y	Y	Y	Y	Y	X	X
		RT-MW-03-570	Y	Y	Y	Y	Y	X	X
		RT-MW-03-760	Y	Y	Y	Y	Y	X	X
		RT-MW-04-320	Y	Y	Y	Y	Y	X	X
		RT-MW-04-450	Y	Y	Y	Y	Y	X	X
		RT-MW-04-730	Y	Y	Y	Y	Y	X	X
		RT-MW-02-370	Y	Y	Y	Y	Y	X	X
		RT-MW-02-650	Y	Y	Y	Y	Y	X	X
		RT-MW-02-810	Y	Y	Y	Y	Y	X	X
		NH-VPB-06	Y	Y	Y	Y	Y	X	X
		NH-C05-320	Y	Y	Y	Y	Y	X	X
	5	RT-MW-09-300			Y			Y	
		RT-MW-09-560			Y			Y	
		RT-MW-09-800			Y			Y	
		RT-MW-07-340			Y			Y	
		RT-MW-07-510			Y			Y	
		RT-MW-07-770			Y			Y	
		RT-MW-08-400			Y			Y	
		RT-MW-08-580			Y			Y	
		RT-MW-08-760			Y			Y	
	10	RT-MW-10-400			Y			Y	
		RT-MW-10-630			Y			Y	
		RT-MW-10-860			Y			Y	

Note: X = Short List for 97-005
Y = All 21 Constituents

NOTE: This plan and the number of constituents may change in the future.

NORTH HOLLYWOOD WEST



NOTE: This plan and the number of constituents may change in the future.

NORTH HOLLYWOOD WEST Sample Frequency

Wellfield	Capture Zone	Monitoring Well	2015	2016	2017	2018	2019	2020 (Jan-June)	2020 (July-Dec)
North Hollywood West	2	NH-MW-03-268	Y	Y	Y	Y	Y	X	X
		NH-MW-03-772	Y	Y	Y	Y	Y	X	X
		NH-MW-05-250	Y	Y	Y	Y	Y	X	X
		NH-MW-05-510	Y	Y	Y	Y	Y	X	X
		NH-MW-05-720	Y	Y	Y	Y	Y	X	X
		NH-MW-06-280	Y	Y	Y	Y	Y	X	X
		NH-MW-06-580	Y	Y	Y	Y	Y	X	X
		NH-MW-06-810	Y	Y	Y	Y	Y	X	X
		NH-MW-11-280	Y	Y	Y	Y	Y	X	X
		NH-MW-11-450	Y	Y	Y	Y	Y	X	X
		NH-MW-11-710	Y	Y	Y	Y	Y	X	X
		NH-VPB- 02	Y	Y	Y	Y	Y	X	X
	5	NH-MW-08-250			Y			Y	
		NH-MW-08-430			Y			Y	
		NH-MW-08-770			Y			Y	
		NH-MW-02-305			Y			Y	
		NH-MW-02-375			Y			Y	
		4909C			Y			Y	
	10	NH-MW-10-300			Y			Y	
		NH-MW-10-450			Y			Y	
		NH-MW-10-820			Y			Y	
		NH-MW-07-230			Y			Y	
		NH-MW-07-390			Y			Y	
		NH-MW-07-770			Y			Y	

Note: X = Short List for 97-005
Y = All 21 Constituents

NOTE: This plan and the number of constituents may change in the future.

Monitoring Well Sampling

	Total Sampled Monitoring Wells (2015 - 2020)	Monitoring Wells Bi-annually Sampled (2020)	Monitoring Wells Sampled Every:		
			1 - year	2 - years	3 -years
Tujunga	9	6	2	4	3
Rinaldi Toluca	11	7	7	0	4
North Hollywood West	10	5	5	0	5
Total	**30**	**18**	**14**	**4**	**12**

*Well Samples are specifically for Interim Sampling before Centralized Treatment Operation. These totals do not account for sampling events outside of Centralized Treatment Operation.

NOTE: This plan and the number of constituents may change in the future.

Monitoring Well Sampling

TUJUNGA SAMPLES

Collection Sample Period	21 Constituents	97-005	Total
Jan 2015- Dec 2019:	22	39	61
2020 (Jan - Dec)	0	43	43
Total	**22**	**82**	**104**

RINALDI-TOLUCA SAMPLES

Collection Sample Period	21 Constituents	97-005	Total
Jan 2015- Dec 2019:	97	0	97
2020 (Jan - Dec)	12	34	46
Total	**109**	**34**	**143**

NORTH HOLLYWOOD-WEST SAMPLES

Collection Sample Period	21 Constituents	97-005	Total
Jan 2015- Dec 2019:	72	0	72
2020 (Jan - Dec)	12	24	36
Total	**84**	**24**	**108**

NOTE: This plan and the number of constituents may change in the future.

2020 Production Well Sampling

Wellfield	Well Numbers	Active Production Wells	97-005 Short Bi-annual Samples (2020)
Tujunga	1 - 12	12	24
Rinaldi Toluca	1 - 15	15	30
North Hollywood West	4, 7, 22, 23, 25, 26, 32, 33, 34, 36, 37, 43A, 44, 45	14	28
Total		**41**	**82**

*Well Samples are specifically for Interim Sampling before Centralized Treatment Operation. These totals do not account for sampling events outside of Centralized Treatment Operation.

NOTE: This plan and the number of constituents may change in the future.

All Well Sampling

	2015 - 2019 Sampled Wells	2020 Sampled Wells	Total Wells
Tujunga	21	36	57
Rinaldi Toluca	26	44	70
North Hollywood West	24	38	62
Total	**71**	**118**	**189**

*Well Samples are specifically for Interim Sampling before Centralized Treatment Operation. These totals do not account for sampling events outside of Centralized Treatment Operation.

NOTE: This plan and the number of constituents may change in the future.

21 Constituents

- TCE
- PCE
- 1,1-DCE
- 1,2,3-TCP
- MTBE
- Carbon Tetrachloride
- 1,4-Dioxane
- Total Dissolved Solids
- Nitrate
- Perchlorate
- Total Chromium
- Hexavalent Chromium
- Freon 11
- Freon 12
- Nitrosamines (NDMA – NDBA – NDPA – NDEA – NMEA – NPIP - NPYR)

NOTE: This plan and the number of constituents may change in the future.

97-005 Constituents

- 1,1,1,2-Tetrachloroethane
- 1,1,1-Trichloroethane
- 1,1,2,2-Tetrachloroethane
- 1,1,2-Trichloroethane
- 1,1-Dichloroethane (1,1-DCA)
- 1,1-Dichloroethene (1,1-DCE)
- 1,1-Dichloropropene
- 1,2,3-TCP (GCMS) -LOW
- 1,2,4-Trichlorobenzene
- 1,2,4-Trimethylbenzene
- 1,2-Dichlorobenzene (o-DCB)
- 1,2-Dichloroethane (1,2-DCA)
- 1,2-Dichloropropane
- 1,3,5-Trimethylbenzene
- 1,3-Dichlorobenzene (m-DCB)
- 1,3-Dichloropropane
- 1,3-Dichloropropene, total
- 1,4-Dichlorobenzene (p-DCB)
- 1,4-Dioxane
- 2,2-Dichloropropane
- 2-Butanone (MEK)
- 2-Chloroethyl vinyl ether
- 2-Chlorotoluene (ortho)
- 2-Hexanone
- 4-Chlorotoluene (para)
- 4-Methyl-2-pentanone
- Acetone
- Acetonitrile
- Acrolein
- Acrylonitrile
- Alachlor (Alanex)
- Alkalinity,total (as CaCO3)
- Aluminum
- Antimony
- Arsenic
- Atrazine (Atrex)
- Barium
- Benzene
- Benzo(a)pyrene
- Beryllium
- Bicarbonate (HCO3-, calc.)
- Boron
- Bromide
- Bromobenzene
- Bromochloromethane
- Bromodichloromethane
- Bromoform
- Bromomethane (Methyl bromide)
- Cadmium
- Calcium
- Carbon disulfide
- Carbon tetrachloride
- Carbonate (CO3-2, calc.)
- Cations, total, calc
- Chloride
- Chlorobenzene (Monochlorobenzene)
- Chlorodibromomethane
- Chloroethane
- Chloroform
- Chloromethane (Methyl chloride)
- Chromium VI (Hexavalent Chromium)
- Chromium, Total
- cis-1,2-Dichloroethylene
- cis-1,3-Dichloropropene
- Coliform Total (CL,QT2000) ,MM0-MUG
- Color, Apparent, Unfiltered
- Copper
- Cyanide
- Di(2-ethylhexyl)adipate (DEHA)
- Di(2-ethylhexyl)phthalate DEHP
- Dibromomethane
- Dichlorodifluoromethane (Freon 12)
- Dichloromethane (Methylene chloride)
- Di-isopropyl ether
- Dissolved oxygen. field
- E.coli (CL,QT2000) ,MMO-MUG
- Ethyl benzene
- Ethyl tert-Butyl Ether (ETBE)
- Fluoride
- Heterotrophic plate count (PCA), PourPlate
- Heterotrophic plate count (R2A),PourPlate
- Hexachlorobutadiene
- Hexachlorocyclopentadiene
- Hydroxide (OH-, calc.)
- Iron
- Isopropylbenzene (Cumene)
- Langelier index at field temp.,calc
- Langelier index source temp
- Lead
- m,p-Xylenes
- Magnesium
- Manganese
- Mercury
- Methyl tert-butyl ether (MTBE)
- Naphthalene
- n-Butyl Benzene
- Nickel
- Nitrate (as N)
- Nitrate (as NO3), calc
- Nitrate and Nitrite (as N) ,Calc
- Nitrite (as N)
- N-Nitrosodiethylamine (NDEA)
- N-Nitrosodimethylamine (NDMA)
- N-Nitrosodi-n-butylamine (NDBA)
- N-Nitrosodi-n-propylamine (NDPA)
- N-Nitrosomethylethylamine (NMEA)
- N-Nitrosopiperidine (NPIP)
- N-Nitrosopyrrolidine (NPYR)
- n-Propyl benzene
- Odor threshold at 60°C
- o-Xylene
- Perchlorate
- pH, field
- p-Isopropyltoluene (p-Cymene)
- Potassium
- sec-Butylbenzene
- Selenium
- Silica
- Silver
- Simazine
- Sodium
- Spec conductance (E.C.)
- Specific conductance, field
- Styrene
- Sulfate (as SO4)
- Temperature, field
- tert-Amyl methyl ether (TAME)
- tert-Butyl Alcohol (TBA)
- tert-Butylbenzene
- Tetrachloroethylene (PCE)
- Thallium
- Thiobencarb (Bolero)
- TOC
- Toluene (Methyl benzene)
- Total dissolved solids (TDS), 180 °C
- Total hardness (as CaCO3, calc.)
- Total THM
- trans-1,2-Dichloroethylene
- trans-1,3-Dichloropropene
- trans-1,4-Dichloro-2-butene
- Trichloroethylene (TCE)
- Trichlorofluoromethane (Freon 11)
- Trichlorotrifluoroethane (F113)
- Turbidity, field
- Turbidity, lab
- Uranium
- Vanadium
- Vinyl chloride (Chloroethane)
- Xylene, Total, calc
- Zinc

NOTE: This plan and the number of constituents may change in the future.

*Revised 2012

Los Angeles Department of Water & Power

NHW IRAD

Appendix C

Technical Support Information for Transport Modeling

Owners Agent San Fernando Basin Groundwater Remediation

Prepared for:

City of Los Angeles
Department of Water and Power
111 North Hope Street
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July, 2017
This Section Originally Published February, 2017

Submitted by:

Hazen and Sawyer (Hazen) under Agreement No. 47329-5 (Owner’s Agent for the SFB Remediation)

Prepared by:

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Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field

INTRODUCTION

The City of Los Angeles Department of Water and Power (LADWP) previously completed numerical groundwater modeling as part of the Interim Remedial Investigation/Feasibility Study (RI/FS) conducted to address the synthetic contaminant 1,4-dioxane dissolved in groundwater at the North Hollywood West (NHW) Well Field located in the San Fernando Groundwater Basin (SFB). This document provides supplemental information related to the fate and transport modeling scenarios summarized in Appendix A of the NHW Interim RI/FS (LADWP 2016). Appendix A presents fate and transport modeling to refine remedial action Alternative 3 in the Interim RI/FS. The information presented herein should be considered in conjunction with Appendix A of the NHW Interim RI/FS (LADWP 2016). This document is not an evaluation of alternatives. It contains the following information:

- additional details and figures relating to certain aspects of the transport scenarios presented in Appendix A of the RI/FS; and
- presentation of a sensitivity analysis performed to investigate the effects of varying key transport parameters.

This document was prepared in response to Joseph Drapalski from Norton Rose Fulbright, and Norton Rose Fulbright's request in their January 18, 2017 letter (and in other correspondence) for additional information about the analysis presented in the Interim RI/FS, such as the modeling. LADWP presented its analysis in the RI/FS and related documents, and those documents (and references contained therein) provide a meaningful opportunity for public comment on the Proposed Plan and related documents; however, in an effort to be responsive to these requests, LADWP has prepared this preliminary response to comment document before the close of the comment period, which contains additional details about the modeling presented in Appendix A of the RI/FS (including the model runs that reflect the effect of a 1900 AFY source control program at the Hewitt Pit) as well as sensitivity analysis completed in connection with modeling.

ALTERNATIVE REMEDIATION CONCEPTS FOR TRANSPORT MODELING

This section repeats the transport modeling scenarios outlined in Section A4.3 of Appendix A of the NHW Interim RI/FS (LADWP 2016), and provides additional information about the typical pump rates for each well and the assumed Hewitt Pit remediation for Alternative Scenarios 3-2 and 3-5.
Section A3.2 of Appendix A separates production wells into broad category definitions. Remediation wells are production wells which are primarily responsible for capturing plume particles, are assumed to operate continuously, and are anticipated to require ongoing water treatment. Secondary wells are

production wells assumed to operate continuously, may capture plume particles, and thus may require water treatment.

- Alternative Scenario 3-1: This transport simulation consists of three Remediation wells (NH-34, NH-37 and NH-45) starting in simulation year 3 and three Secondary wells (NH-26, NH-43A, NH-44) starting two years later. The NHW Interim RI/FS Section 4.1.3 explains that this pumping plan has the potential to reduce the size of the groundwater treatment facility as groundwater fate and transport modeling indicates the Secondary wells should not contain 1,4-dioxane concentrations exceeding the Notification Level (NL) after two years of Remediation well pumping. Figure 4-2 and the cost estimate in the Interim RI/FS are based on treating only the water from the three Remediation wells.
- Alternative Scenario 3-2: The pumping rates at NHW Well Field employed for this transport simulation are identical to those used for Alternative Scenario 3-1. However, additional pumping is incorporated to simulate remedial action by other third parties as follows.
  - Cooperative Containment Concept (CCC) North Hollywood Operable Unit (OU) Second Interim Remedy (2IR) pumping of approximately of 5,000 AFY as a pumping rate estimated for this simulation, starting in simulation year 4. This is to evaluate the potential effects of the CCC pumping on the Alternative Scenario 3-1 concept for NHW Well Field. Locations and pumping rates used for the CCC wells are as documented in 'Groundwater Modeling Memorandum, North Hollywood Operable Unit, Second Interim Remedy, Groundwater Remediation System Design' (AMEC 2015).
  - Pumping and reinjection within the footprint of Hewitt Pit of approximately 1,900 AFY as a pumping rate estimated for this simulation, starting in simulation year 3. This scenario is used to evaluate the potential effect of source control of the 1,4-dioxane plume core at Hewitt Pit on the Alternative Scenario 3-1 concept for NHW Well Field.
- Alternative Scenario 3-3: The pumping rates at NHW Well Field employed for this transport simulation are similar to that used for the Alternative Scenario 3-1 concept simulation but consist of six Remediation wells rather than three. These six wells are NH-26, NH-34, NH-37, NH-43A, NH-44 and NH-45, all of which start pumping at capacity in simulation year 3. This scenario is used to evaluate the required duration of treatment and clean-up if the number of (remediation) wells being treated was increased from three (as used in Alternative Scenario 3-1 concept) to six.
- Alternative Scenario 3-4: The pumping rates at NHW Well Field employed for this transport simulation are identical to that used for the Alternative Scenario 3-3 concept simulation but includes additional pumping to simulate CCC North Hollywood OU 2IR pumping of approximately of 5,000 AFY starting in simulation year 4. This scenario is used to evaluate the potential effects of the CCC pumping on the Alternative Scenario 3-3 concept for NHW Well Field.
- Alternative Scenario 3-5: The pumping rates at NHW Well Field employed for this transport simulation are identical to that used for the Alternative Scenario 3-4 concept simulation but includes additional pumping and reinjection of approximately 1,900 AFY within the footprint of Hewitt Pit starting in simulation year 3. This scenario is used to evaluate the potential effects of

source control of the 1,4-dioxane plume core at Hewitt Pit on the Alternative Scenario 3-4 concept for NHW Well Field.

- Alternative Scenario 3-6: Like Alternative Scenario 3-1, this scenario employs three Remediation wells; however, it uses different Remediation wells to test how the configuration of the Remediation wells affect the capture of 1,4-dioxane at NHW Well Field. This scenario consists of three Remediation wells pumping at full capacity (NH-37, NH-43A, NH-45) and three Secondary wells (NH-26, NH-34, NH-44), with Remediation wells starting in simulation year 3 and Secondary wells starting two years later.

Table 1, below, provides a summary of the typical pumping schedule for key NHW wells for each scenario. Scenarios involving simulated pumping and reinjection within the footprint of Hewitt Pit were designed to evaluate the effect of on-site remediation at the Hewitt Pit on the on-going migration of 1,4-dioxane from the Hewitt Pit and includes on-site extraction and injection wells. Well locations and pumping rates for the extraction and injection wells were selected to limit 1,4-dioxane migration southward towards the NHW well field and northward towards other well fields. Extraction and injection rates assumed to be in place for the Hewitt Pit (for Alternative Scenarios 3-2 and 3-5) are shown in Table 2 and locations are illustrated in Figure 1.

The following also applies to the six scenarios:

- each transport model was developed and set-up using the methodology described in Section A4.2 of Appendix A of the NHW Interim RI/FS (LADWP 2016); and
- each of the six transport simulations described above use the simulated initial plume condition and Hewitt Pit source (flux boundary condition), referred to as the ‘Plume Case’, described in Section A4.1 and A4.2 of Appendix A of the NHW Interim RI/FS (LADWP 2016).

TRANSPORT MODEL RESULTS

Table 3 provides a summary of transport modeling results and a brief qualitative comparison of the six scenarios simulated.

More detailed transport modeling results for each scenario are presented in this section as follows:

- simulated 1,4-dioxane concentration through time at selected individual NHW production wells; and
- treatment facility influent concentrations from flow-weighted 1,4-dioxane concentration estimates through time for combined Remediation well flow.

Detailed results for Alternative Scenario 3-1 are reproduced from Section A4.4 of Appendix A of the NHW Interim RI/FS (LADWP 2016).

Simulated Production Well Concentrations - Temporal Variation

Figure 2 through Figure 7 present simulated 1,4-dioxane concentrations through time at key NHW production wells.

These figures include simulated time series concentrations, simulated production rates and a map of well types for the relevant scenario as well as maximum historical observed concentrations from production well water quality data between January 2011 and May 2016.

In general, the results indicate simulated 1,4-dioxane concentrations are forecast to be highest in the remediation wells in the eastern part of the NHW Well Field. The highest simulated 1,4-dioxane concentrations in pumping wells are present at NH-37, with simulated maximum concentrations between 11 µg/L (Alternative Scenario 3-5) and 26 µg/L (Alternative Scenario 3-1) across the six scenarios. Other than these eastern wells (NH-26, NH-34, NH-37, NH-43A, NH-44 and NH-45), other production wells at NHW have concentrations less than 1 µg/L after five years in all pumping scenarios. The oscillation in concentrations occurs due to the simulated seasonal changes in pumping rates (e.g. peak pumping during the summer high-demand period).

As shown in Table A4-5 from Appendix A to the Interim RI/FS (LADWP 2016), and with respect to the comparable scenarios with six remediation wells, the three-well scenarios have shorter or similar durations before all Remediation wells are below the 1,4-dioxane NL, such that no further treatment for 1,4-dioxane would be needed (Alternative Scenario 3-1 is shorter than 3-3 and Alternative Scenario 3-2 is shorter than 3-5). The three well scenarios are equally protective of the non-treated wells, since the non-treated wells will remain below the NL for 1,4-dioxane throughout the period of operation once the wells become operational.

Simulated Treatment Plant Influent Concentration - Temporal Variation

Figure 8 presents flow-weighted 1,4-dioxane concentration estimates through time. The maximum flow-weighted influent concentrations of 1,4-dioxane ranges from approximately 3 µg/L (Alternative Scenario 3-5 with six remediation wells) to 8 µg/L (Alternative Scenario 3-1 with three remediation wells) across the six scenarios.

SENSITIVITY ANALYSIS

A sensitivity analysis was performed to evaluate the effects of key transport parameters, including dispersivity, Hewitt Pit source (flux boundary condition), and the initial 1,4-dioxane plume definition. The sensitivity analysis was carried out using the pumping from Alternative Scenario 3-1.

Dispersivity

In general terms, dispersivity is used to describe the mixing of solute at the leading edge of a contaminant plume due to variations in groundwater flow velocity. There are three primary directions of dispersivity including longitudinal (parallel to flow), transverse horizontal (normal to flow in the horizontal direction), and transverse vertical (normal to flow in the vertical direction).

In order to evaluate the sensitivity of the simulated 1,4-dioxane concentrations to dispersivity, two simulations were conducted using twenty percent and two hundred percent of the estimated dispersivity values used in the alternative scenario simulations (which were 35, 3.5 and 0.35 ft for longitudinal, transverse horizontal and transverse vertical dispersivity respectively). Therefore, the values applied for the sensitivity analysis were 7 and 70 ft for longitudinal dispersivity, 0.7 and 7 ft for transverse horizontal dispersivity, and 0.07 and 0.7 ft for transverse vertical dispersivity.

Simulated 1,4-dioxane concentrations through time at key NHW production wells using the different dispersivity values for Alternative Scenario 3-1 are presented in Figure 9. Decreased dispersivity resulted in higher simulated concentrations at NH-37 and in lower simulated concentrations at the other Remediation wells. Conversely, increased dispersivity resulted in lower simulated concentrations at NH-37 and in higher simulated concentrations at the other Remediation wells. However, in each sensitivity simulation, the concentrations of 1,4-dioxane remain below 1 µg/l in each non-remediation well once the well becomes operational.

The sensitivity of the estimated treatment plant influent concentration to the various dispersivity values is presented in Figure 13. The maximum flow-weighted influent concentrations were similar for cases with longitudinal dispersivity values of 35 and 70 ft, and were slightly lower overall for a longitudinal dispersivity of 7 ft.

Hewitt Pit Source (Flux Boundary Condition)

The sensitivity of simulated 1,4-dioxane concentrations to the leakage rate from the Hewitt Pit source (flux boundary condition) was also investigated. The flux boundary condition was developed based on the reported topography of the bottom of the landfill, reported area of leachate buildup, reported leachate concentrations and the model recharge. The leakage rate is the volumetric flow rate at which the defined concentration is released into the simulated aquifer system.

Concentration time series with flux values of 14.6, 29.3 and 58.5 ft^3/d (0.5, 1, and 2 times that used in the alternative scenario simulations) are presented in Figure 10 (58.5 ft^3/d) and lower concentrations would be expected with the lower leakage rate (14.6 ft^3/d). The other NHW production wells generally showed little difference in variation for these simulations.

The sensitivity of the estimated treatment plant influent concentration to the leakage rate is presented in Figure 13. The maximum flow-weighted influent concentrations ranged from approximately 5 to 12 µg/L for the lower and higher leakage rate, respectively.

Initial 1,4-Dioxane Plume Definition

The sensitivity of simulated 1,4-dioxane concentrations to the initial plume distribution and Hewitt Pit source (flux boundary condition) was also investigated. Two additional initial plume distributions were developed to test sensitivity of simulated initial concentrations. The method for developing these additional initial plume distributions followed the same approach for interpolating concentration data and assigning flux boundary conditions described in Section A4.1 of Appendix A of the NHW Interim RI/FS (LADWP 2016) the following summarizes the concept for each sensitivity plume case.

- Sensitivity Plume Case 1 - incorporates the Environmental Protection Agency (EPA; 2015) plume map and the 2011-2016 maximum observed concentration in each monitoring well in the A-Zone (see Attachment A for data points). In contrast to Sensitivity Plume Case 2, NHW Production well data were not incorporated in defining initial plume distribution and a Hewitt Pit source (flux boundary condition) was not assigned (i.e., no ongoing source of 1,4-dioxane).

- Sensitivity Plume Case 2 - incorporates the EPA (2015) plume map, recent observed concentrations in monitoring wells in A-Zone (see Attachment A for data points), and recent flow-weighted production well concentrations (see Attachment B for calculations). In addition, a continuous source (flux boundary condition) of 1,4-dioxane from Hewitt Pit was assigned using a flux boundary condition with prescribed concentration in the same manner as implemented for the ‘Plume Case’ used for the alternative scenario modeling (see Section A4.2 of Appendix A of the NHW Interim RI/FS [LADWP 2016]).

Figure 11 illustrates the two simulated sensitivity plume cases for 1,4-dioxane in the A-Zone (2IR Model layer 1 as defined in Appendix A of the NHW Interim RI/FS [LADWP 2016]). The data points used for the two simulated sensitivity plume cases in Attachment A.

Simulated concentration time series of key NHW production wells using the ‘Plume Case’ and the two sensitivity plume cases are presented in Figure 12. For Sensitivity Plume Case 2, results are similar to the ‘Plume Case’ used in Appendix A, with concentrations above 1 µg/L until simulation year 13 for NH-34 and NH-45, and simulation year 16 for NH-37. For Sensitivity Plume Case 1, concentrations are above 1 µg/L until simulation year 8 for NH-34, simulation year 9 for NH-45, and simulation year 12 for NH-37. Concentrations reduce more rapidly in Remediation wells for Sensitivity Plume Case 1 as a result of the lack of an on-going source at Hewitt Pit in this case.

The sensitivity of the estimated treatment plant influent concentration for the different sensitivity plume cases is presented in Figure 13. The maximum average flow-weighted influent concentrations were approximately 3 µg/L (Sensitivity Plume Case 1), 6 µg/L (Sensitivity Plume Case 2) and 8 µg/L (alternative scenario ‘Plume Case’). The estimated influent concentrations for the ‘Plume Case’ and Sensitivity Plume Case 2 were similar after approximately 11 years.

CONCLUSIONS

This document provides information relating to the numerical groundwater modeling carried out as part of the Interim RI/FS conducted by LADWP (2016) to address the synthetic contaminant 1,4-dioxane dissolved in groundwater at the NHW Well Field. Information is provided in relation to six fate and transport modeling scenarios, the results of which were summarized in Appendix A of the NHW Interim RI/FS (LADWP 2016). In addition, results of the sensitivity analysis to address the effects of selected transport parameters are provided. This document is not an evaluation of alternatives, but rather a modeling exercise to determine the most protective and cost effective combination of wells to define a remedial action alternative under a range of potential conditions (e.g. with and without third party remedial actions such as the CCC and source control at the Hewitt Pit). The information presented herein supplements Appendix A of the NHW Interim RI/FS (LADWP 2016).

ASSUMPTIONS AND LIMITATIONS

The modeling presented is subject to the following main assumptions and limitations in addition to those presented in the RI/FS.

- Data used for 1,4-dioxane plume definition:

- The plume definition used for alternative scenario modeling (referred to as the ‘Plume Case’) is intended to provide a conservative to realistic estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field. Compared to Sensitivity Plume Cases 1 and 2, the ‘Plume Case’ used for alternative scenario modeling is considered more conservative in terms of protection of human health and the environment considering uncertainties and variabilities in the underlying data, assumptions and limitations of the remedial alternative simulations described herein. This assumption was subject to sensitivity analysis to develop a greater understanding of how plume definition affects modeling results.
- Exact source conditions in the vicinity of Hewitt Pit are unknown and have been interpreted based on available site data from the relevant studies cited in Appendix A of the NHW Interim RI/FS. This interpretation was subject to sensitivity analysis to develop a greater understanding of how source conditions in the vicinity of Hewitt Pit affects modeling results.

- Modeling:
  - Solute transport model development was not subject to calibration; however, the various assumptions regarding the source term, initial contaminant distributions and transport model parameterization are considered adequate for evaluating the relative differences for the various pumping scenarios. The sensitivity analysis using different simulated plume cases, Hewitt Pit source boundary conditions and values for dispersivity provide bookends for likely plume migration that is intended to encompass much of the variability that might be identified through a formal calibration process. Uncertainties that may be introduced through the lack of formal calibration are expected to fall within the range of results produced in the sensitivity analysis.

REFERENCES

AMEC (AMEC Foster Wheeler Environment & Infrastructure, Inc.). 2015. Groundwater Modeling Memorandum, North Hollywood Operable Unit, Second Interim Remedy, Groundwater Remediation System Design. Proj. Number 8615180350. July, 2015.

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LADWP (Los Angeles Department of Power and Water), 2016. Interim Remedial Investigation / Feasibility Study Report, North Hollywood West Well Field. Submitted by Hazen and Sawyer (Hazen) under Agreement No. 47329-5 (Owner’s Agent for the SFB Remediation)

Tables

Table 1: Summary of Simulated Production Rates for Key NHW Production Wells by Scenario

Scenario	Summary Type	NH-26	NH-34	NH-37	NH-43A	NH-44	NH-45
Alternative Scenario 3-1	Simulation Year When Pumping Starts	5	2.5	2.5	5	5	2.5
	Typical Rate When Active (cfs)	3.6	5.6	3.3	5.4	5.2	7.5
	Well Category	Secondary	Remediation	Remediation	Secondary	Secondary	Remediation
Alternative Scenario 3-2	Simulation Year When Pumping Starts	5	2.5	2.5	5	5	2.5
	Typical Rate When Active (cfs)	3.6	5.6	3.3	5.4	5.2	7.5
	Well Category	Secondary	Remediation	Remediation	Secondary	Secondary	Remediation
Alternative Scenario 3-3	Simulation Year When Pumping Starts	2.5	2.5	2.5	2.5	2.5	2.5
	Typical Rate When Active (cfs)	3.6	5.6	3.3	5.4	5.2	7.5
	Well Category	Remediation	Remediation	Remediation	Remediation	Remediation	Remediation
Alternative Scenario 3-4	Simulation Year When Pumping Starts	2.5	2.5	2.5	2.5	2.5	2.5
	Typical Rate When Active (cfs)	3.6	5.6	3.3	5.4	5.2	7.5
	Well Category	Remediation	Remediation	Remediation	Remediation	Remediation	Remediation
Alternative Scenario 3-5	Simulation Year When Pumping Starts	2.5	2.5	2.5	2.5	2.5	2.5
	Typical Rate When Active (cfs)	3.6	5.6	3.3	5.4	5.2	7.5
	Well Category	Remediation	Remediation	Remediation	Remediation	Remediation	Remediation
Alternative Scenario 3-6	Simulation Year When Pumping Starts	5	5	2.5	2.5	5	2.5
	Typical Rate When Active (cfs)	3.6	5.6	3.3	5.4	5.2	7.5
	Well Category	Secondary	Secondary	Remediation	Remediation	Secondary	Remediation

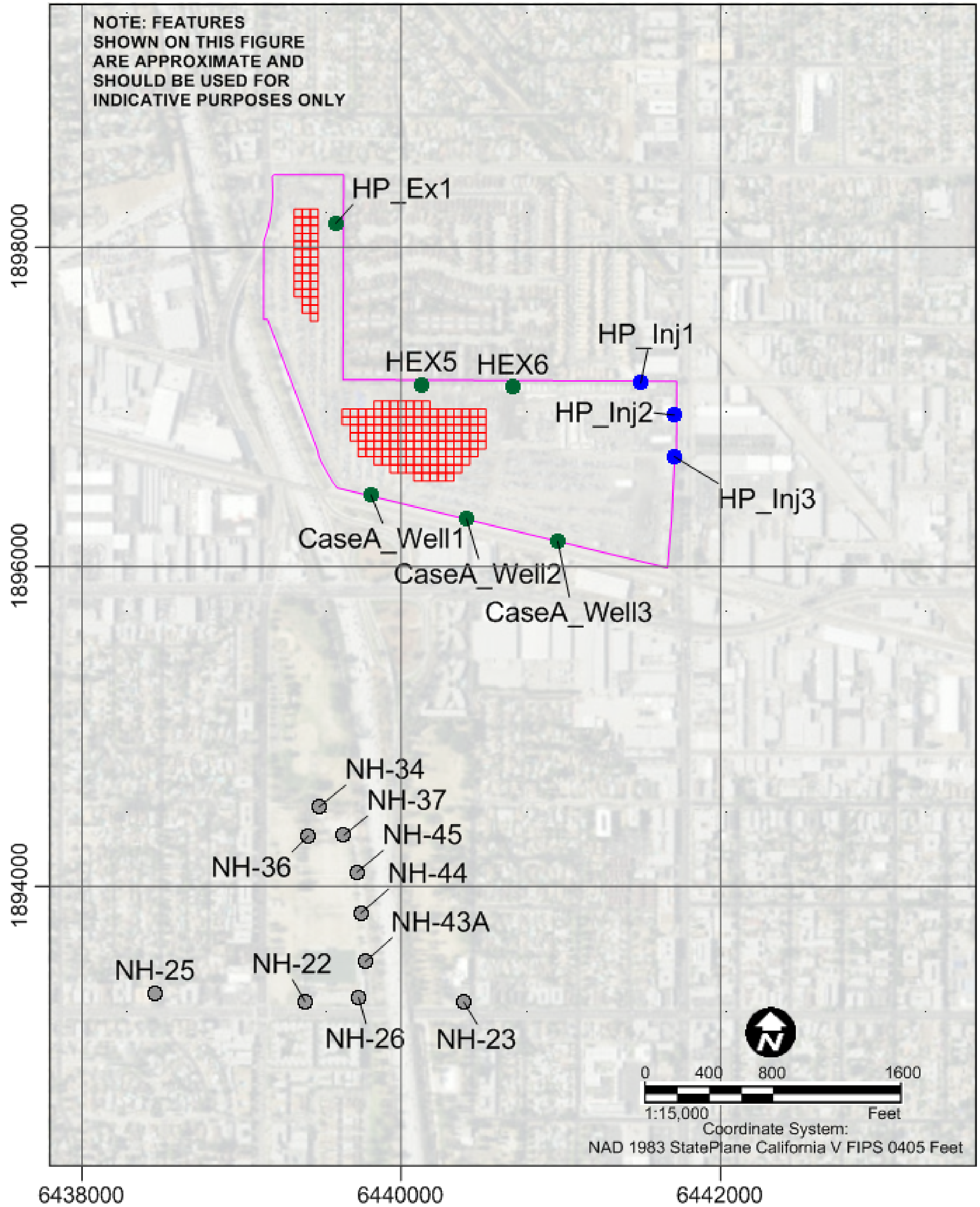
Table 2: Summary of Pumping and Reinjection Rates for Scenarios Simulating Source Control of Plume Core at Hewitt Pit

Well Name	Type	Extraction Rate (cfs)	Injection Rate (cfs)
HP_Ex1	Extraction	0.56	---
HEX5	Extraction	0.56	---
HEX6	Extraction	0.56	---
CaseA_Well1	Extraction	0.28	---
CaseA_Well2	Extraction	0.28	---
CaseA_Well3	Extraction	0.28	---
HP_Inj1	Injection	---	0.84
HP_Inj2	Injection	---	0.84
HP_Inj3	Injection	---	0.84

Table 3: Summary of Transport Modeling Scenarios *(reproduced from Table A4-5 of Appendix A of the NHW Interim RI/FS [LADWP 2016])*

Transport Modeling Alternative Scenario	Scenario Description	Maximum 1,4-Dioxane Influent Concentration (µg/L)	Time of Maximum 1,4-Dioxane Influent Concentration (Years from Plant Start-Up)	Duration of Treatment (Years From Plant Start-Up to Year All Remediation Wells are Below 1 µg/L of 1,4-Dioxane)	Remediation Wells (Piped to Treatment Plant)			Active Non-Remediation Wells (Not Piped to Treatment Plant) Which Are Below 1 µg/L of 1,4-Dioxane			Inactive Wells or Wells Above 1 µg/L of 1,4-Dioxane			Total Available Well Field Capacity (AFY)	Criterion Description				Retained (Yes/No)
					Count	Well Names	Capacity of Wells (AFY)	Count	Well Names	Capacity of Wells (AFY)	Count	Well Names	Capacity of Wells (AFY)		Comparative Criterion 1: Required Treatment Capacity	Comparative Criterion 2: Non-Remediation Capacity	Comparative Criterion 3: Required Treatment Duration	Comparative Criterion 4: Dependent on Remediation by Third Parties	
Alternative Scenario 3-1	- NHW Well Field Remediation (3 wells)	8	Year 4	13	3	NH-34 NH-37 NH-45	11,881	10	NH-04 NH-07 NH-22 NH-25 NH-26 NH-32 NH-33 NH-36 NH-43A NH-44	24,342	1	NH-23 (Inactive)	1,955	36,223	This scenario has smaller required treatment capacity relative to other scenarios.	This scenario has greatest available non-remediation capacity.	This scenario has the shortest treatment duration.	This scenario is not dependent on other remedial action by Third Parties.	Yes
Alternative Scenario 3-2	- NHW Well Field Remediation (3 wells), - CCC Remediation, - Hewitt Pit Remediation	4	Year 1	13	3	NH-34 NH-37 NH-45	11,881	10	NH-04 NH-07 NH-22 NH-25 NH-26 NH-32 NH-33 NH-36 NH-43A NH-44	24,342	1	NH-23 (Inactive)	1,955	36,223	This scenario has smaller required treatment capacity relative to other scenarios.	This scenario has greatest available non-remediation capacity.	This scenario has the shortest treatment duration.	This scenario is dependent on other remedial action by Third Parties.	No
Alternative Scenario 3-3	- NHW Well Field Remediation (6 wells)	4	Year 4	13	6	NH-26 NH-34 NH-37 NH-43A NH-44 NH-45	22,168	7	NH-04 NH-07 NH-22 NH-25 NH-32 NH-33 NH-36	14,055	1	NH-23 (Inactive)	1,955	36,223	Other scenario(s) have significantly smaller required treatment capacity.	Other scenario(s) have greater available non-remediation capacity.	This scenario has the shortest treatment duration.	This scenario is not dependent on other remedial action by Third Parties.	No
Alternative Scenario 3-4	- NHW Well Field Remediation (6 wells), - CCC Remediation	5	Year 4	> 18	6	NH-26 NH-34 NH-37 NH-43A NH-44 NH-45	22,168	7	NH-04 NH-07 NH-22 NH-25 NH-32 NH-33 NH-36	14,055	1	NH-23 (Inactive)	1,955	36,223	Other scenario(s) have significantly smaller required treatment capacity.	Other scenario(s) have greater available non-remediation capacity.	Other scenario(s) have the shorter treatment duration.	This scenario is dependent on other remedial action by Third Parties.	No
Alternative Scenario 3-5	- NHW Well Field Remediation (6 wells), - CCC Remediation, - Hewitt Pit Remediation	3	Year 1	> 18	6	NH-26 NH-34 NH-37 NH-43A NH-44 NH-45	22,168	7	NH-04 NH-07 NH-22 NH-25 NH-32 NH-33 NH-36	14,055	1	NH-23 (Inactive)	1,955	36,223	Other scenario(s) have significantly smaller required treatment capacity.	Other scenario(s) have greater available non-remediation capacity.	Other scenario(s) have the shorter treatment duration.	This scenario is dependent on other remedial action by Third Parties.	No
Alternative Scenario 3-6	- NHW Well Field Remediation (3 wells - configuration 2)	7	Year 4	13	3	NH-37 NH-43A NH-45	11,736	8	NH-04 NH-07 NH-22 NH-25 NH-26 NH-32 NH-33 NH-36	16,663	1	NH-23 (Inactive) NH-34 (Above 1 µg/L) NH-44 (Above 1 µg/L)	9,779	28,399	This scenario has smaller required treatment capacity relative to other scenarios.	Other scenario(s) have greater available non-remediation capacity.	This scenario has the shortest treatment duration.	This scenario is not dependent on other remedial action by Third Parties.	No

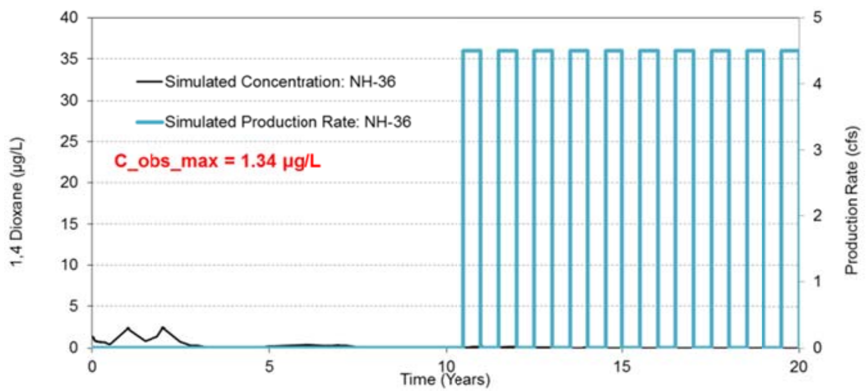
FIGURES

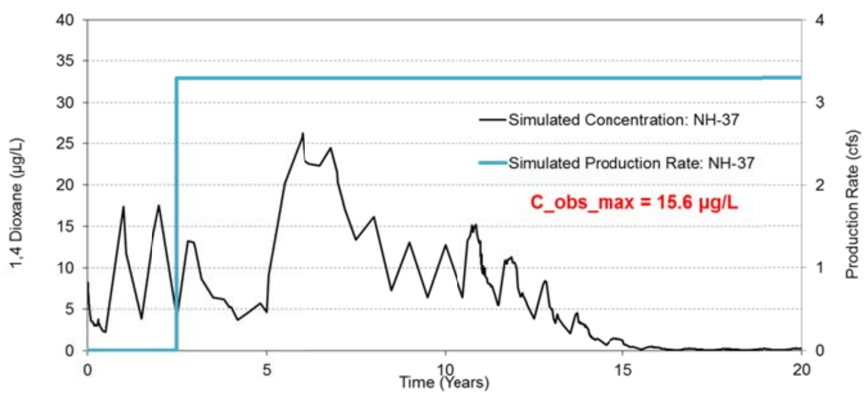


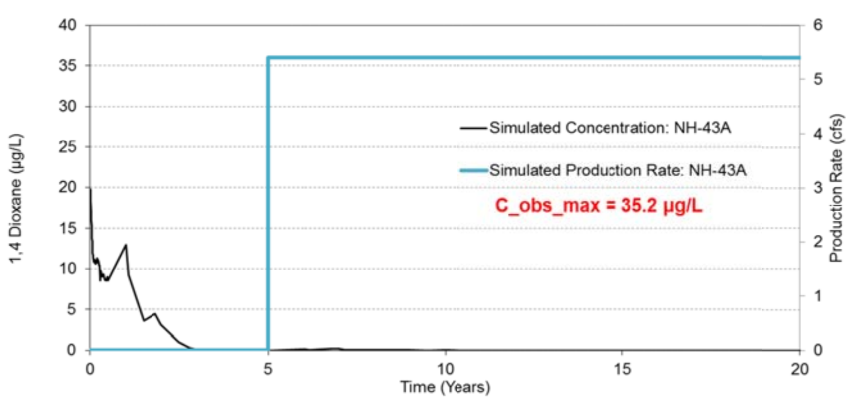
LEGEND

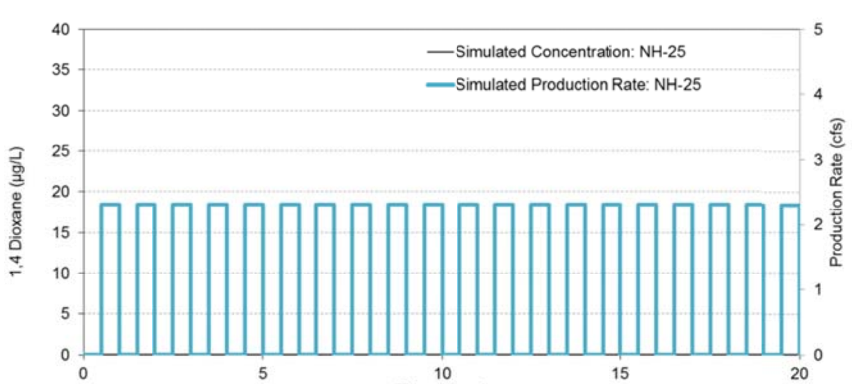
- NHW Production Wells
- Simulated Hewitt Pit Injection Wells
- Simulated Hewitt Pit Extraction Wells
- Hewitt Pit
- Simulated Hewitt Pit Source (Flux Boundary Condition)

Figure 1: Illustration of Simulated Pumping and Reinjection Locations for Scenarios Simulating Source Control of Plume Core at Hewitt Pit









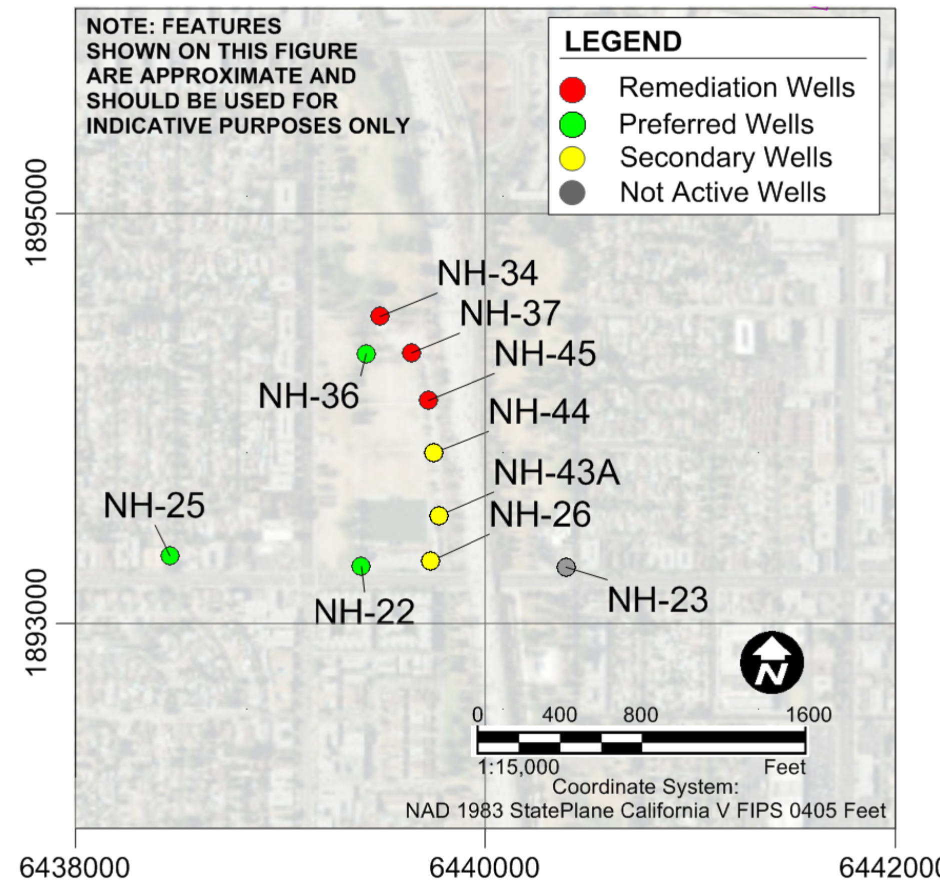
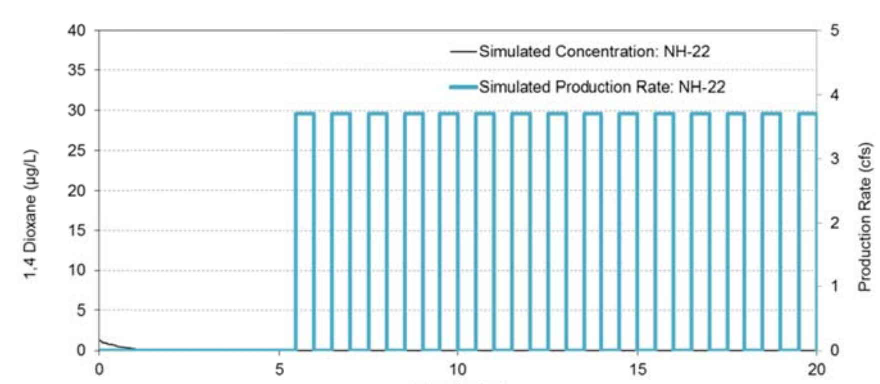
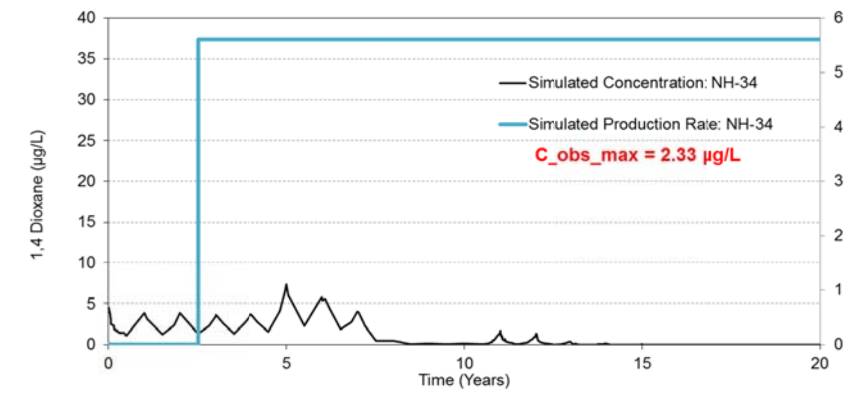
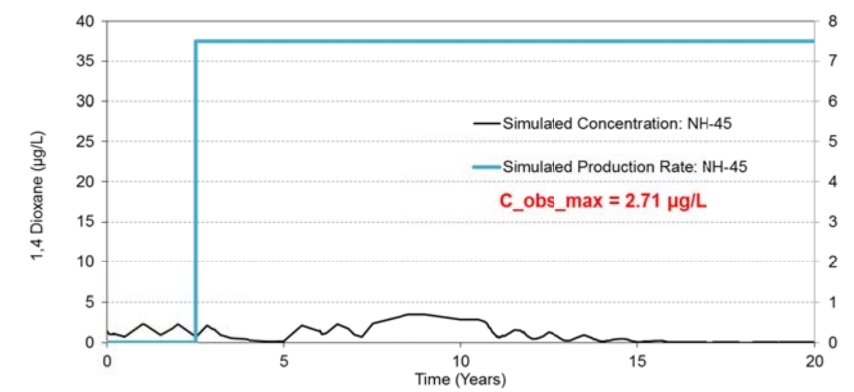


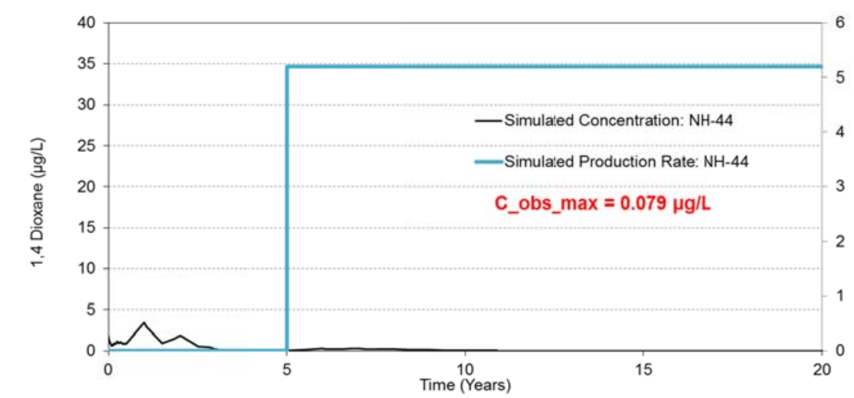
Figure 2: Alternative Scenario 3-1 Simulation - Time-Series Plots for Simulated 1,4-Dioxane Concentrations and Production Rates for Selected NHW Production Wells
(reproduced from Figure A4-4 of Appendix A of the NHW Interim RI/FS [LADWP 2016]).

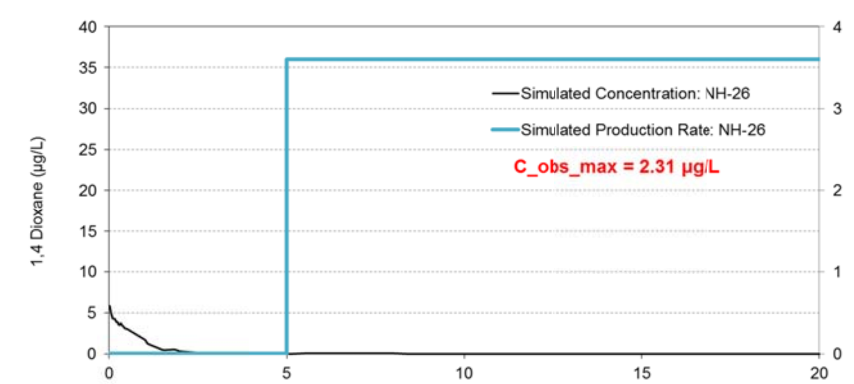
Note: C_obs_max is the maximum historical observed concentrations from production well water quality data between January 2011 and May 2016.

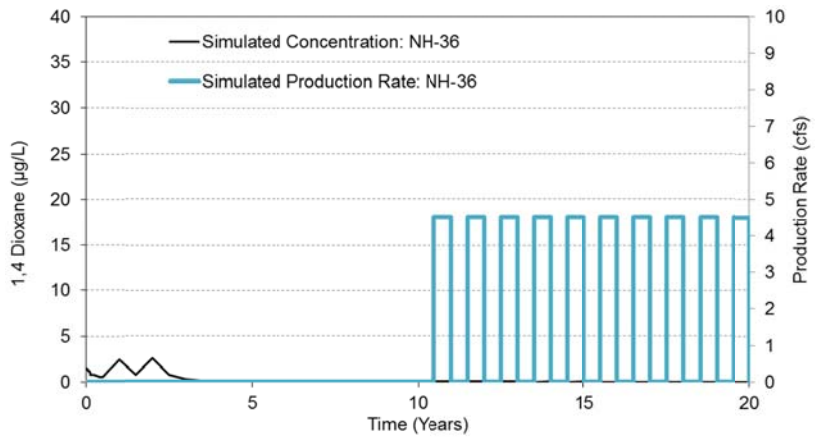


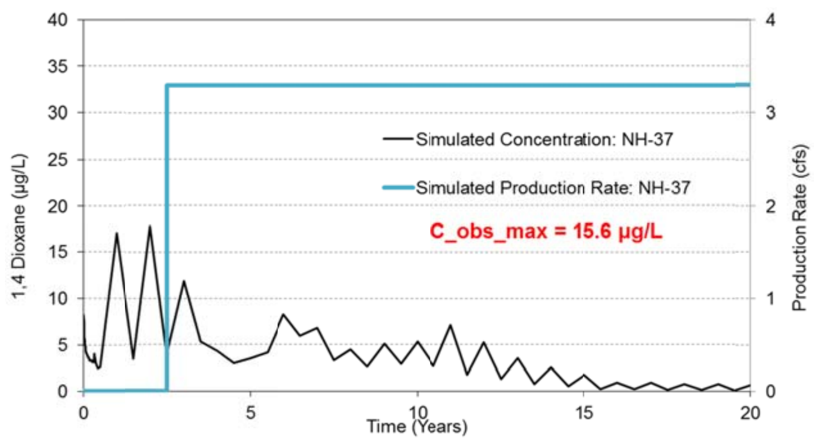


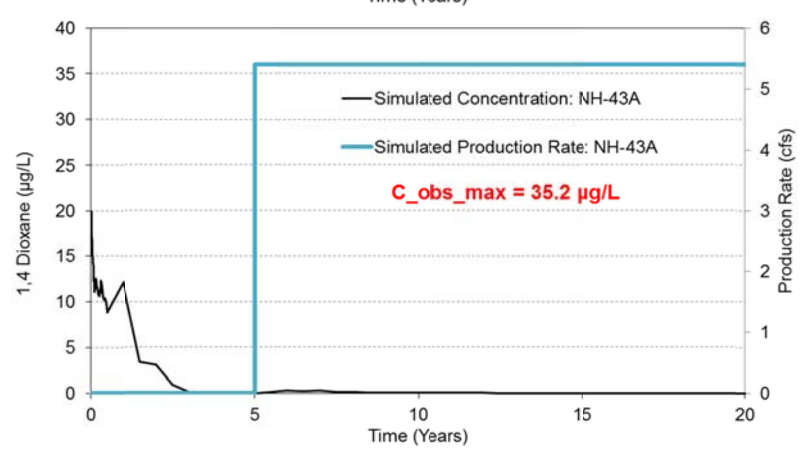


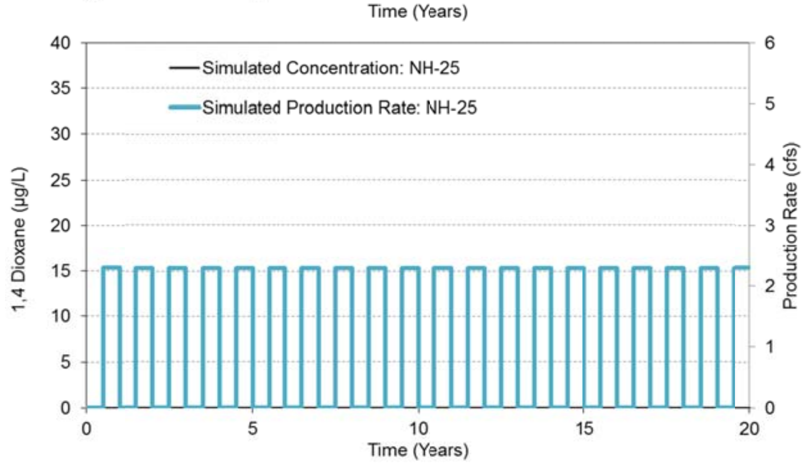












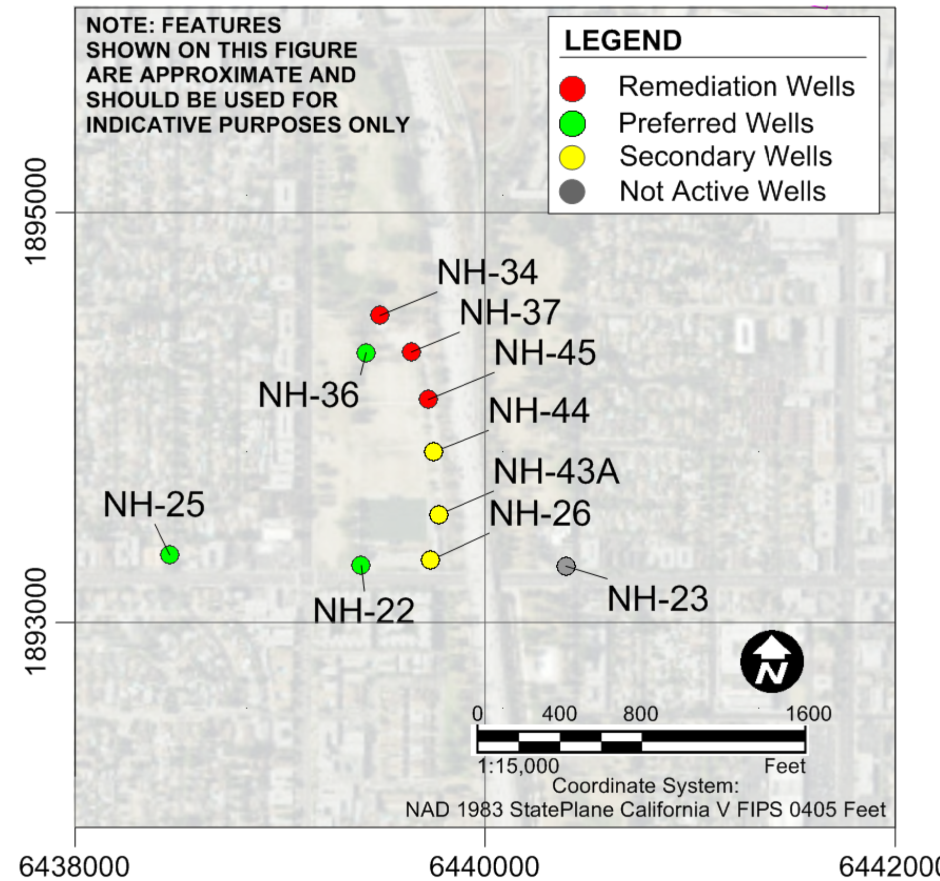
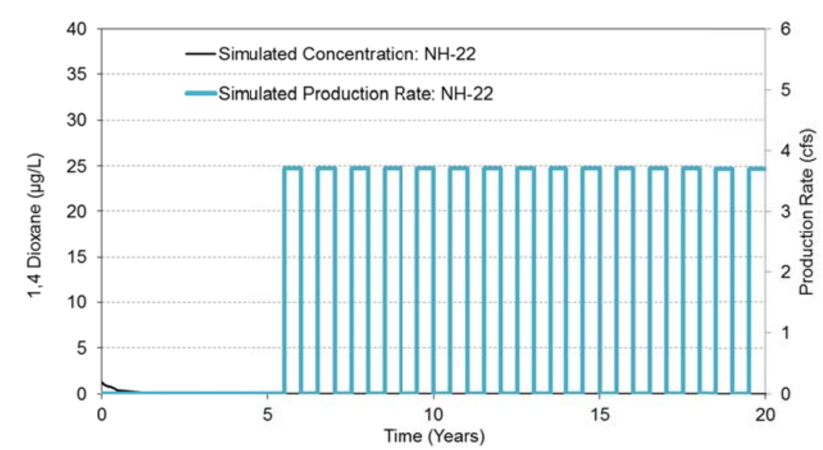
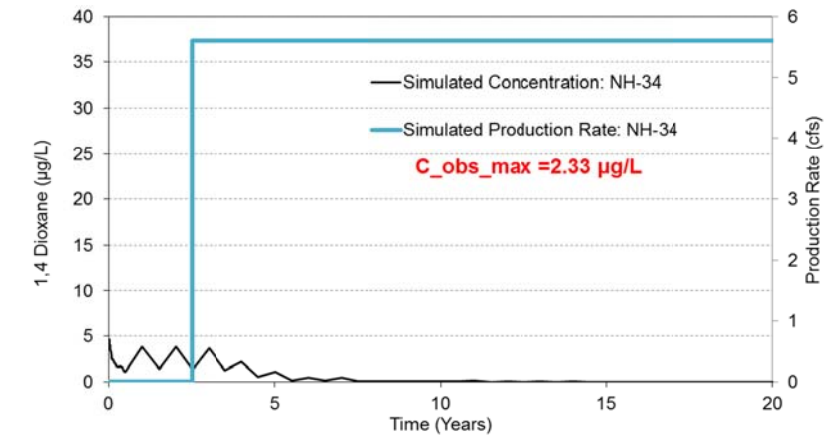


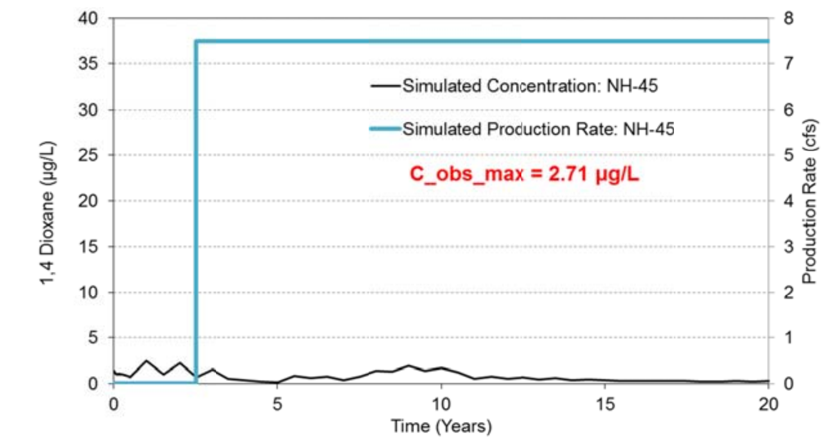
Figure 3: Alternative Scenario 3-2 Simulation - Time-Series Plots for Simulated 1,4-Dioxane Concentrations and Production Rates for Selected NHW Production Wells

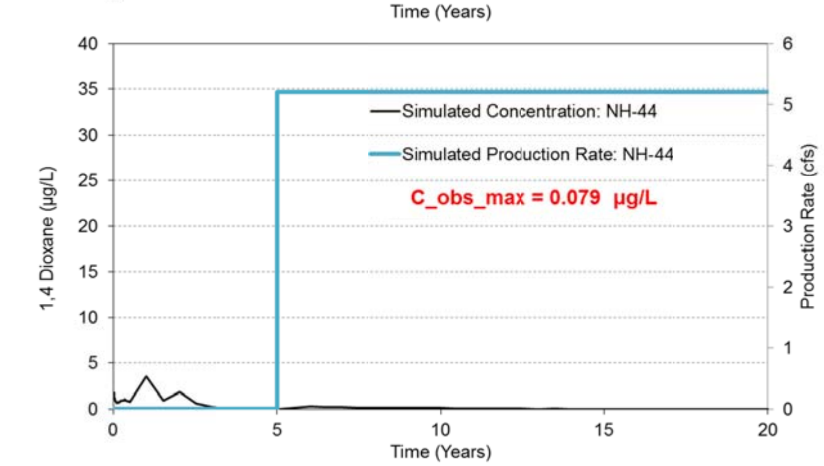
Note: C_obs_max is the maximum historical observed concentrations from production well water quality data between January 2011 and May 2016.

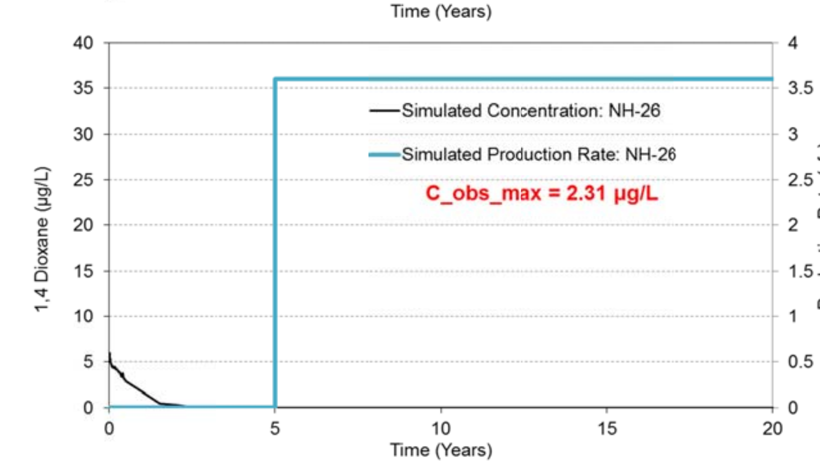
Scenario includes simulated CCC remediation and Hewitt Pit remediation.

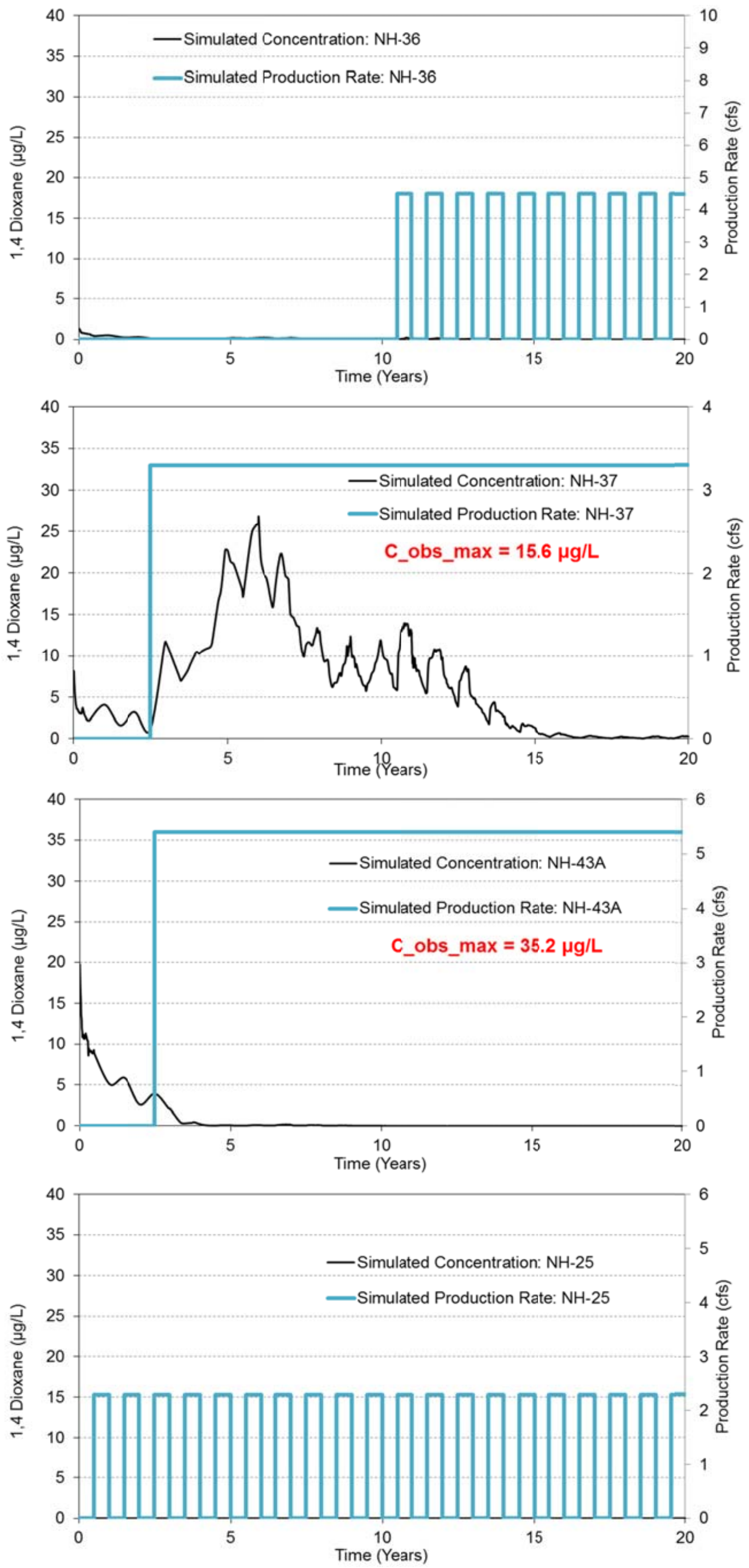












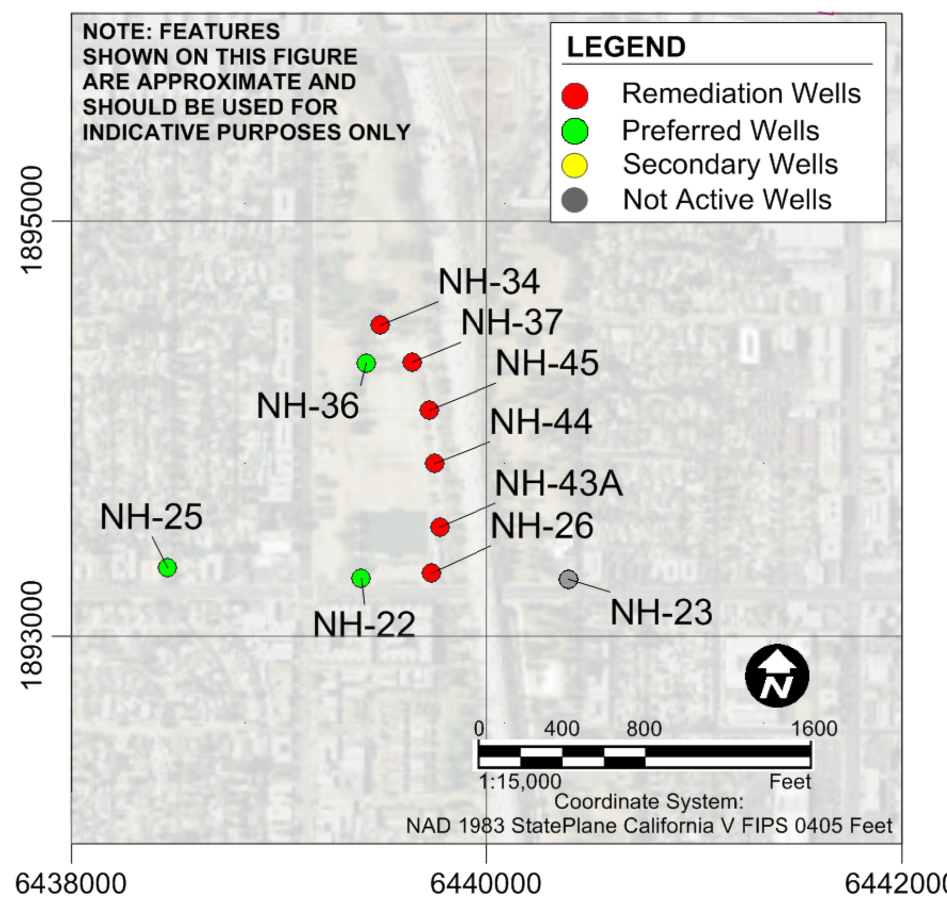
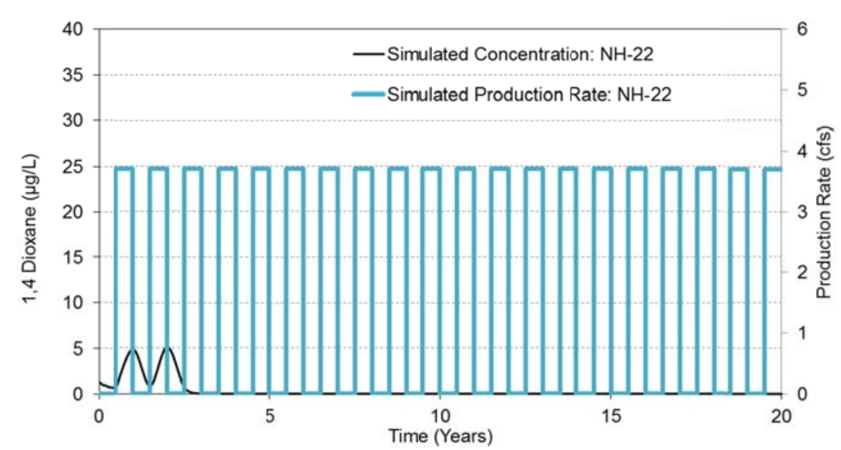
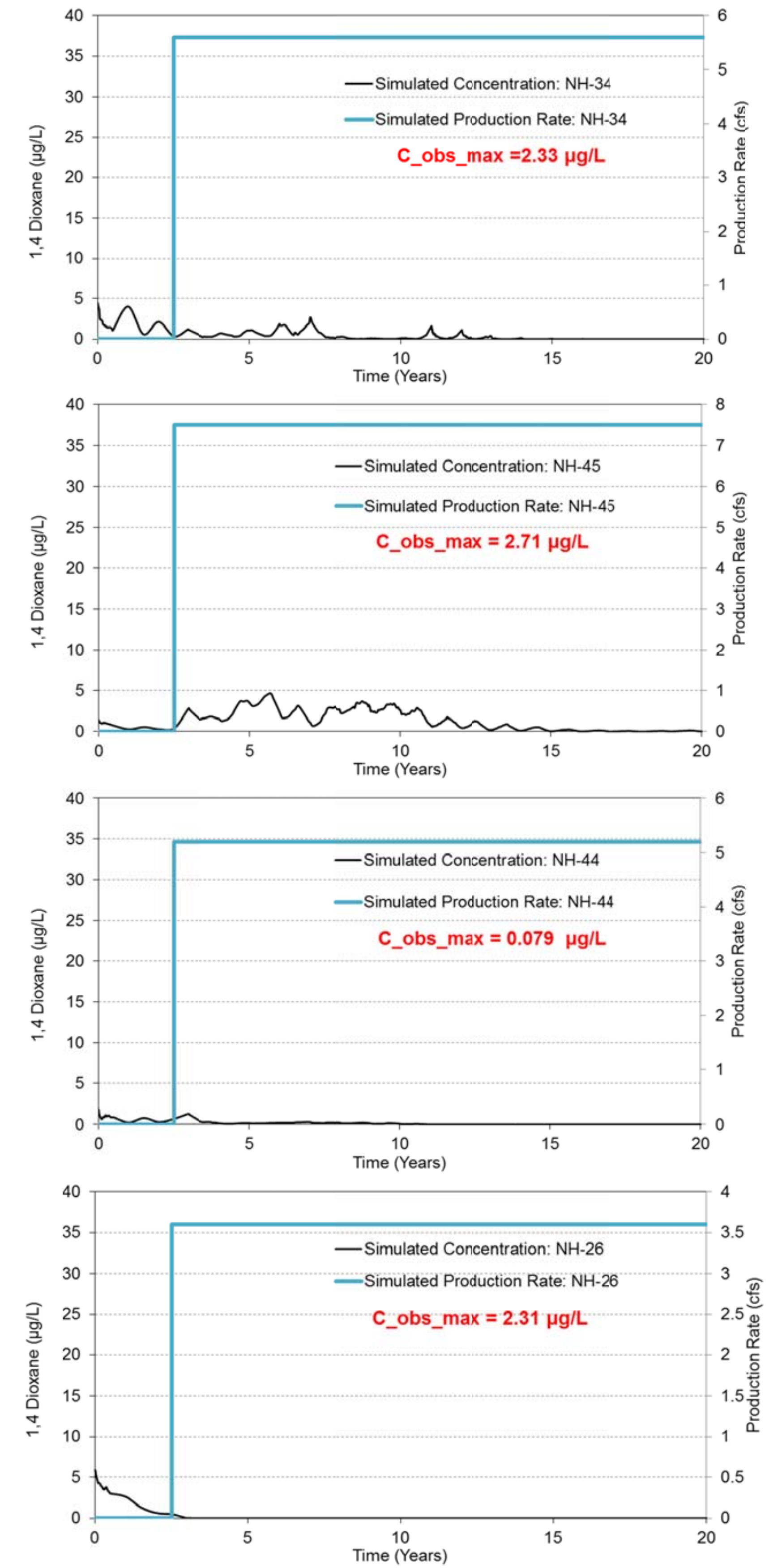
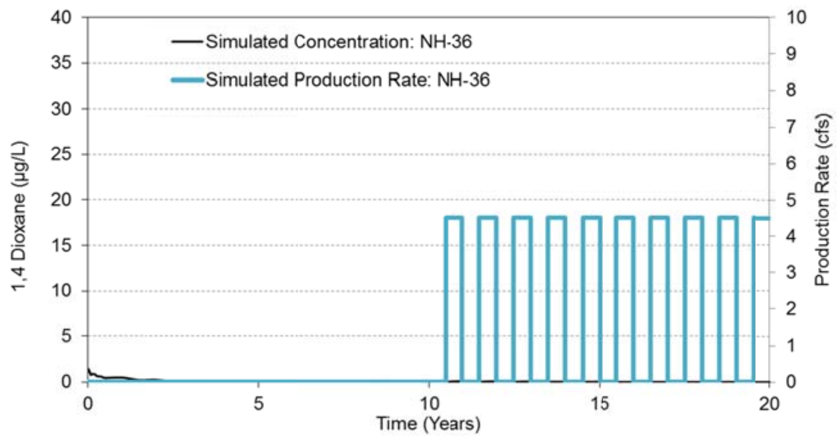


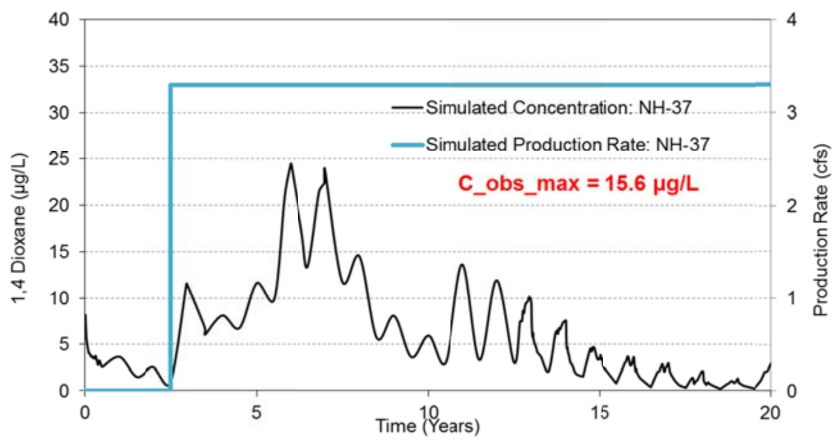
Figure 4: Alternative Scenario 3-3 Simulation - Time-Series Plots for Simulated 1,4-Dioxane Concentrations and Production Rates for Selected NHW Production Wells

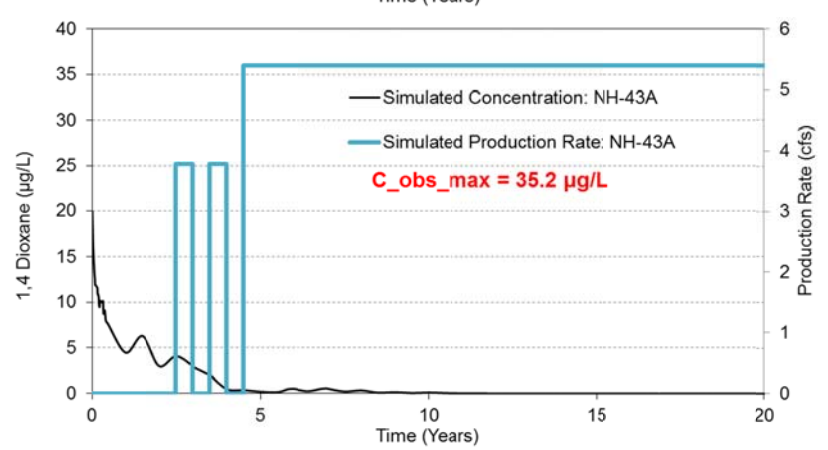
Note: C_obs_max is the maximum historical observed concentrations from production well water quality data between January 2011 and May 2016.

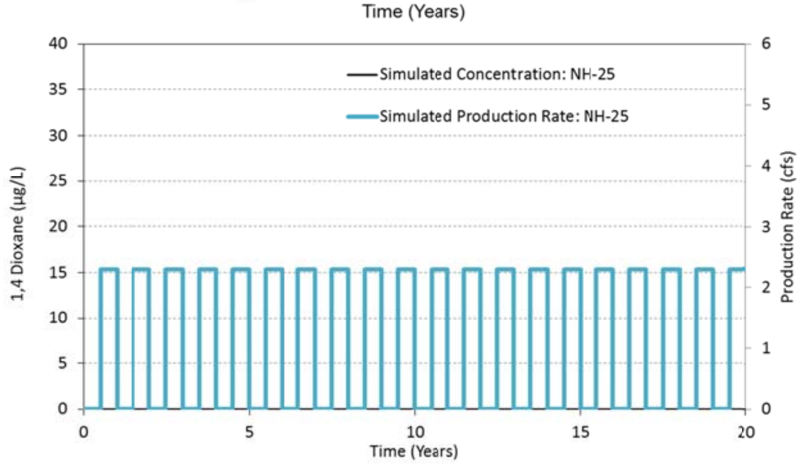












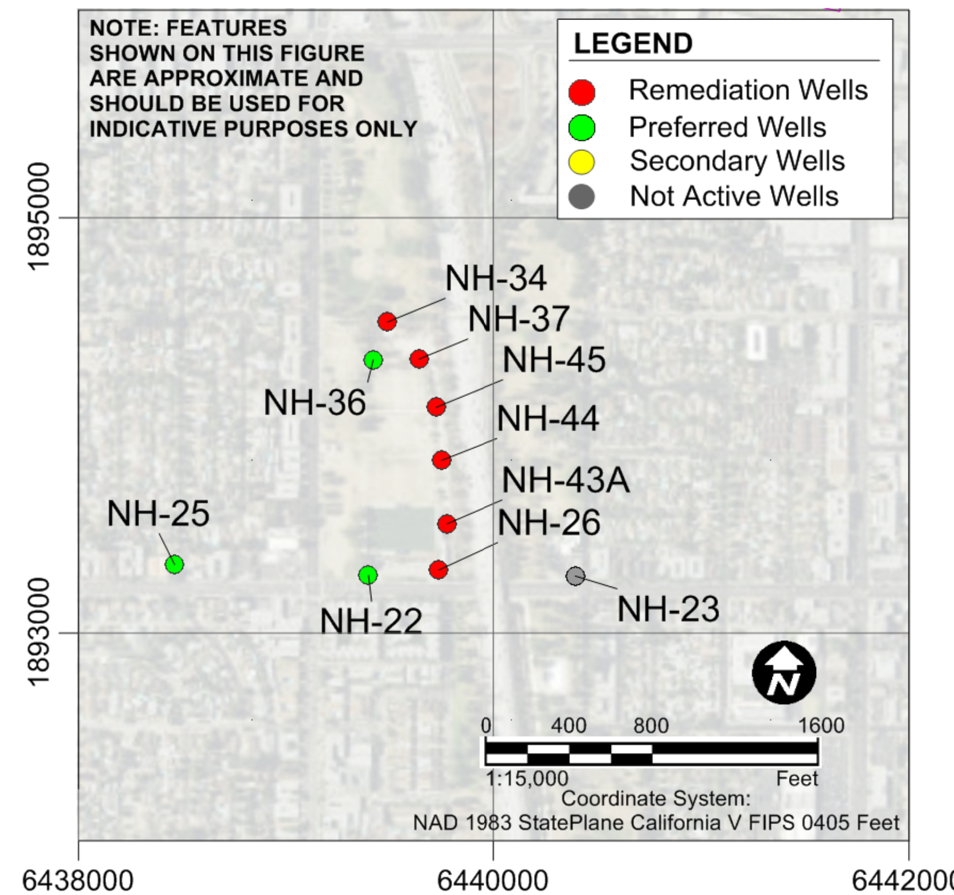
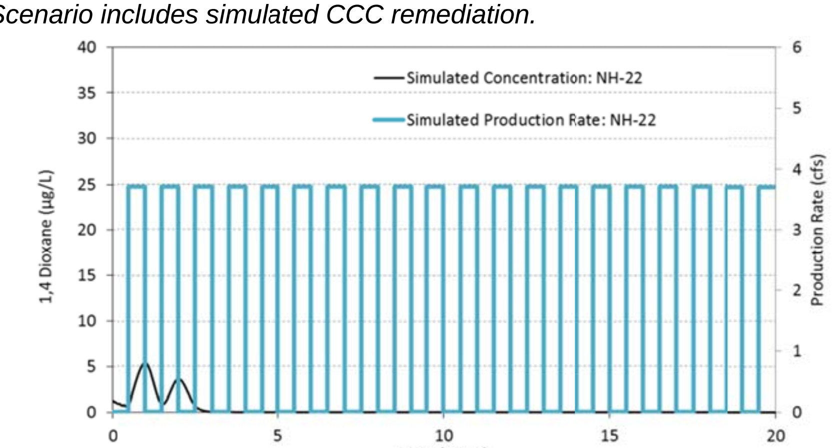
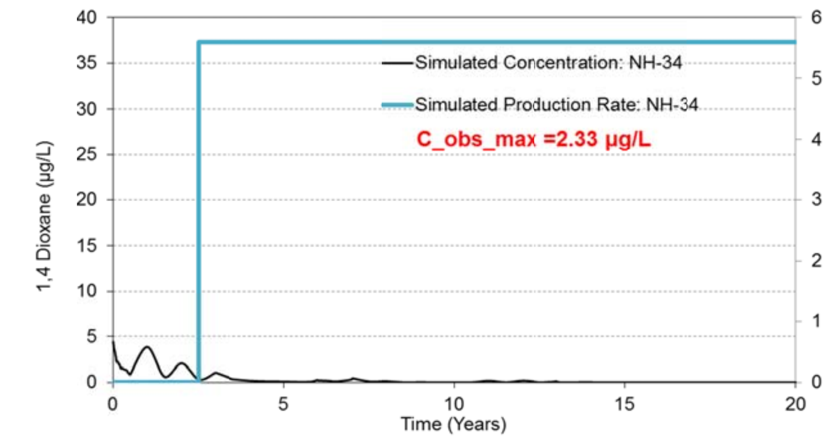


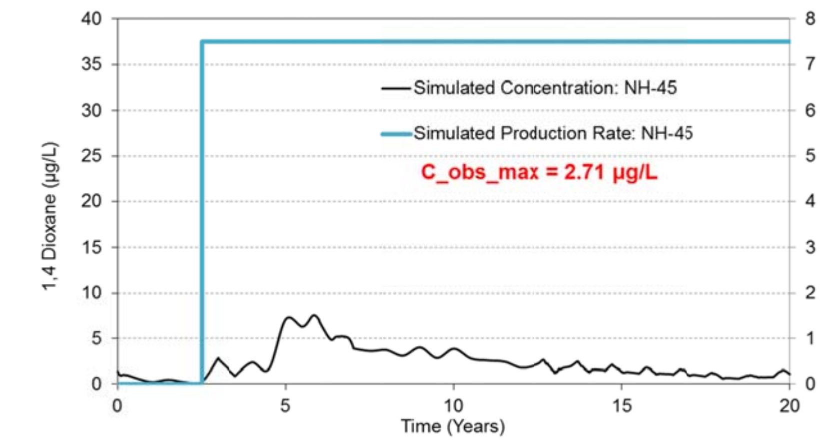
Figure 5: Alternative Scenario 3-4 Simulation - Time-Series Plots for Simulated 1,4-Dioxane Concentrations and Production Rates for Selected NHW Production Wells

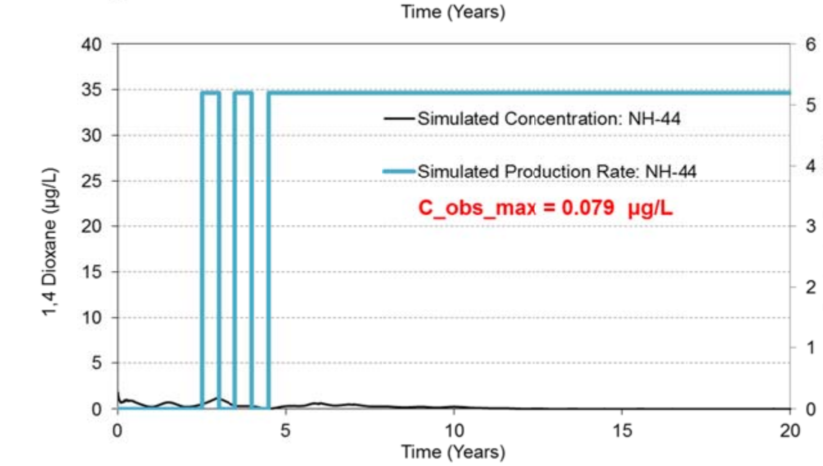
Note: C_obs_max is the maximum historical observed concentrations from production well water quality data between January 2011 and May 2016.

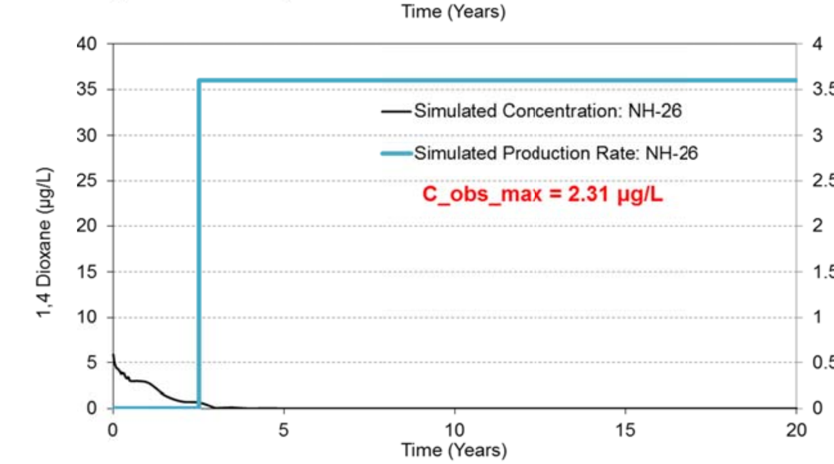
Scenario includes simulated CCC remediation.

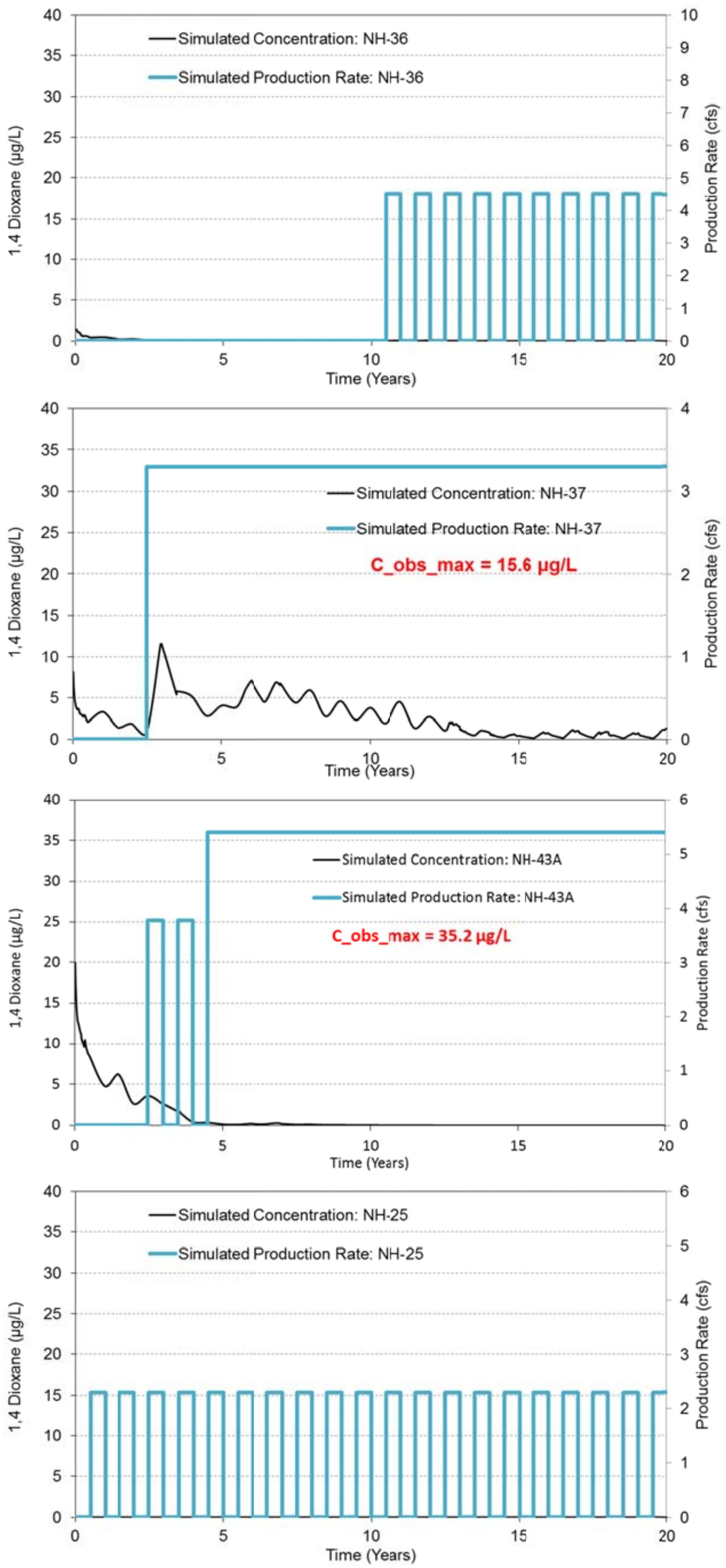












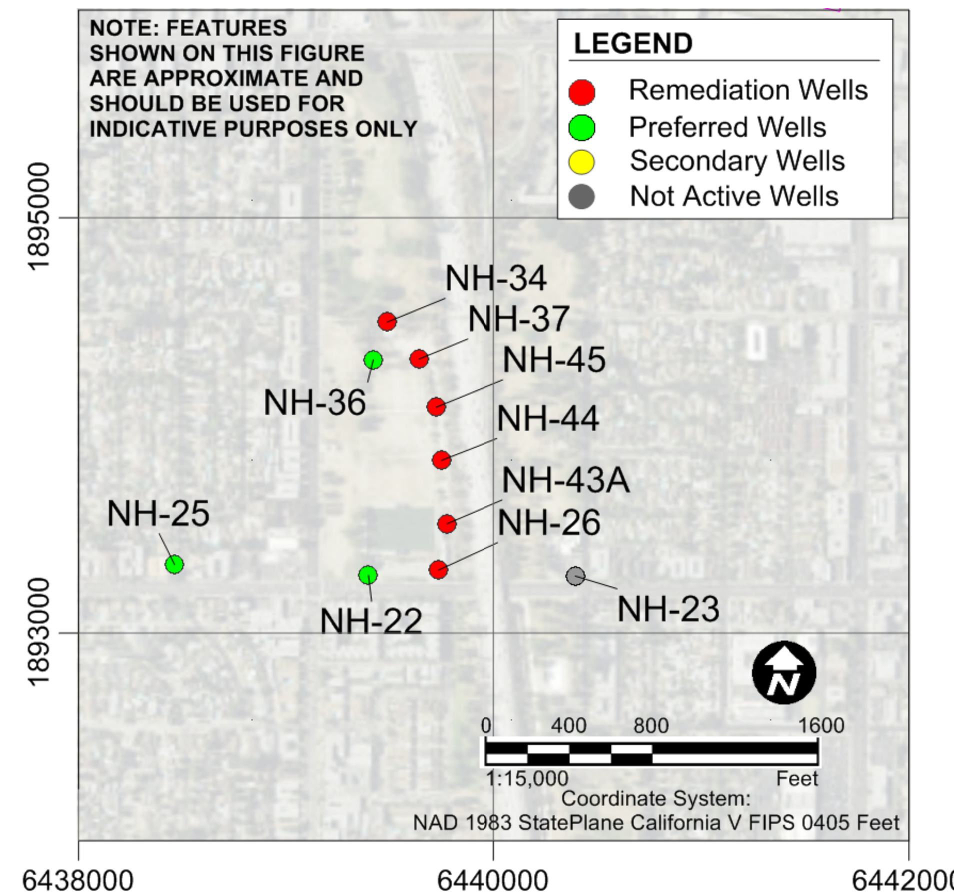
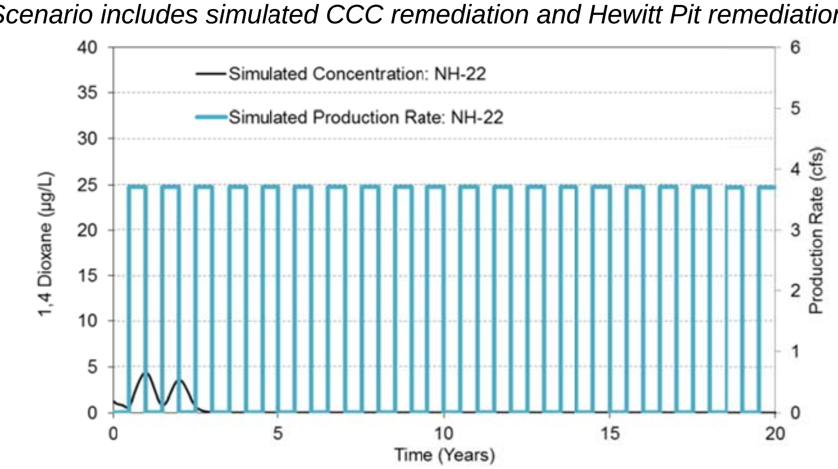
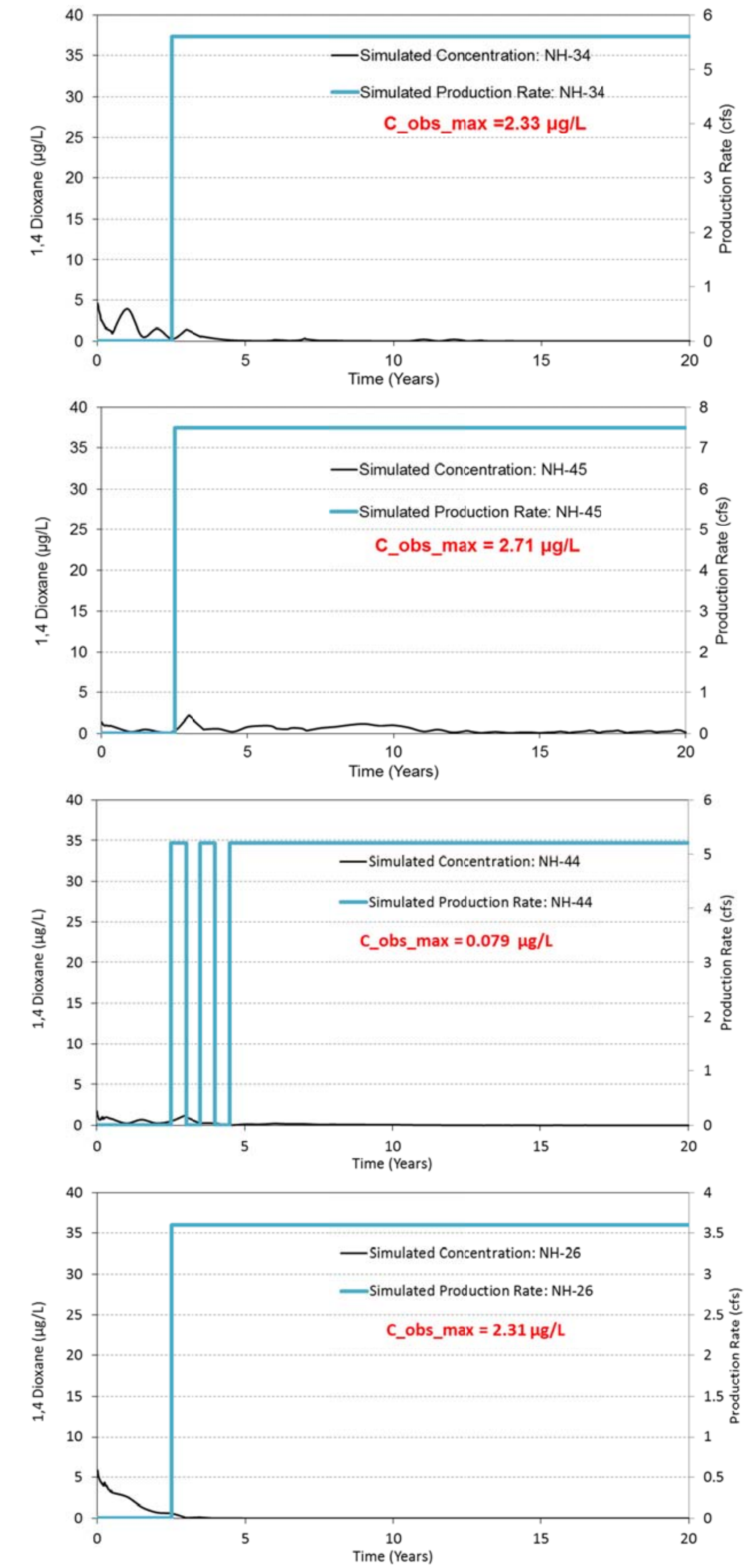


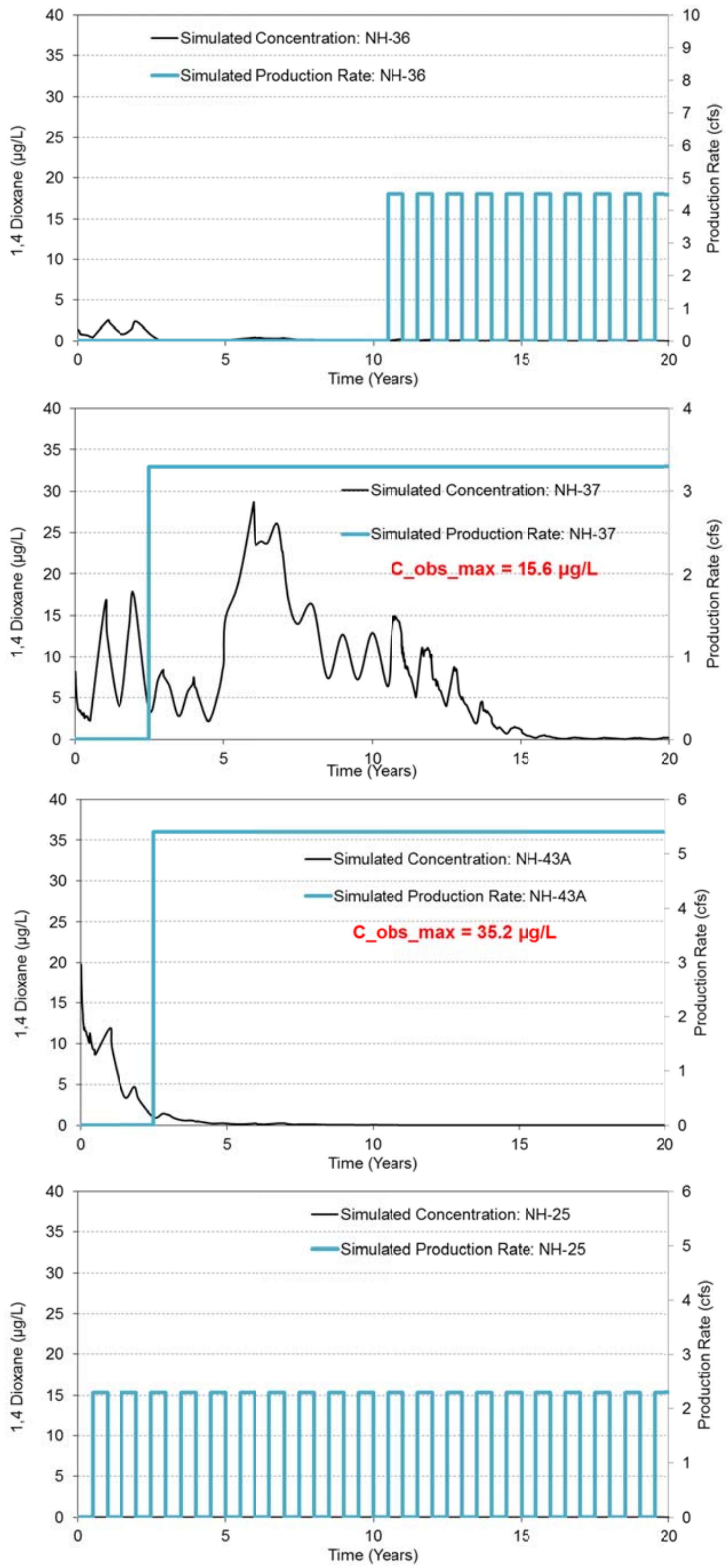
Figure 6: Alternative Scenario 3-5 Simulation - Time-Series Plots for Simulated 1,4-Dioxane Concentrations and Production Rates for Selected NHW Production Wells

Note: C_obs_max is the maximum historical observed concentrations from production well water quality data between January 2011 and May 2016.

Scenario includes simulated CCC remediation and Hewitt Pit remediation.







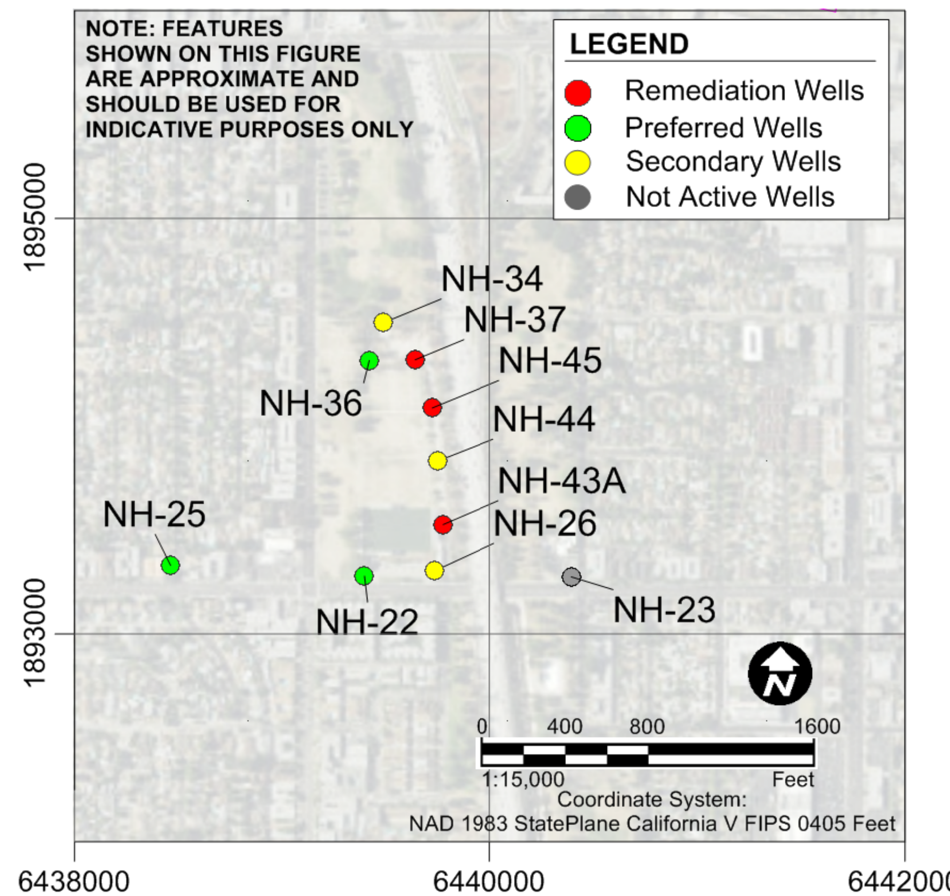
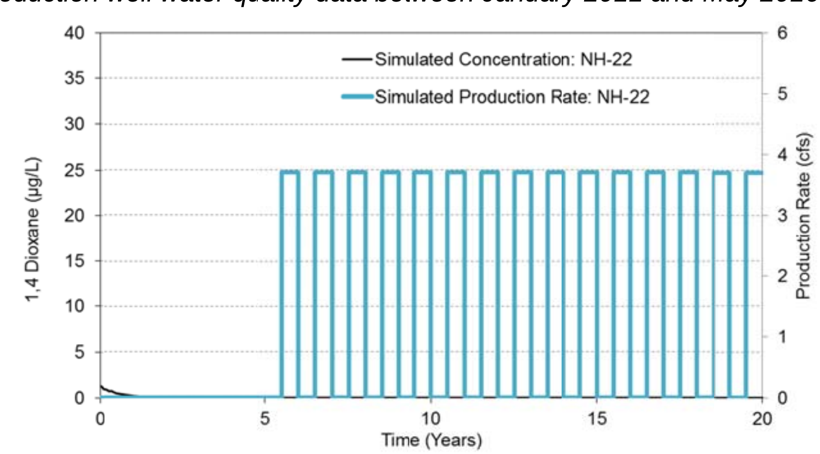
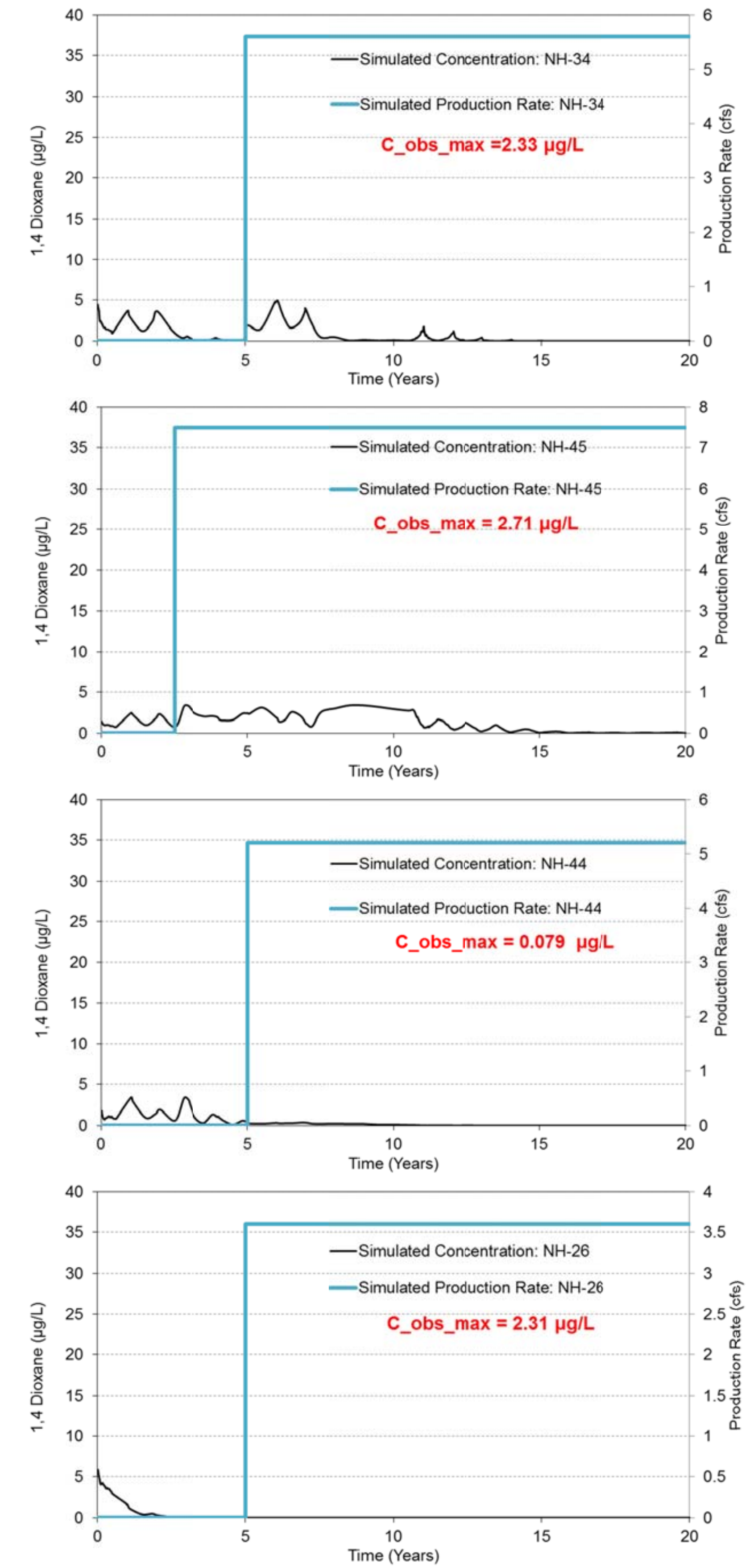


Figure 7: Alternative Scenario 3-6 Simulation - Time-Series Plots for Simulated 1,4-Dioxane Concentrations and Production Rates for Selected NHW Production Wells

Note: C_obs_max is the maximum historical observed concentrations from production well water quality data between January 2011 and May 2016.





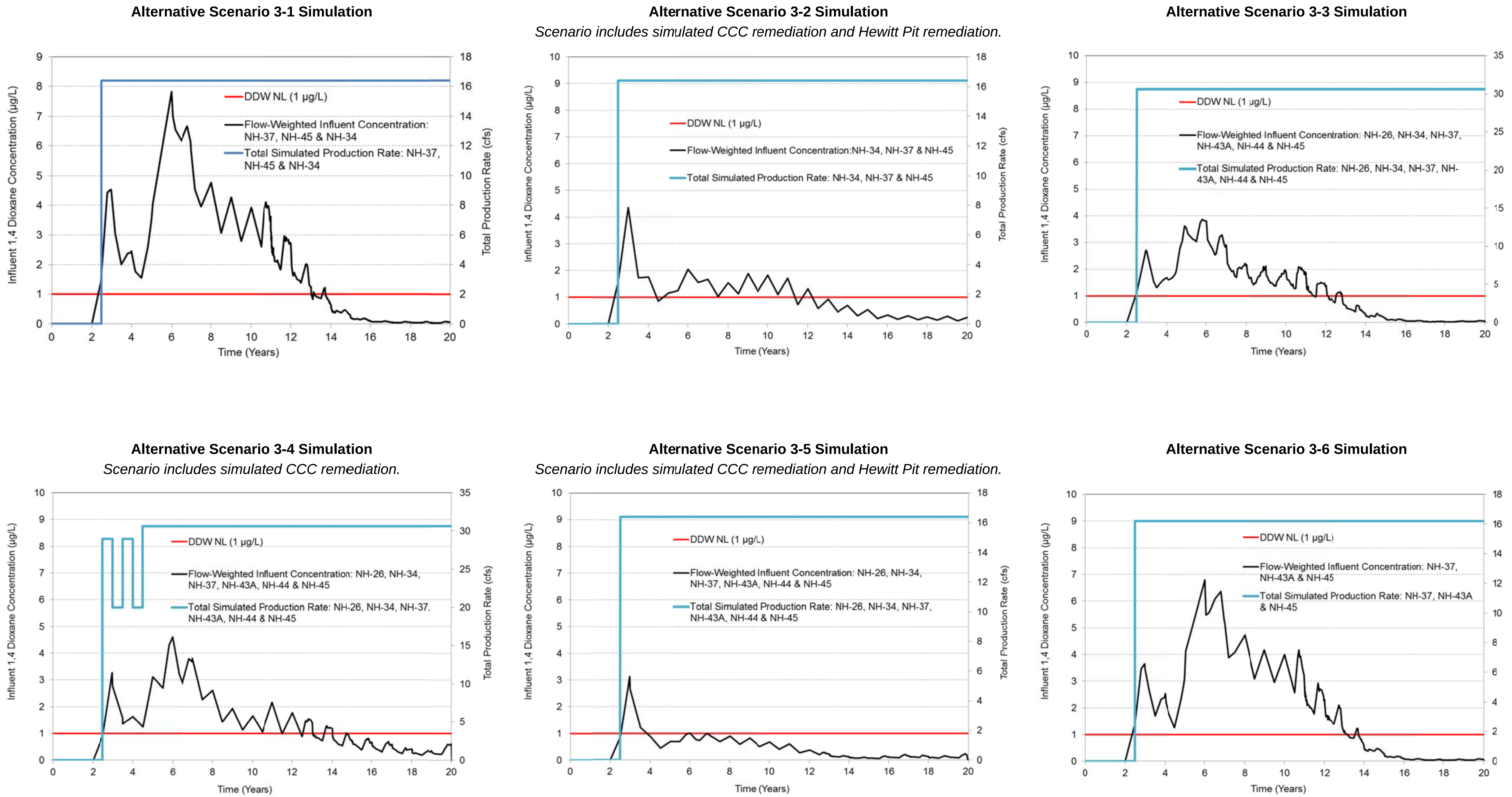


Figure 8: Estimated Flow-Weighted Influent Concentration to Treatment Facility by Scenario

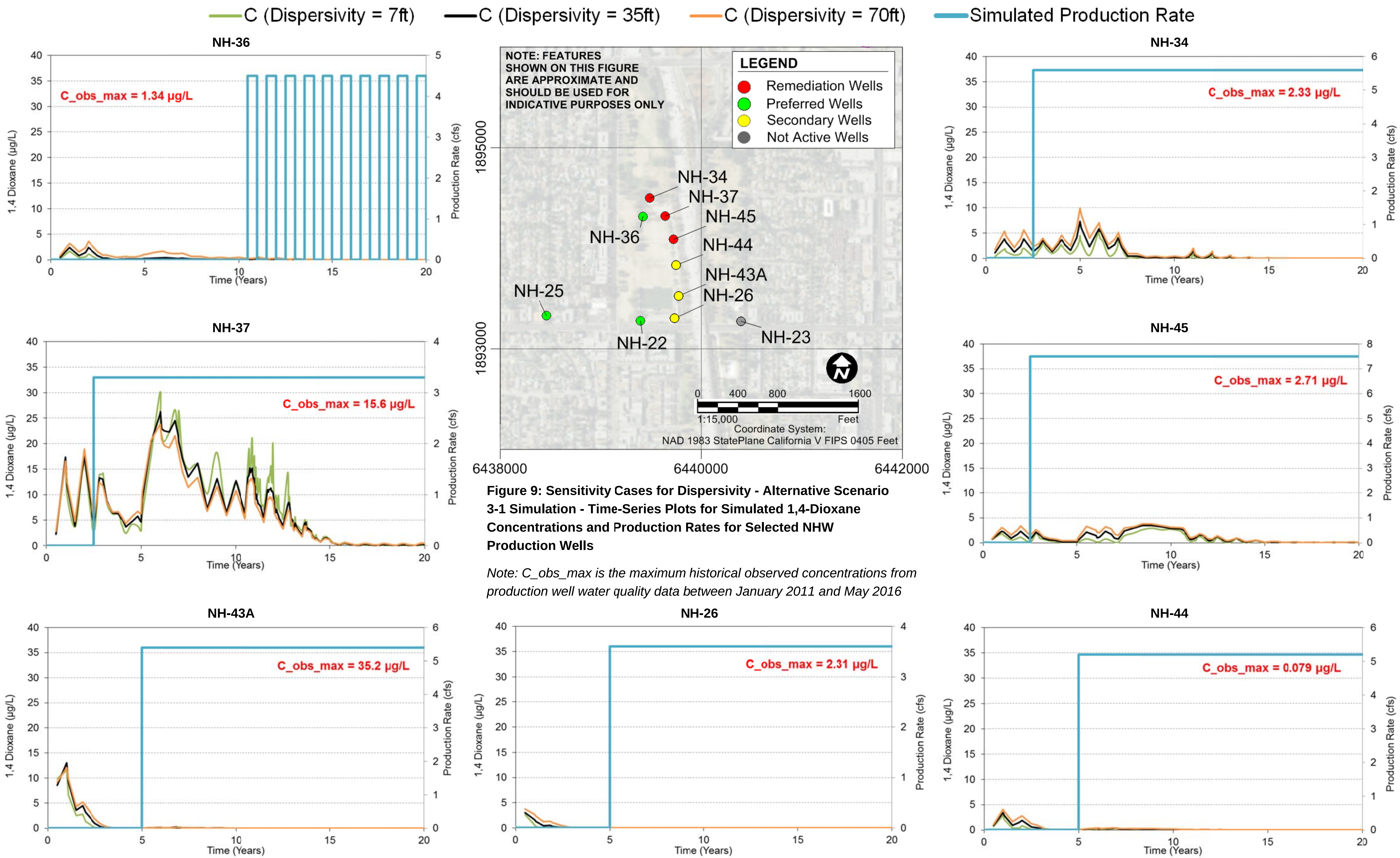


Figure 9: Sensitivity Cases for Dispersivity - Alternative Scenario 3-1 Simulation - Time-Series Plots for Simulated 1,4-Dioxane Concentrations and Production Rates for Selected NHW Production Wells

Note: C_obs_max is the maximum historical observed concentrations from production well water quality data between January 2011 and May 2016

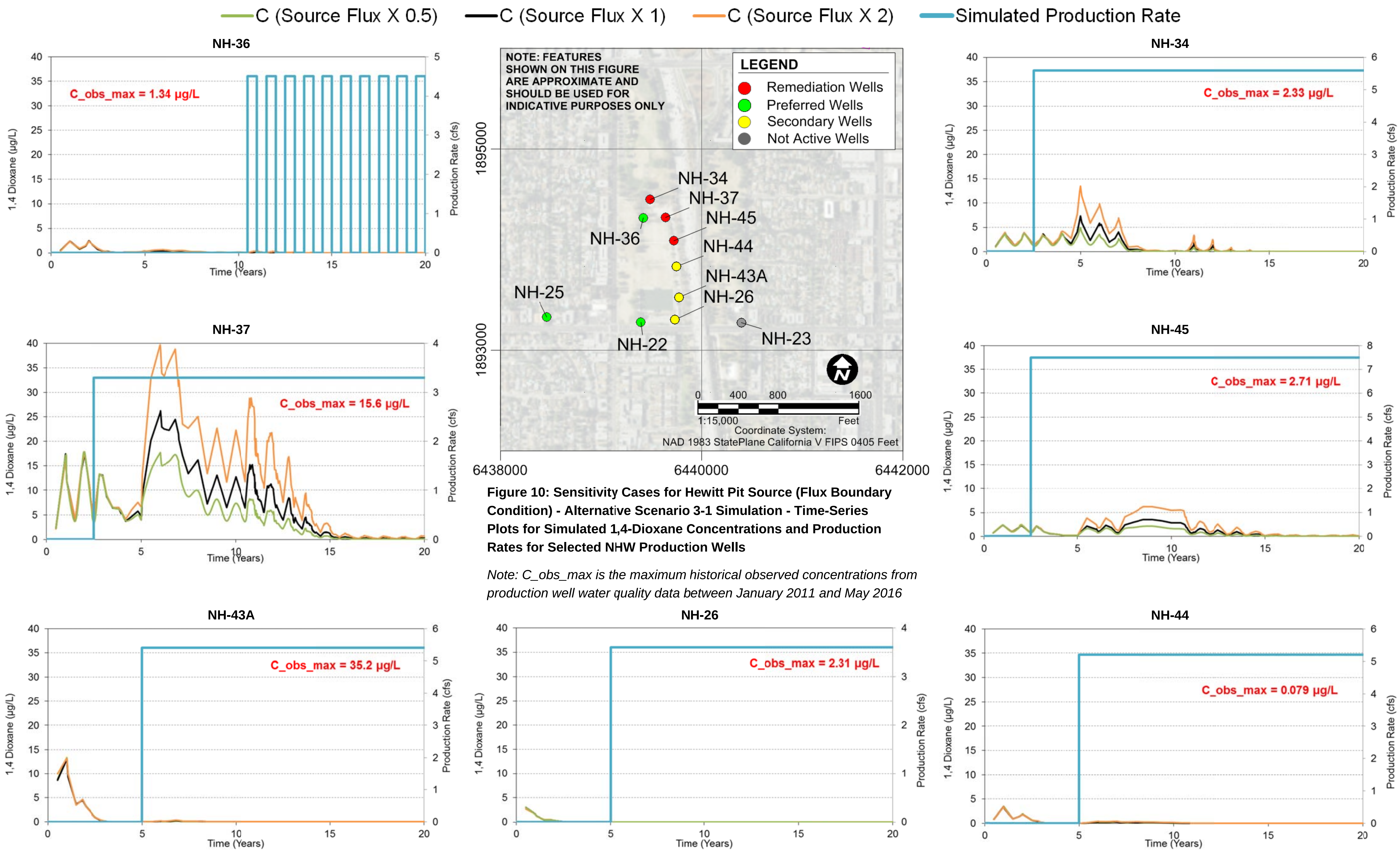
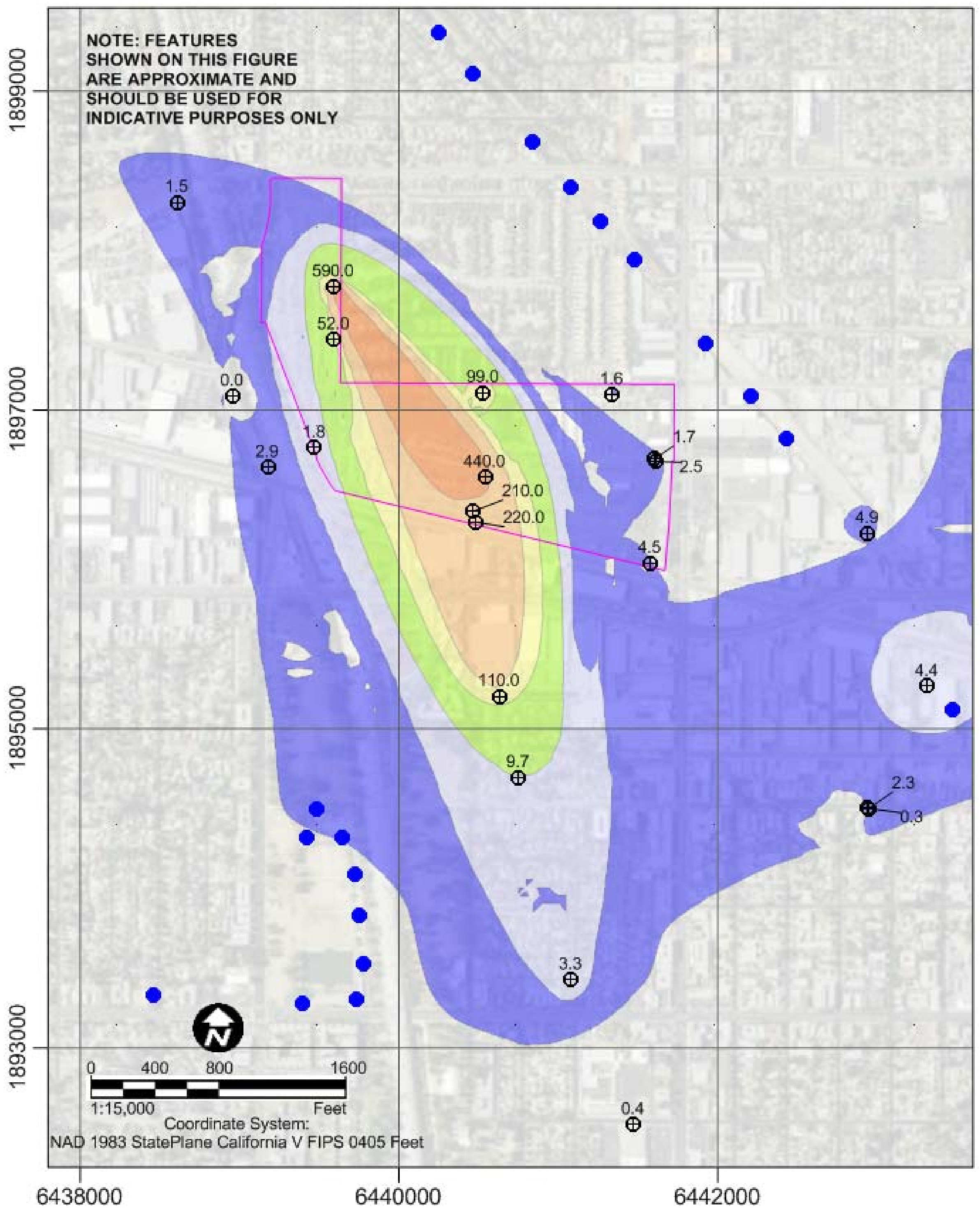


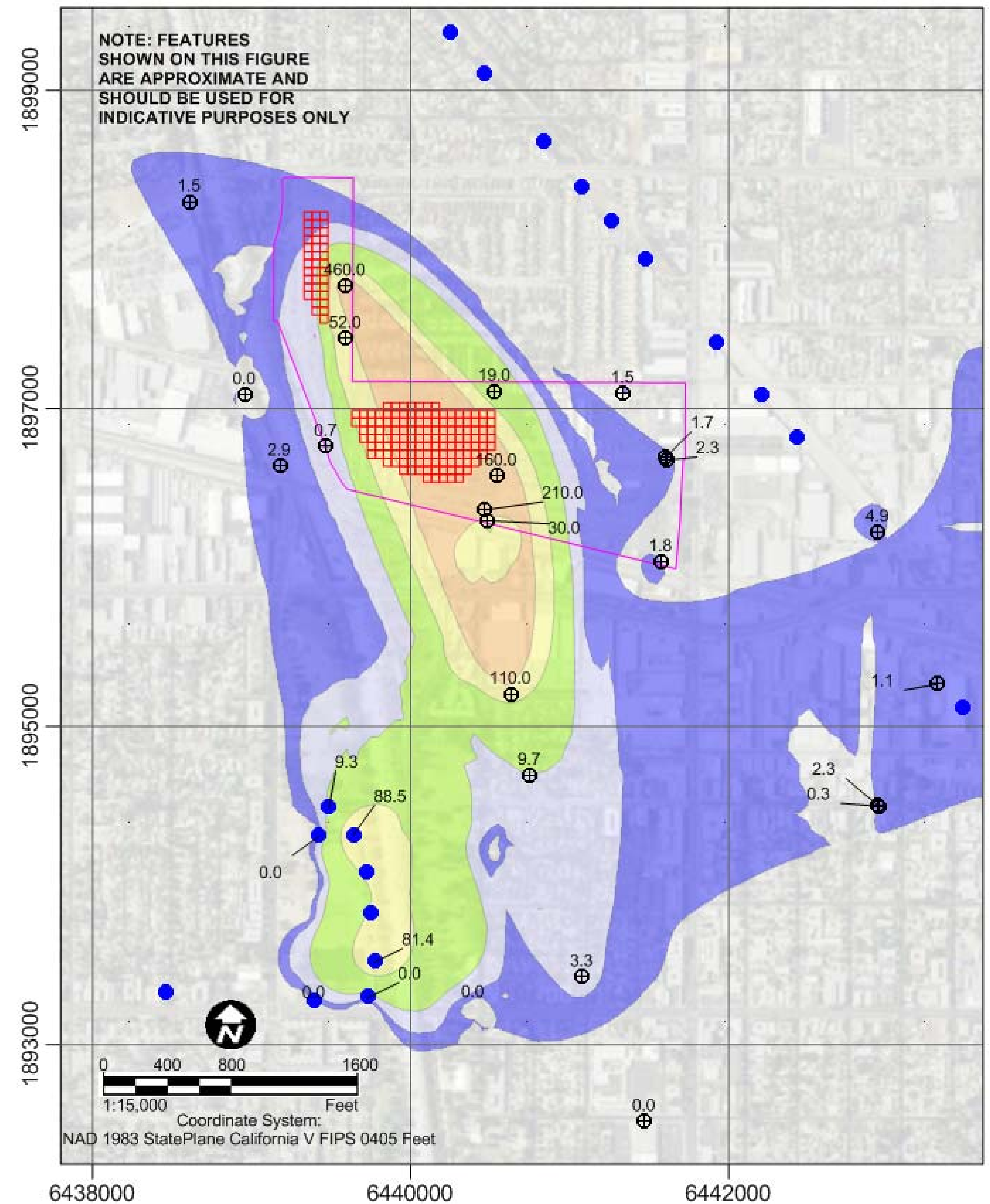
Figure 10: Sensitivity Cases for Hewitt Pit Source (Flux Boundary Condition) - Alternative Scenario 3-1 Simulation - Time-Series Plots for Simulated 1,4-Dioxane Concentrations and Production Rates for Selected NHW Production Wells

Note: C_obs_max is the maximum historical observed concentrations from production well water quality data between January 2011 and May 2016

SENSITIVITY PLUME CASE 1: A-ZONE (2IR MODEL LAYER 1 AS DEFINED IN LADWP 2016)



SENSITIVITY PLUME CASE 2: A-ZONE (2IR MODEL LAYER 1 AS DEFINED IN LADWP 2016)



LEGEND

- Production Wells
- Monitoring Wells
- 110.0 Observed Concentration (µg/L)
- Hewitt Pit
- Simulated Hewitt Pit Source (Flux Boundary Condition)

Interpolated Concentration Distribution of 1,4-Dioxane (µg/L): 1, 3, 10, 50, 100, 400

Figure 11: Interpolated Initial Concentration Distribution of 1,4-Dioxane in A-Zone the Simulated Sensitivity Plume Cases

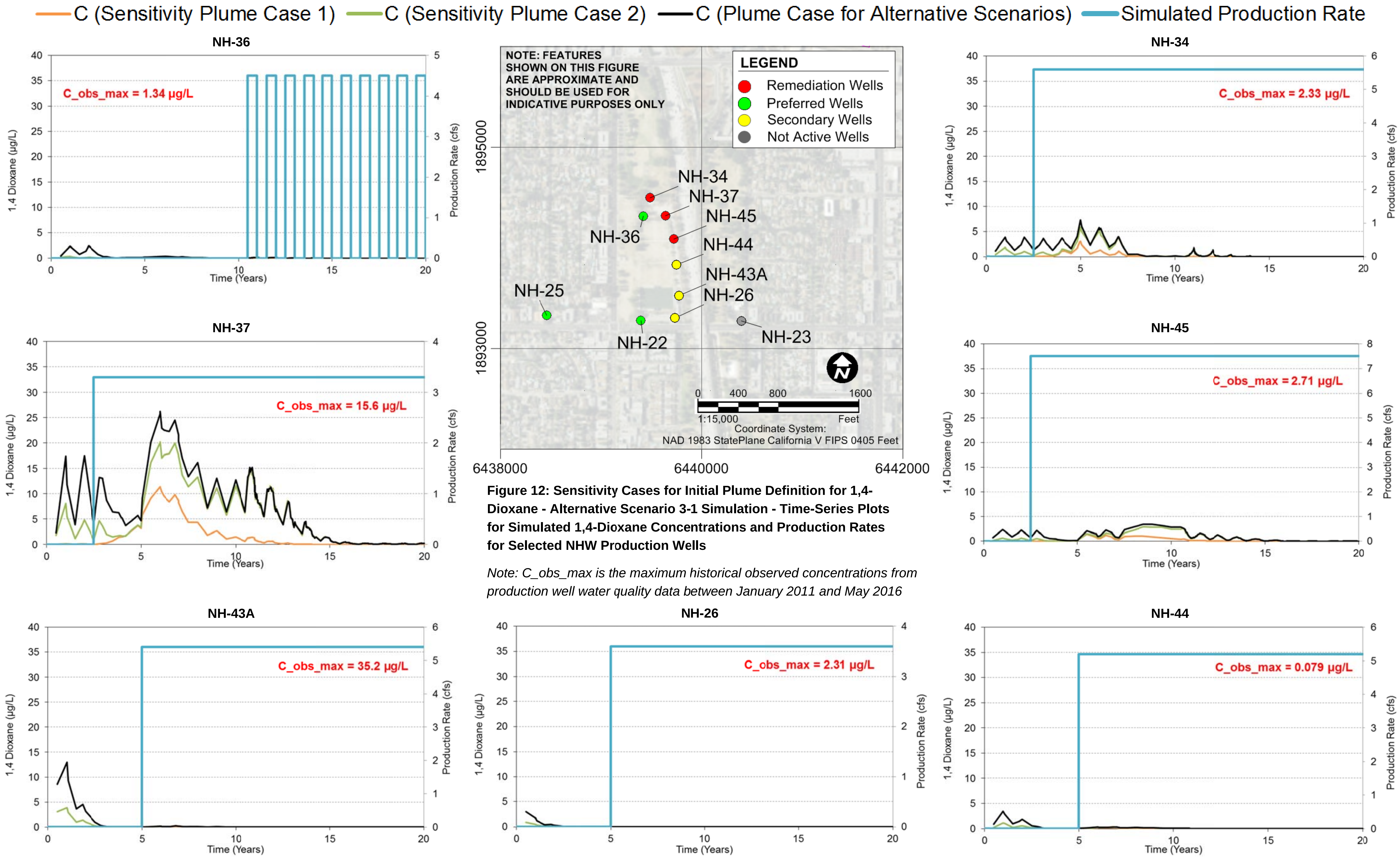
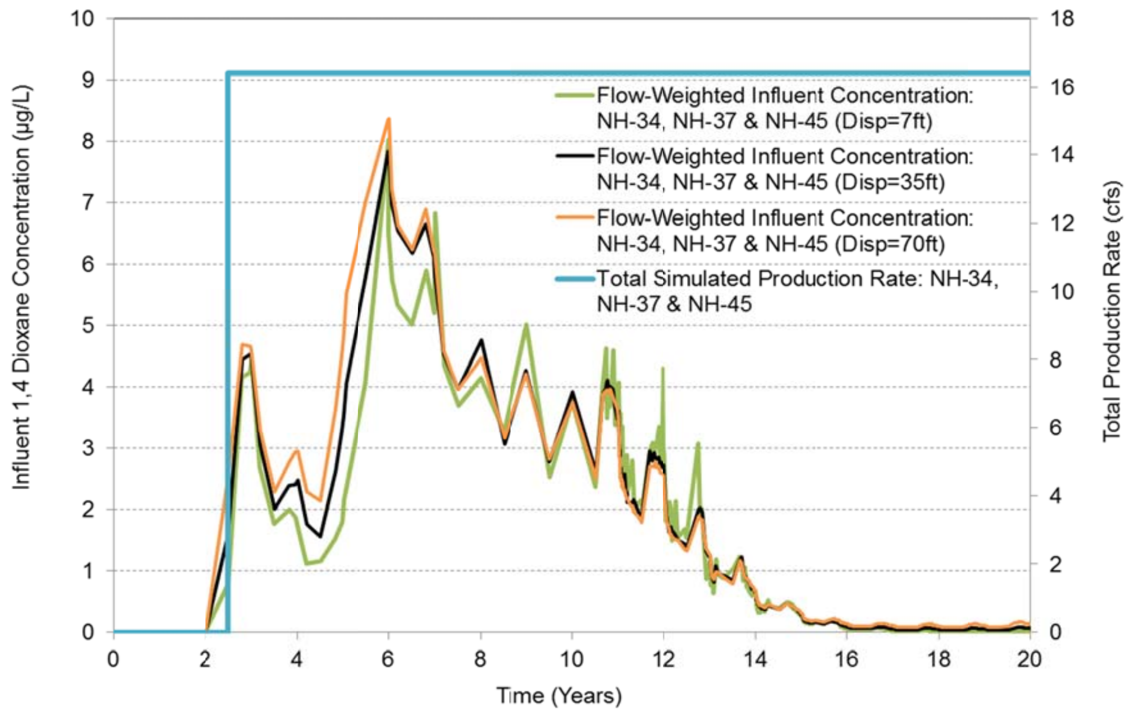


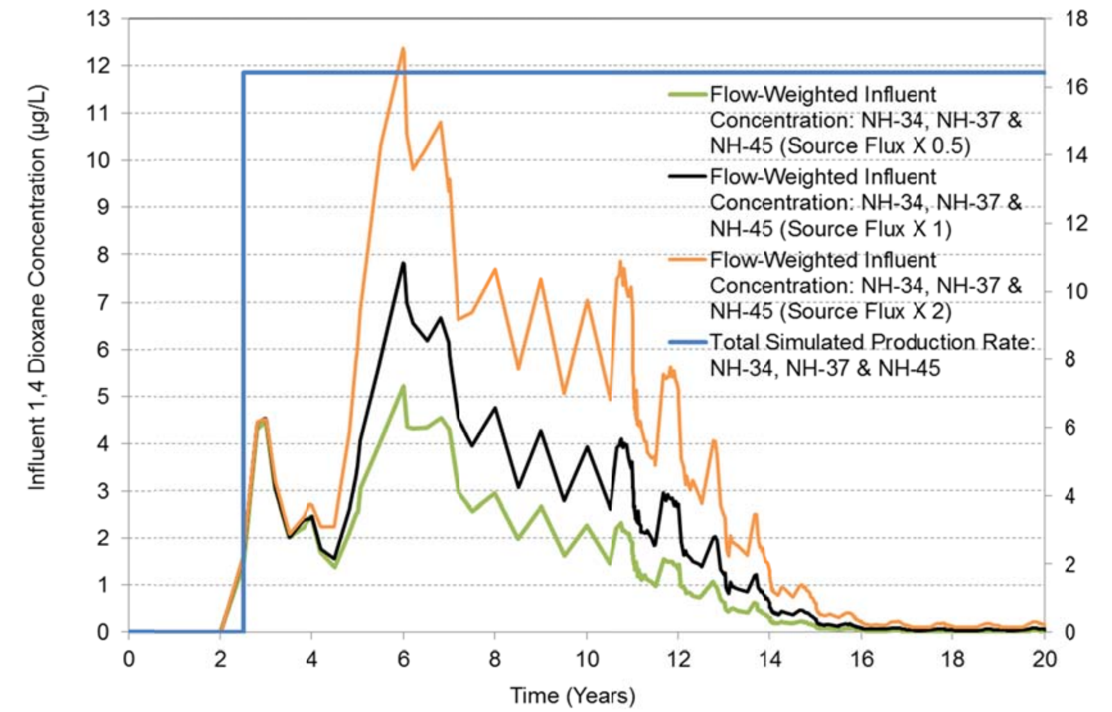
Figure 12: Sensitivity Cases for Initial Plume Definition for 1,4-Dioxane - Alternative Scenario 3-1 Simulation - Time-Series Plots for Simulated 1,4-Dioxane Concentrations and Production Rates for Selected NHW Production Wells

Note: C_obs_max is the maximum historical observed concentrations from production well water quality data between January 2011 and May 2016

Sensitivity Cases for Dispersivity - Alternative Scenario 3-1 Pumping



Sensitivity Cases for Hewitt Pit Source (Flux Boundary Condition) - Alternative Scenario 3-1 Pumping



Sensitivity Cases for Initial Plume Definition for 1,4-Dioxane - Alternative Scenario 3-1 Pumping

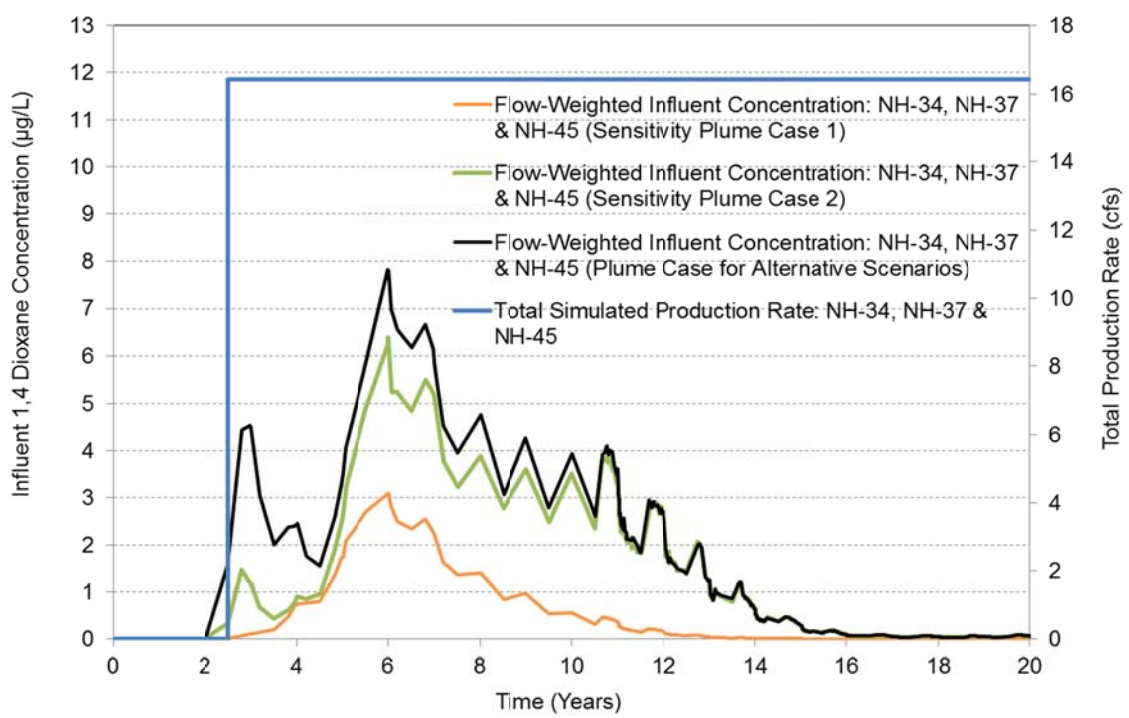


Figure 13: Estimated Flow-Weighted Influent Concentration to Treatment Facility for Sensitivity Simulations

ATTACHMENT A DATA POINTS USED FOR 1,4-DIOXANE SENSITIVITY PLUME CASES

Data used for Sensitivity Plume Case 1 (2IR Model Layer 1 Only)				
Easting	**Northing**	**Concentration (µg/L)**	**Well ID**	**Data Source**
6438609	1898302	1.5	4899	Observed value from monitoring well water quality data between 1 January 2011 and May 2016
6443313	1895267	4.4	3800E	
6441602	1896692	1.7	4909F	
6441614	1896678	2.5	4909FR	
6440462	1896363	210	EW-1S	
6440630	1895203	110	NH-C09-310	
6439177	1896638	2.9	NH-C11-295	
6442936	1894501	0.35	NH-C19-290	
6442946	1894501	2.3	NH-C19-360	
6434397	1895982	0	NH-MW-01-288	
6440750	1894693	9.7	NH-MW-06-280	
6441079	1893427	3.3	NH-MW-11-340	
6441470	1892517	0.43	NH-VPB-02	
6442940	1896226	4.93	NH-VPB-06	
6437482	1901017	0	NH-VPB-11	
6438957	1897088	0	V14HEWMW1	
6440540	1896577	440	V14HEWMW2	
6440529	1897109	99	V14HEWMW3	
6439591	1897773	590	V14HEWMW4	
6440479	1896297	220	V14HEWMW5	
6441575	1896039	4.5	V14HEWMW6	
6441336	1897097	1.6	V14HEWMW7	
6439592	1897440	52	V14HEWMW8S	
6439470	1896762	1.8	V14HEWMW9	

Notes: All values are approximate only; coordinate projection is NAD 1983 State Plane California V FIPS 0405 (US Feet).

Data used for Sensitivity Plume Case 2 (2IR Model Layer 1 Only)				
Easting	**Northing**	**Concentration (µg/L)**	**Well ID**	**Data Source**
6438609	1898302	1.5	4899	Observed value from monitoring well water quality data between January 2011 and May 2016
6443313	1895267	1.1	3800E	
6441602	1896692	1.7	4909F	
6441614	1896678	2.3	4909FR	
6440462	1896363	210.0	EW-1S	
6440630	1895203	110.0	NH-C09-310	
6439177	1896638	2.9	NH-C11-295	
6442936	1894501	0.4	NH-C19-290	
6442946	1894501	2.3	NH-C19-360	
6434397	1895982	0.0	NH-MW-01-288	
6440750	1894693	9.7	NH-MW-06-280	
6441079	1893427	3.3	NH-MW-11-340	
6441470	1892517	0.0	NH-VPB-02	
6442940	1896226	4.9	NH-VPB-06	
6437482	1901017	0.0	NH-VPB-11	
6438957	1897088	0.0	V14HEWMW1	
6440540	1896577	160.0	V14HEWMW2	
6440529	1897109	19.0	V14HEWMW3	
6439591	1897773	460.0	V14HEWMW4	
6440479	1896297	30.0	V14HEWMW5	
6441575	1896039	1.8	V14HEWMW6	
6441336	1897097	1.5	V14HEWMW7	
6439592	1897440	52.0	V14HEWMW8S	
6439470	1896762	0.7	V14HEWMW9	
6439393	1893272	0.0	3790C (NH-22)	Estimated value based on production well water quality data between January 2011 and May 2016
6440393	1893275	0.0	3790D (NH-23	
6439729	1893294	0.0	3790E (NH-26)	
6439487	1894490	9.3	3790G (NH-34)	
6439420	1894308	0.0	3790H (NH-36)	
6439640	1894320	88.5	3790J (NH-37)	
6439772	1893518	81.4	3790K (NH-43A)	
6439835	1895488	3.0	meta data	Additional interpreted data points based on EPA-mapped 1,4-dioxane distribution
6439781	1895413	3.0	meta data	
6439686	1895345	3.0	meta data	
6439571	1895291	3.0	meta data	
6439435	1895210	3.0	meta data	
6439618	1895644	1.5	meta data	
6439340	1895664	1.5	meta data	
6439530	1895549	1.5	meta data	
6439503	1895393	1.5	meta data	
6439652	1895461	1.5	meta data	

Notes: All values are approximate only; coordinate projection is NAD 1983 State Plane California V FIPS 0405 (US Feet).

ATTACHMENT B FLOW-WEIGHTED PRODUCTION WELL LAYER 1 CONCENTRATION ESTIMATES FOR SENSITIVITY PLUME CASE 2

Flow-weighted production well concentrations in Model Layer 1 used for plume definition in Sensitivity Plume Case 2 were estimated as follows:

$$\mathbf{C\ Layer\ 1 = Cw \times (V1 + V2 + V3 + V4) / (V1 + 0.1 \times V2 + 0.01 \times V3 + 0 \times V4)}$$

Where:

C Layer 1 = estimated concentration in Layer 1

Cw = most recent observed concentration in production well (between January 17, 2011 and May 18, 2016)

V1 = volumetric flow rate produced from Layer 1

V2 = volumetric flow rate produced from Layer 2

V3 = volumetric flow rate produced from Layer 3

V4 = volumetric flow rate produced from Layer 4

The produced volumetric flow rate is calculated as B × H × K in each layer, where

B = thickness of screened interval in model layer

H = head difference between well and cell (assumed to be 1)

K = hydraulic conductivity in model layer

Concentrations in Layer 2 were assumed to be 10% of those in Layer 1. Concentrations in Layer 3 were assumed to be 1% of those in Layer 1. Concentrations in Layer 4 were assumed to be zero. Calculations are provided on the next page.

Production Well	Observed Concentration In Production Well (µg/L)	Date Of Sample	2IR Model Layer	Approximate Thickness Of Screened Interval (ft)	Head Difference Between Well And Cell (Assumed To Be 1) (ft)	Hydraulic Conductivity In Model Layer (ft/d)	Estimated Flow-Weighted Production Well Concentrations In Layer 1 (µg/L)
NH-23	<0.5 (non-detect)	4/29/2016	L1	90	1	150	Observed value is non-detect; estimated value assumed 0
			L2	90	1	300	
			L3	50	1	188	
			L4	0	1	52.5	
NH-26	<0.5 (non-detect)	4/29/2016	L1	90	1	150	Observed value is non-detect; estimated value assumed 0
			L2	90	1	300	
			L3	130	1	188	
			L4	0	1	52.5	
NH-34	2.08	5/18/2016	L1	120	1	150	9.3
			L2	90	1	300	
			L3	250	1	188	
			L4	50	1	52.5	
NH-36	<0.5 (non-detect)	4/26/2016	L1	70	1	150	Observed value is non-detect; estimated value assumed 0
			L2	90	1	300	
			L3	270	1	188	
			L4	20	1	52.5	
NH-37	15.6	5/18/2016	L1	100	1	150	88.5
			L2	90	1	300	
			L3	270	1	188	
			L4	200	1	52.5	
NH-43A	12.3	1/7/2016	L1	40	1	150	81.4
			L2	90	1	300	
			L3	140	1	188	
			L4	0	1	52.5	
NH-44	0.546	4/29/2016	L1	0	1	150	Not applicable (well not screened in model layer 1)
			L2	70	1	300	
			L3	270	1	188	
			L4	80	1	52.5	
NH-45	0.699	5/18/2016	L1	0	1	150	Not applicable (well not screened in model layer 1)
			L2	70	1	300	
			L3	270	1	188	
			L4	80	1	52.5	

Los Angeles Department of Water & Power

NHW IRAD

Appendix D

Additional Scenario 3-7 Simulation for Transport Modeling

Owners Agent San Fernando Basin Groundwater Remediation

Prepared for:

City of Los Angeles
Department of Water and Power
111 North Hope Street
Los Angeles, California 90012

July, 2017

Submitted by:

Hazen and Sawyer (Hazen) under Agreement No. 47329-5 (Owner's Agent for the SFB Remediation)

Prepared by:

WorleyParsons and Hazen

INTRODUCTION

The City of Los Angeles Department of Water and Power (LADWP) previously completed numerical groundwater modeling as part of the Interim Remedial Investigation (RI)/Feasibility Study (FS) conducted to address the synthetic contaminant 1,4-dioxane dissolved in groundwater at the North Hollywood West (NHW) Well Field located in the San Fernando Basin (SFB) Groundwater. Details of the groundwater modelling were presented in Appendix A of the NHW Interim RI/FS (LADWP 2016; the "RI/FS"). Appendix A presents fate and transport modeling to refine remedial action Alternative 3 in the RI/FS. Additional supplemental information on the fate and transport modeling scenarios in RI/FS Appendix A is presented in the 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the Interim Remedial Action Decision [IRAD]); that document includes details of all six scenarios modeled for Alternative 3-1, plus results of a sensitivity analysis that was conducted as part of the RI/FS modelling. The information presented herein should be considered in conjunction with Appendix A of the NHW Interim RI/FS (LADWP 2016) and the supporting information in Appendix C of the IRAD.

This document is not an evaluation of alternatives. It contains information related to modeling of a seventh pumping scenario for Interim RI/FS Alternative 3:

- Additional Alternative Scenario 3-7 simulation set up and results.

This model simulation was conducted and this document prepared in response to the request of the California State Water Resources Control Board (SWRCB) Department of Financial Assistance (DFA) and the Los Angeles Regional Water Quality Control Board (LARWQCB) for a scenario simulation in additional to those presented in the Interim RI/FS and Supporting Document in response to a grant fund application.

ALTERNATIVE SCENARIO 3-7 REMEDIATION CONCEPTS FOR TRANSPORT MODELING

The pumping rates at NHW Well Field employed for Alternative Scenario 3-7 transport simulation are similar to those used for the Alternative Scenario 3-1 presented in the RI/FS (LADWP 2016). However, additional pumping is incorporated to simulate other remedial actions by third parties as follows.

- Cooperative Containment Concept (CCC) of the North Hollywood Operable Unit (OU) Second Interim Remedy (2IR) pumping approximately 1,600 AFY, starting in simulation year 4 (October 1, 2019). This is to evaluate the potential effects of the CCC pumping on the Alternative 3-1 concept for NHW Well Field. Locations and pumping rates used for the CCC wells are as documented in 'Groundwater Modeling Memorandum, North Hollywood Operable Unit, Second Interim Remedy, Groundwater Remediation System Design' (AMEC 2015).
- Pumping and reinjection within the footprint of Hewitt Pit of approximately 1,900 AFY, starting in simulation year 4 (October 1, 2019). This scenario is used to evaluate the potential effect of 1,4-dioxane source control at Hewitt Pit on the Alternative Scenario 3-1 concept for NHW Well Field.

- Two Environmental Protection Agency (EPA) extraction wells with total rate of approximately 3,200 AFY in the downgradient plume core of the Hewitt Pit 1,4-dioxane plume, starting in simulation year 5 (October 1, 2020).
- Two new North Hollywood OU wells for treatment at the Burbank OU wells with total rate of approximately 1,900 AFY, starting in simulation year 4 (October 1, 2019).

Table 1 provides a summary of the typical simulated pumping schedule for key NHW wells for Scenario 3-7. Table 2 provides the extraction and injection rates at the Hewitt Pit on site wells and at the EPA plume core extraction wells. Well locations are provided in Figure 1.

The simulated pumping and reinjection within the footprint of Hewitt Pit was designed to evaluate the effect of on-site remediation at the Hewitt Pit on the on-going migration of 1,4-dioxane from the Hewitt Pit and includes on-site extraction and injection wells. Well locations and pumping rates for the extraction and injection wells are identical those used in Alternative Scenarios 3-2 and 3-5 documented in LADWP (2016) and Hazen and Sawyer (2017).

The simulated pumping at the EPA plume core extraction wells was designed to capture the core of the plume at a significant continuous extraction rate of 3,200 AFY total. The wells were placed at the leading edge of the 1,4-dioxane plume core, downgradient of Hewitt Pit and upgradient of the NHW production wells, at locations that could be reasonably expected to produce a positive remedial result. The wells were simulated in model layers 1 and 2 of the AMEC (2015) model (2IR Model). At the time of preparation, there is considerable uncertainty relating to future Third Party remediation plans in the vicinity of NHW Well Field, including pumping locations, rates and duration. The assumptions relating to remediation pumping by Third Parties are considered adequate for the objective of assessing the potential effects of other potential future remediation efforts by Third Parties on the NHW Well Field remedial alternatives. Groundwater produced from the two EPA wells is not reinjected in this simulation.

The transport model was developed and set-up using the methodology described in Section A4.2 of Appendix A of the NHW Interim RI/FS (LADWP 2016). The transport simulations described above use the simulated initial plume condition and Hewitt Pit source (flux boundary condition), referred to as the 'Plume Case', described in Section A4.1 and A4.2 of Appendix A of the NHW Interim RI/FS (LADWP 2016).

TRANSPORT MODEL RESULTS

Table 3 provides a summary of transport modeling results and a brief qualitative comparison of the scenarios simulated.

More detailed transport modeling results for each scenario are presented in this section as follows:

- simulated 1,4-dioxane concentration through time at selected individual NHW production wells;
- treatment facility influent concentrations from flow-weighted 1,4-dioxane concentration estimates through time for combined NHW Remediation well flow; and
- simulated concentration snapshots at various times to illustrate migration and capture of the 1,4-dioxane plume.

Simulated Production Well Temporal Concentration

Simulated 1,4-dioxane concentrations through time at the Remediation, Secondary and Preferred NHW production wells are presented in Figure 2. Simulated concentration results are presented along with the simulated production rates and the maximum observed concentrations at each of the production wells between January 2011 and May 2016.

In general, the results indicate simulated 1,4-dioxane concentrations are forecast to be highest in the three remediation wells in the north-eastern part of the NHW Well Field (*i.e.*, NH-34, NH-37 and NH-45). The highest simulated 1,4-dioxane concentration was present at NH-37, with a maximum simulated concentration of approximately 25 µg/L. Other than these northern Remediation wells, all other NHW production wells have concentrations less than 1 µg/L after four years. The oscillation in concentrations over time occurs due to the seasonal changes in simulated pumping rates (e.g. peak pumping during the summer high-demand period).

Simulated Treatment Plant Influent Temporal Variation

The estimated flow-weighted 1,4-dioxane concentration for the treatment facility influent over time is presented in Figure 3. The estimated maximum average flow-weighted influent 1,4-dioxane concentration to the treatment plant is approximately 7 µg/L. The simulated influent concentration is above 1,4-dioxane Notification Level (NL) for less than 1.5 years after start-up of the treatment facility.

Simulated Temporal Plume Migration

Concentration distribution snapshots for the Plume Case at various times throughout the simulation are presented in Figure 4.

In simulation years 3 and 5, the effect of pumping at NHW Well Field is evident as the plume is pulled towards the northern Remediation wells. As well, production at the northern Rinaldi-Toluca production wells pulls the plume northwards. By simulation year 10, the influence on the 1,4-dioxane distribution from other simulated production wells (Hewitt Pit extraction/injection wells and EPA plume core extraction wells) is evident. From year 15 onwards, the plume has reached an approximate steady state between the various production wells and the Hewitt Pit source, with the majority of the 1,4-dioxane plume captured by HP extraction wells, EPA plume core extraction wells and select RT wells (RT-10, 12 and 13).

IMPLEMENTATION

Scenario 3-7 was considered at a screening level in the RI/FS. There were several factors related to implementation that caused this scenario to be rejected in the screening process.

Uncertainties

Hewitt Pit Site injection and extraction wells are currently in the pilot-scale testing stage, and are much smaller than the source control system assumed for this scenario. A relatively simple pump-and-treat system was assumed in the RI/FS modelling due to limited available information on the planned full-scale source control system at Hewitt Pit, and in particular, the absence of a remedial action plan or remedial design for Hewitt Pit. The assumptions relating to simulated extraction and reinjection at and down-gradient of Hewitt Pit include the following.

- Extraction in proximity to simulated source locations to remove the contaminant source.
- Extraction at boundaries of Hewitt Pit Site with the aim of preventing further off-site migration of contamination.
- Reinjection occurring in an up-gradient location of the site where no source is simulated to reduce the likelihood of uncontrolled spreading of contamination towards the Rinaldi-Toluca Well Field.
- Extraction from two plume core interceptor wells (2,000 gpm total capacity) down-gradient of the Hewitt Site to the plume core which has migrated off-site towards NHW Well Field.

These assumptions were considered adequate for the objective of assessing the effects of other potential future remediation efforts for this simulation. It is uncertain if actual wells of those capacities would be constructed, or if the wells may be of lesser capacity, and in less effective locations. For example, this remedy may be less effective if the wells are not located properly or if the plume moves over time or if the interceptor wells are not pumped at a sufficient rate.

The criteria for capacity and location of those wells will likely be based on their effectiveness at controlling the source and core of the plume, which might not be adequate to remediate the plume in the vicinity of the NHW Production Wells. This introduces uncertainty about the ability to use the North Hollywood Well Field without wellhead treatment.

It is also uncertain if there would be regulatory or environmental requirements that would delay or add to the cost of the source control wells or plume core interceptor wells. The placement of new wells and treatment facilities and pipelines would require California Environmental Quality Act Environmental Impact process before land acquisition and construction can proceed. Plume core interceptor wells and treatment facilities would require acquisition of private property in a highly developed area, or acquisition of open space or public land in highway right of way or parks. Regulatory approval for reinjection wells as an end use would add another level of review and permitting that is not included in the other FS scenarios. In comparison the Proposed Plan would utilize existing wells and an existing end use, and would constrain the remediation facilities within the fenceline of an existing LADWP facility. These regulatory and environmental processes are vulnerable to less public support than the preferred alternative as identified in the Proposed Plan.

This alternative therefore has a greater risk of failure and, therefore, is weaker from a long-term protectiveness standpoint than wellhead treatment. Wellhead treatment will ensure that the beneficial use of the groundwater is restored and that the water from the NHW Well Field can used for potable use.

Cost

The cost of Scenario 3-7 is expected to be similar to, or greater than, the cost of Alternative 3-1 in the Proposed Plan. There would be several additional costs, including the following.

- Land purchase of residential property, commercial property, or replacement or mitigation of withdrawing park or other public land. Land would be required for interceptor wells and injection wells, and may require additional well sites than those hypothetical scenario included in the model. This may be difficult, time-consuming and costly given the residential nature of the area.
- Well installation of two or more interceptor wells, including hydrogeological investigation, monitoring well drilling, monitoring, determination of depth and location, test well drilling, power and instrumentation, and well completion. Because the interceptor wells are smaller and target a narrow range of the aquifer, additional investigation into the lateral and vertical extent of the plume may be warranted. This may require an iterative approach of installing and monitoring additional wells
- Injection wells or other end use facilities, including hydrogeological investigation, monitoring well drilling, design, and construction. It is not known the location or extent of the end use facilities.
- Pipelines connecting the extraction wells to the remediation treatment facilities, and connecting the treatment facilities to the end use. For an end use of reinjection, a pipeline of approximately one mile length would be required from the interceptor wells to the injection site. For an end use of direct domestic use. Approximately one half mile of pipeline would be required to deliver treated water from interceptor well treatment facilities to the well collector pipeline that conveys water to the North Hollywood Pump Station for domestic distribution. A crossing beneath the California Department of Transportation State Route 170 would add time and cost for permitting and directional drilling or other trenchless pipe installation method.
- Purchase of replacement water has an estimated cost of $20M for each year of delay in restoring the beneficial use of the NHW Well Field.

The cost of treatment facilities would be similar to the cost of treating three wells at the Whitsett Park site. The pumping rates of the interceptor wells are likely to be lower, but the concentrations commensurately higher, requiring a similar type and capacity of 1,4-dioxane treatment. The pretreatment and peroxide quenching processes may be smaller due to the smaller flowrate, but backwash chemical handling and site utilities would be very similar. The treatment structure architecture, fencing and site improvements would be similar to the Proposed Plan to be compatible with surrounding land uses. A new treatment site for this scenario would likely require landscaping and access road construction that are not needed for the Proposed Plan which utilizes existing LADWP facilities.

Schedule

The time to implement would be substantially longer than a remedial action in Whitsett Park. Time will be required in order to perform the groundwater modeling and conduct a FS to develop a plan for the plume core extraction wells. Regulatory review of the proposed end uses of the treated water would require time for the Regional Board and the Division of Drinking Water if direct potable use is proposed as an end use. The remediation sites will require time to identify and purchase property for new wells and remediation facilities, acquire right-of-way or easements for pipelines, and conduct environmental review. All of these steps would be in addition to the time for design and construction. If land is not available, and condemnation procedures are used, that process would likely add more years to implementation.

CONCLUSION

This document provides information relating to the Alternative Scenario 3-7 requested by the DFA and the LARWQCB, in response to a grant fund application submitted by LADWP (2016) to address the synthetic contaminant 1,4-dioxane dissolved in groundwater at the NHW Well Field. The information presented herein supplements RI/FS Appendix A of the NHW Interim RI/FS (LADWP 2016) and the supporting information in Appendix C of the IRAD.

The modeling does not change the conclusions of the FS that it is appropriate to screen out the option based on cost, implementability and long-term protectiveness. Modeling indicates that interceptor wells have the potential to shorten, but not eliminate, the need for treatment at the NHW wells.

ASSUMPTIONS AND LIMITATIONS

The modeling presented herein is subject to the assumptions and limitations presented in the RI/FS (LADWP 2016) and in Appendix C of the IRAD.

In addition, this simulation includes several assumptions related to the design, implementation, and timing of third party remedial actions, all of which are highly uncertain at the present time. Any delay in the implementation of third party remedial actions would increase the duration of treatment required at the NHW Wellhead Treatment. Similarly, any deficiencies in design or operation of third party remedial actions could increase the maximum concentrations of 1,4-dioxane at the NHW Wellhead Treatment or the duration of treatment required at NHW.

REFERENCES

AMEC (AMEC Foster Wheeler Environment & Infrastructure, Inc.). 2015. Groundwater Modeling Memorandum, North Hollywood Operable Unit, Second Interim Remedy, Groundwater Remediation System Design. Proj. Number 8615180350. July, 2015

Hazen and Sawyer. 2017. Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field. Submitted by Hazen and Sawyer (Hazen) under Agreement No. 47329-5 (Owner's Agent for the SFB Remediation)

LADWP (Los Angeles Department of Power and Water), 2016. Interim Remedial Investigation / Feasibility Study Report, North Hollywood West Well Field. Submitted by Hazen and Sawyer (Hazen) under Agreement No. 47329-5 (Owner's Agent for the SFB Remediation)

Tables

Table 1: Summary of Simulated Production Rates for Key NHW Production Wells by Scenario

Scenario	Summary Type	NH-26	NH-34	NH-37	NH-43A	NH-44	NH-45
Alternative Scenario 3-7	Simulation Year When Pumping Starts	7	5	5	7	7	5
	Typical Rate When Active (cfs)	3.6	5.6	3.3	5.4	5.2	7.5
	Well Category	Secondary	Remediation	Remediation	Secondary	Secondary	Remediation

Table 2: Summary of Pumping and Reinjection Rates for Alternative Scenario 3-7 Simulating Source Control at Hewitt Pit and Downgradient Plume Core Extraction (EXT) Wells

Well Name	Type	Extraction Rate (cfs)	Injection Rate (cfs)
HP_Ex1	Extraction	0.56	---
HEX5	Extraction	0.56	---
HEX6	Extraction	0.67	---
CaseA_Well1	Extraction	0.28	---
CaseA_Well2	Extraction	0.28	---
CaseA_Well3	Extraction	0.28	---
HP_Inj1	Injection	---	0.87
HP_Inj2	Injection	---	0.87
HP_Inj3	Injection	---	0.87
EXT-01	Extraction	2.21	---
EXT-02	Extraction	2.21	---

Table 3: Summary of Transport Modeling Scenario

Transport Modeling Alternative Scenario	Scenario Description	Maximum 1,4-Dioxane Influent Concentration (µg/L)	Time of Maximum 1,4-Dioxane Influent Concentration (Years from Plant Start-Up)	Duration of Treatment (Years From Plant Start-Up to Year All Remediation Wells are Below 1 µg/L of 1,4-Dioxane)	Remediation Wells (Piped to Treatment Plant)			Active Non-Remediation Wells (Not Piped to Treatment Plant) Which Are Below 1 µg/L of 1,4-Dioxane			Inactive Wells or Wells Above 1 µg/L of 1,4-Dioxane			Total Available Well Field Capacity (AFY)	Criterion Description				Retained (Yes/No)
					Count	Well Names	Capacity of Wells (AFY)	Count	Well Names	Capacity of Wells (AFY)	Count	Well Names	Capacity of Wells (AFY)		Comparative Criterion 1: Required Treatment Capacity	Comparative Criterion 2: Non-Remediation Capacity	Comparative Criterion 3: Required Treatment Duration	Comparative Criterion 4: Dependent on Remediation by Third Parties	
Alternative Scenario 3-7	- NHW Well - NHW Well Field Remediation (3 wells), - CCC Remediation, - Hewitt Pit Remediation - EPA Plume Core Extraction	7	Year 0	<1.5	3	NH-34 NH-37 NH-45	11,873	10	NH-04 NH-07 NH-22 NH-25 NH-26 NH-32 NH-33 NH-36 NH-43A NH-44	24,325	1	NH-23 (Inactive)	1,955	36,198	This scenario has smaller required treatment capacity relative to other scenarios.	Other scenario(s) have greater available non-remediation capacity.	This scenario has the shortest treatment duration.	This scenario is dependent on other remedial action by Third Parties.	No

Figures

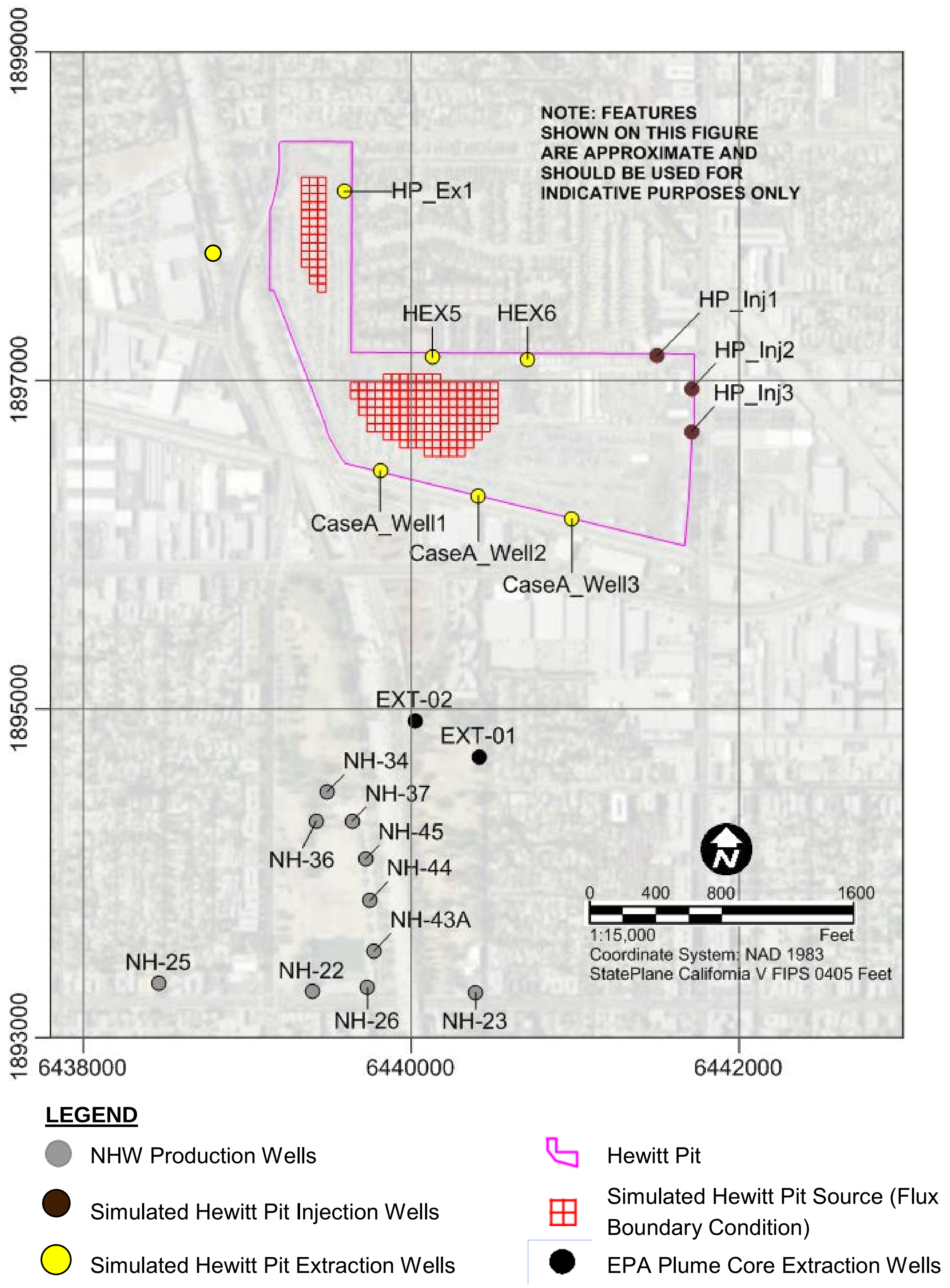
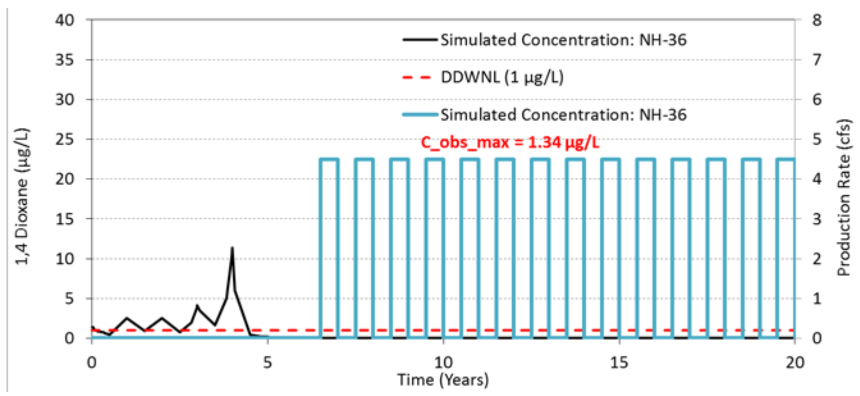
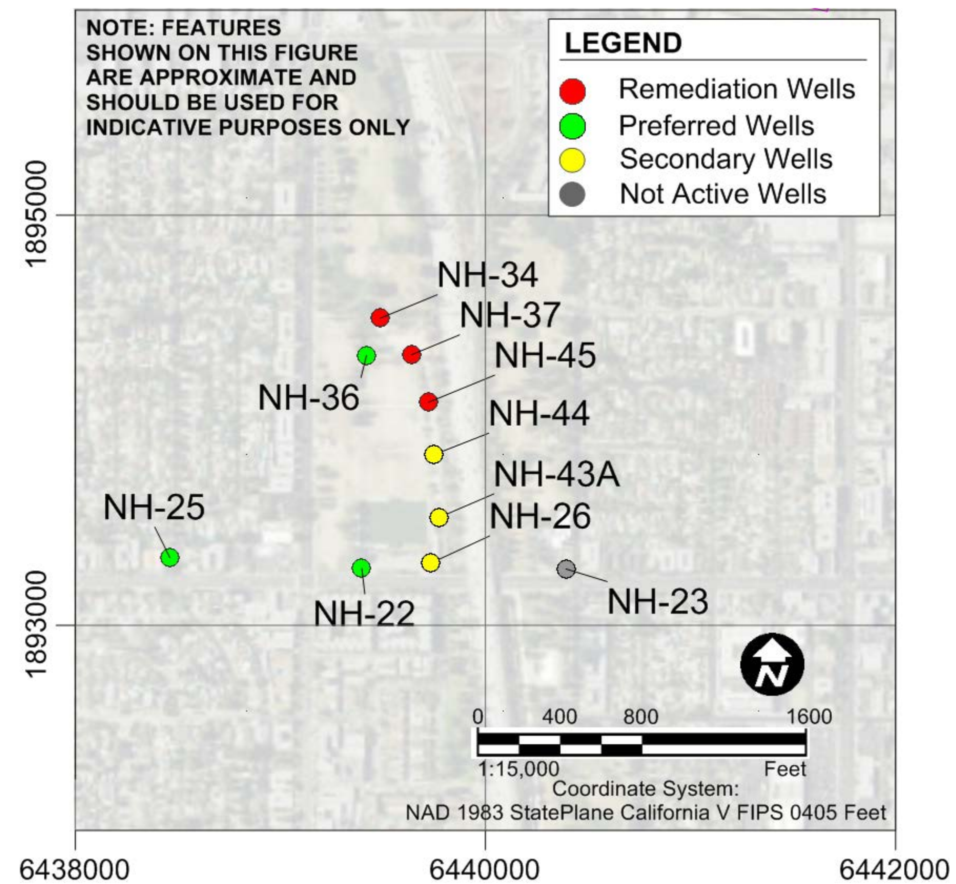
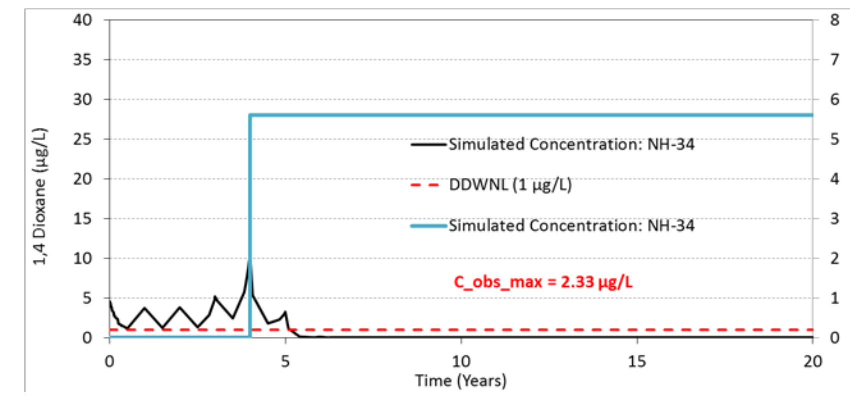
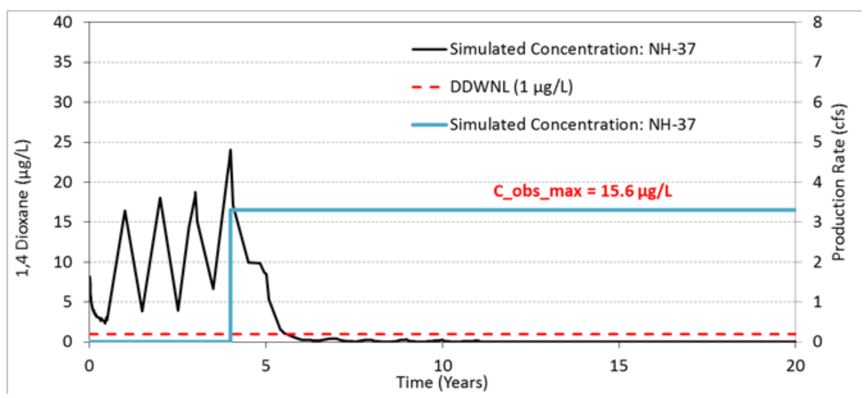


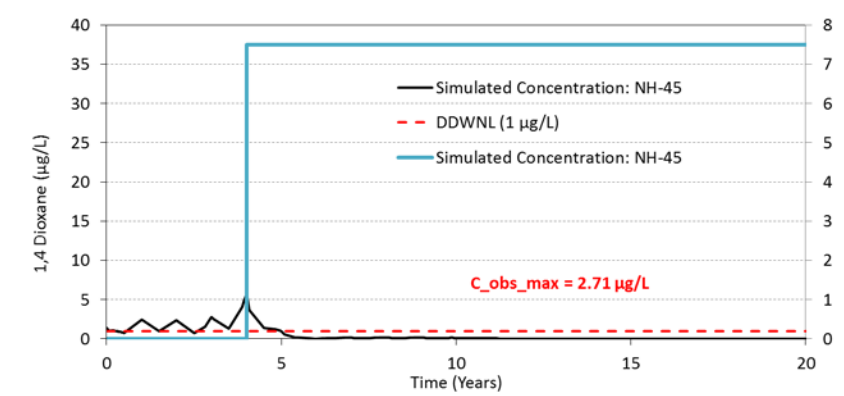
Figure 1: Illustration of Simulated Pumping and Reinjection Locations for Alternative Scenario 3-7 with Source Control at Hewitt Pit and Downgradient Plume Core Control











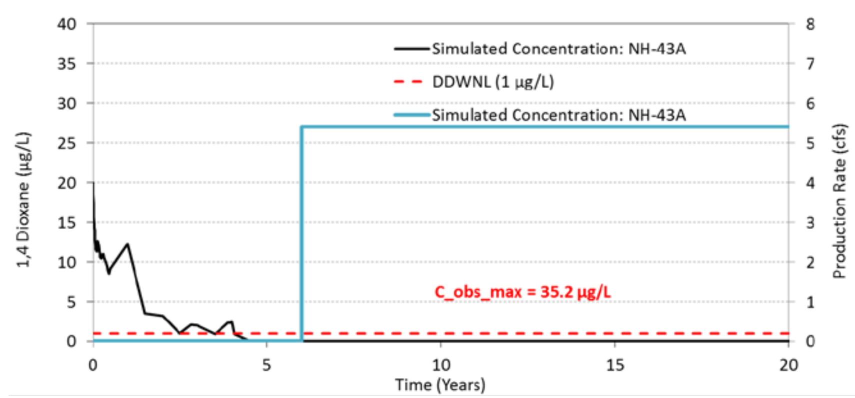
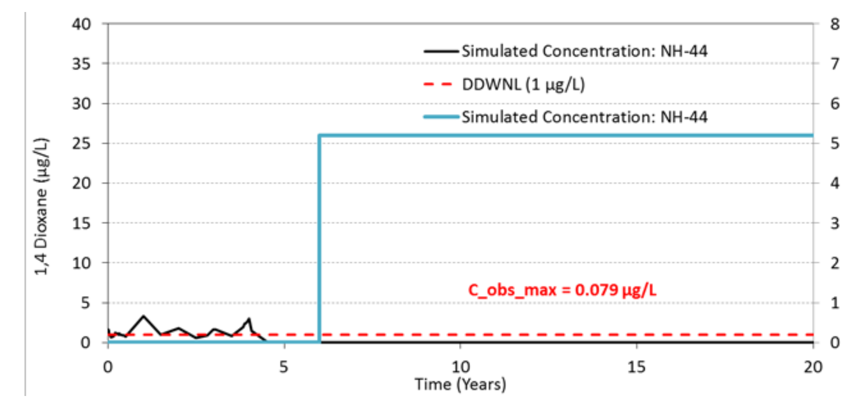
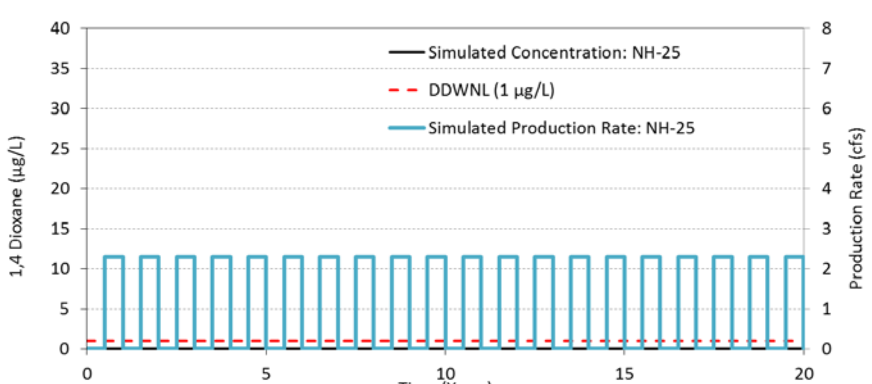
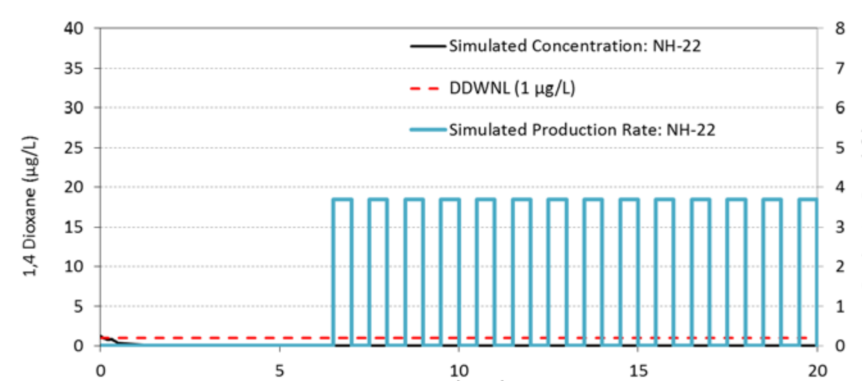


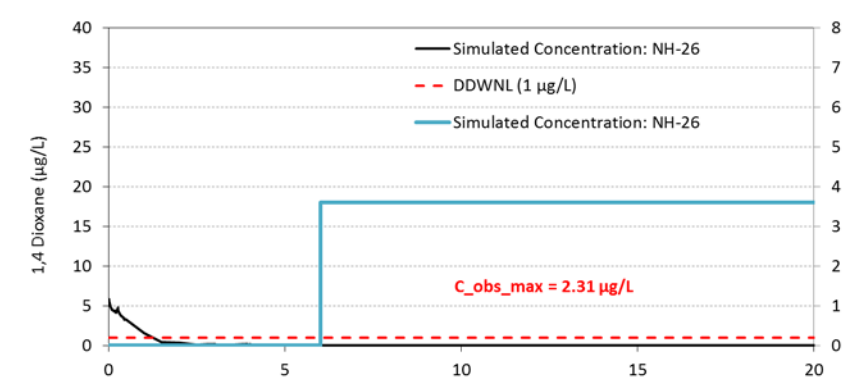
Figure 2: Alternative Scenario 3-7 Simulation - Time-Series Plots for Simulated 1,4-Dioxane Concentrations and Production Rates for Selected NHW Production Wells.

Note: C_obs_max is the maximum historical observed concentrations from production well water quality data between January 2011 and May 2016.









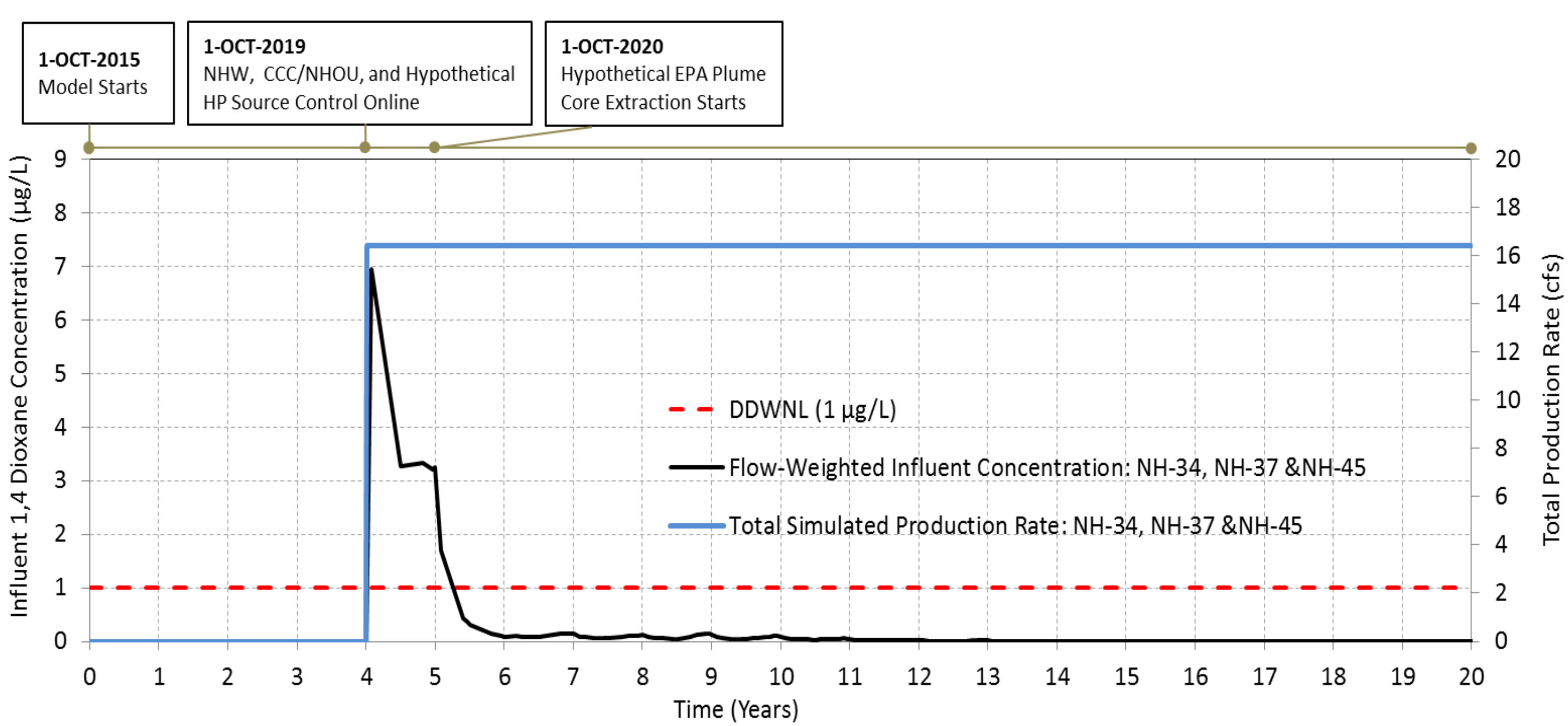


Figure 3: Estimated Flow-Weighted Influent Concentration to Treatment Facility for Alternative Scenario 3-7

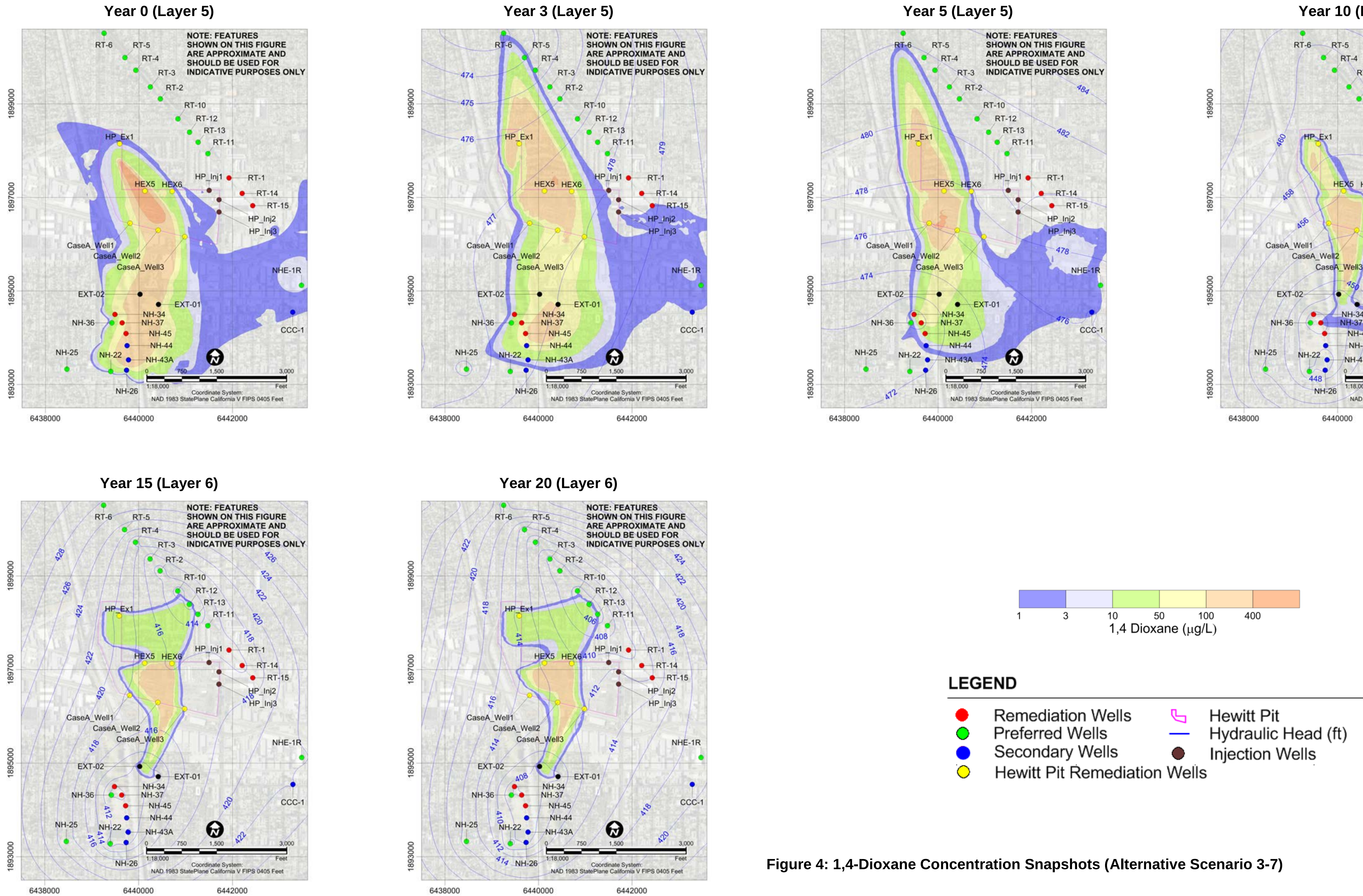


Figure 4: 1,4-Dioxane Concentration Snapshots (Alternative Scenario 3-7)

Los Angeles Department of Water & Power

NHW IRAD
Appendix E
Additional Data Evaluation

Owners Agent San Fernando Basin Groundwater Remediation

Prepared for:

City of Los Angeles
Department of Water and Power
111 North Hope Street
Los Angeles, California 90012

July, 2017

Submitted by:

Hazen and Sawyer (Hazen) under Agreement No. 47329-5 (Owner's Agent for the SFB Remediation)

Prepared by:

WorleyParsons

INTRODUCTION

A plume definition (the "Plume Case") with a Hewitt Site source (flux boundary condition) was developed for 1,4-dioxane for use as initial conditions in fate and transport modelling as part of the Interim Remedial Investigation/Feasibility Study (RI/FS) for North Hollywood West (NHW) Well Field (Los Angeles Department of Water and Power [LADWP] 2016). To address the sensitivity of transport modeling results to the Plume Case definition and Hewitt Site source (flux boundary condition) assumptions, sensitivity analyses were also performed as part of the RI/FS transport modeling to consider recent (between January 2011 and May 2016; this is the date range for data assessed in the RI/FS plume definition) observed concentrations in monitoring wells in the A-Zone, and recent production well concentrations. The sensitivity analysis results are presented in 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix B of the Interim Remedial Action Decision [IRAD]) which was provided in February 2017.

The monitoring data compiled for review during generation of these plumes dates from first quarter (Q1; January) 2011 to Q2 (May) 2016. However, new analytical data from sampling locations on-site and off-site of Hewitt Site have been collected since the publication of the RI/FS. This includes data from Q3 2016 through Q2 2017. This new sampling data includes results from newly installed monitoring wells. This memo provides a summary of the data collated since the publication of the RI/FS for 1,4-dioxane, and an evaluation of the potential changes in plume definition assumptions resulting from incorporation of the new sampling results.

The method for developing the Plume Case and the two additional sensitivity plume distributions followed the same approach for interpolating concentration data and assigning flux boundary conditions described in Section A4.1 of Appendix A of the RI/FS (LADWP 2016). The following summarizes the concept for each plume definition case (from Appendix B of the IRAD).

- Plume Case - incorporates the EPA (2015) plume map, maximum observed concentration in monitoring wells in the A-Zone between January 2011 and May 2016, and maximum flow-weighted production well concentrations between January 2011 and May 2016. In addition, a continuous source (flux boundary condition) of 1,4-dioxane from Hewitt Site was assigned using a flux boundary condition with prescribed concentration (see Section A4.2 of Appendix A of the RI/FS [LADWP 2016]).
- Sensitivity Plume Case 1 - incorporates the EPA (2015) plume map and the maximum observed concentration in monitoring wells in the A-Zone between January 2011 and May 2016. In contrast to Sensitivity Plume Case 2, NHW Production well data were not incorporated in defining initial plume distribution and a Hewitt Site source (flux boundary condition) was not assigned (i.e., no ongoing source of 1,4-dioxane).
- Sensitivity Plume Case 2 - incorporates the EPA (2015) plume map, recent observed concentration in monitoring wells in the A-Zone between January 2011 and May 2016, and recent flow-weighted production well concentrations between January 2011 and May 2016. In addition, a continuous source (flux boundary condition) of 1,4-dioxane from Hewitt Site was assigned using a flux boundary condition with prescribed concentration in the same manner as

implemented for the 'Plume Case' used for the alternative scenario modeling (see Section A4.2 of Appendix A of the RI/FS [LADWP 2016]).

AVAILABLE DATA

Table 1 summarizes the available 1,4-dioxane analytical data in each of the three quarters (Q3 2016, Q4 2016, and Q1 2017) along with the interpolated contour interval at the relevant locations for the 1,4-dioxane Plume Case, Sensitivity Plume Case 1, and Sensitivity Plume Case 2. Newly installed wells are also identified. In addition, Attachment A presents time series charts of observed 1,4-dioxane concentration data for selected monitoring wells, including the new sampling results from Q3 2016 to Q1 2017.

RESULTS

With the addition of Q3 2016, Q4 2016, and Q1 2017 1,4-dioxane data to the data set, the following alterations to the 1,4-dioxane draft Plume Case definition are likely.

- The overall mass of the plume within the Hewitt Site extents in the A-Zone is likely increased due to the 750 μg/L concentration observed at MW-25A (A-Zone) at the south edge of the property in Q1 2017.
- The overall mass of the plume within the Hewitt Site extent in the B-Zone is increased due to the 250 μg/L concentration at MW-25B at the south edge of the property in Q1 2017 and the detected concentrations at MW-11D a the western edge of the north arm. The highest concentration in the Plume Case in the B-Zone is 58 μg/L.
- Interpolated concentrations migrating to the south past the Hewitt Site would be decreased as a result of the measurements at new wells MW-21A (6.2 μg/L) and MW-22A (11 μg/L).
- For interpolated concentrations in the vicinity of NH-C09, use of the new value of 8.7 μg/L would limit the southern and eastern extent of the down-gradient plume core in this area.

The changes would likely not uniformly increase or decrease the conservativeness of the 1,4-dioxane draft Plume Case definition. In the cases where the new concentration data (from Q3 2016 through Q1 2017) is lower than the previous historical maximum, the previous historical maximum would still be used in the Plume Case plume definition. In the cases where Q1 2017 concentration data is higher than the previous historical maximum or in the case of new wells, the Plume Case plume definition would change.

Also, as charts presented in Attachment A indicate, many monitoring wells and lysimeters do not show a distinct decreasing trend in new observed concentrations (from Q3 2016 through Q1 2017). A number of monitoring wells and lysimeters show a recent increase and/or significant fluctuation in observed 1,4-dioxane concentrations based on recent sampling events from Q3 2016 through Q1 2017, including monitoring wells MW-25A, MW-25B, MW-26A, MW-5, MW-8S, and lysimeters LW-10 and LW-13S. Review of monitoring data also indicates that measured concentration fluctuations of one order of magnitude are not unusual within or near the Hewitt Site (e.g., MW-2, MW-5, MW-8S, MW-15).

It is due to this variability in observed concentrations within individual monitoring locations, coupled with variability in observed 1,4-dioxane trends across the Hewitt Site monitoring data, that an approach was taken to adopt conservatism as a base scenario for the RI/FS (as stated in RI/FS Appendix A p. 49, the plume definition is intended to provide a conservative, yet realistic, estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field). The new data further supports this approach, given the variability of the data. The approach of using maximum concentration values rather than average values or the recent data as a base scenario (Plume Case) provides a conservative yet realistic estimate of 1,4-dioxane distribution within groundwater in the vicinity of NHW Well Field. To address the uncertainty in this approach, sensitivity analyses were carried out to evaluate the effects of the RI/FS Plume Case definition and source flux boundary condition assumptions on transport modeling simulation results. These sensitivity analyses were presented in 'Technical Support Information for Transport Modeling in response to comments regarding: Interim Remedial Investigation/Feasibility Study North Hollywood West Well Field' (Appendix C of the IRAD).

It is important to note that the RI/FS Plume Case and Sensitivity Case 1 both use maximum observed concentrations for the date range considered for the RI/FS, and without robust justification for discounting an observed historical value within the assessed date range, this maximum value would still be included to maintain the conservative yet realistic approach adopted for RI/FS.

Table 1: Q1 2017 Sample Results and Associated Plume Case Contour Interval for 1,4-dioxane

Well Name	Maximum Concentration (µg/L)			Interpolated Contour Interval			Hydro-Stratigraphic Zone	Recently Installed
	Q3 2016	Q4 2016	Q1 2017	Plume Case	Sensitivity Plume Case 1	Sensitivity Plume Case 2		
MW-1	---	---	---	<0.5	<0.5	<0.5	A	×
MW-2	64	---	---	400+	400+	100-400	A	×
MW-3A	---	---	63	50-100	50-100	10-50	A	✓
MW-3D	4.9	1.9	1.5	3-10	3-10	1-3	B	×
MW-4	---	---	---	100-400	100-400	100-400	A	×
MW-5		180	190	100-400	100-400	50-100	A	×
MW-5D	---	6	3	10-50	10-50	3-10	B	×
MW-6	---	1.5	1.3	1-3	1-3	0.5-1	A	×
MW-7	0.94	3.4	0.13	1-3	1-3	0.5-1	A	×
MW-8D	ND (<0.2)	1.7	0.12	3-10	3-10	3-10	B	×
MW-8S	13	4.9	40	10-50	10-50	50-100	A	×
MW-9	---	6.1	1.7	3-10	3-10	1-3	A	×
MW-11D	ND (<0.2)	0.58	0.97	<0.5	<0.5	<0.5	B	×
MW-11S	ND (<0.2)	2.4	0.41	1-3	1-3	1-3	A	×
MW-12A	---	---	0.19	1-3	1-3	1-3	A	×
MW-12D	---	0.89	0.36	<0.5	<0.5	<0.5	B	×
MW-15	180	180	---	100-400	100-400	100-400	A	×
MW-15B	---	---	100	10-50	10-50	10-50	B	✓
MW-21A	---	---	6.2	50-100	1-3	3-10	A	✓
MW-21B	---	---	2.6	3-10	<0.5	0.5-1	B	✓
MW-22A	---	---	11	100-400	3-10	10-50	A	✓
MW-22B	---	---	1.2	10-50	<0.5	1-3	B	✓
MW-25A	---	---	750	50-100	50-100	50-100	A	✓
MW-25B	---	---	250	3-10	3-10	3-10	B	✓
MW-26A	---	---	570	400+	400+	100-400	A	✓
MW-27A	---	---	5	10-50	10-50	10-50	A	✓
NH-C09 [1]	8.1	8.4	2.9	100-400	50-100	50-100	A	×
NH-C13 [2]	ND (<0.2)	0.74	ND (<0.5)	<0.5	<0.5	<0.5	A	×

NOTES:

[1] Well entry for NH-C09 assumed to be NH-C09-310

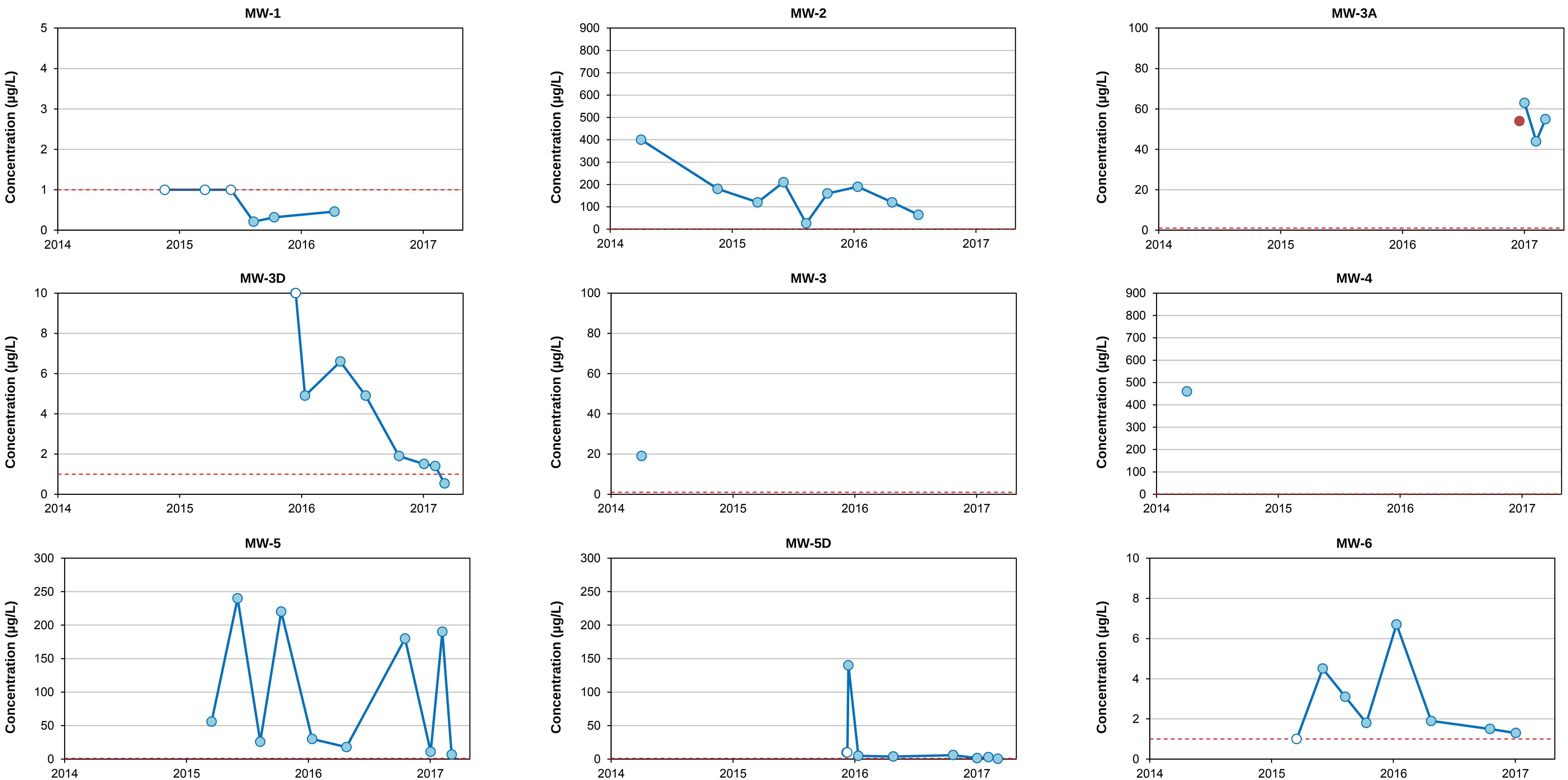
[2] Well entry for NH-C13 assumed to be NH-C13-385

Attachment A Time Series Charts

1,4-DIOXANE (CAS No. 123-91-1) [µg/L]

- Filled symbols denote sample values; unfilled symbols denote values less than detection limit(s)
- Dashed line between data points indicates data gap of more than two years
- Data not in Geotracker download May 12, 2017; data source: Well Installation Report for Hewitt Site (Golder, March 2017)

Notification Level: 1 µg/L



1,4-DIOXANE (CAS No. 123-91-1) [µg/L]

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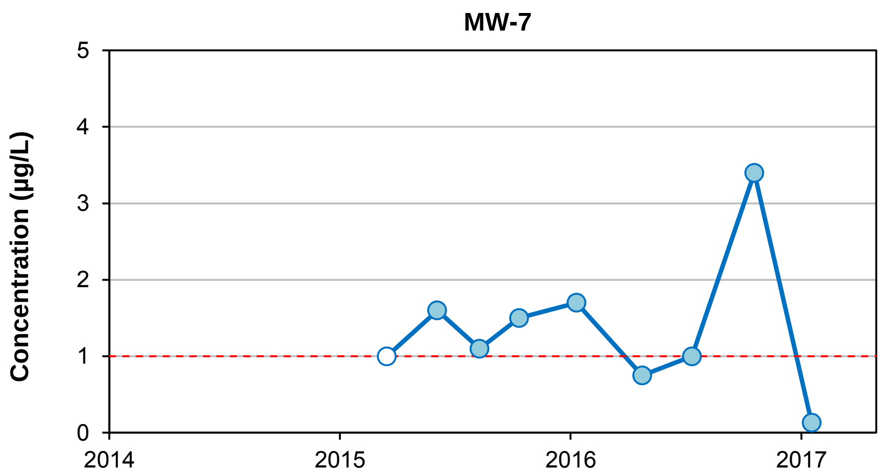

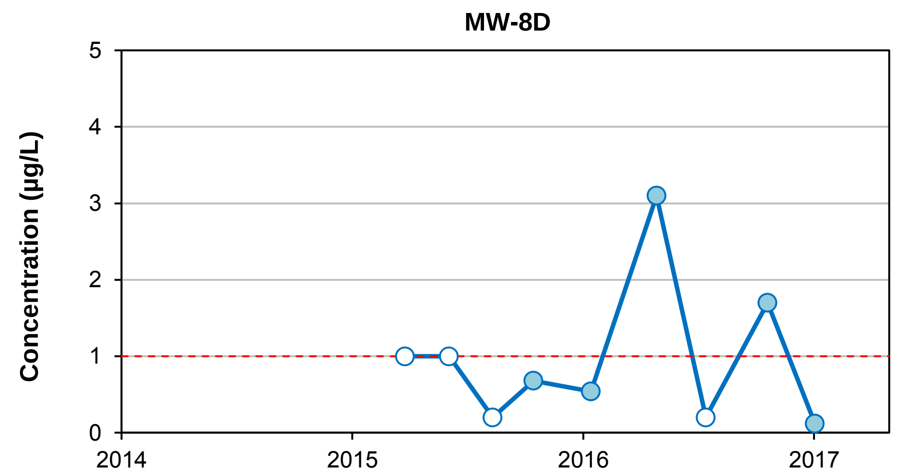

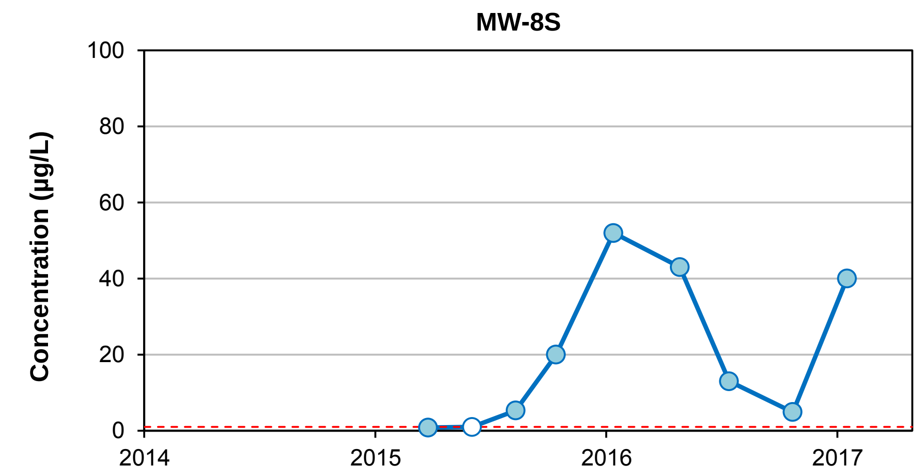

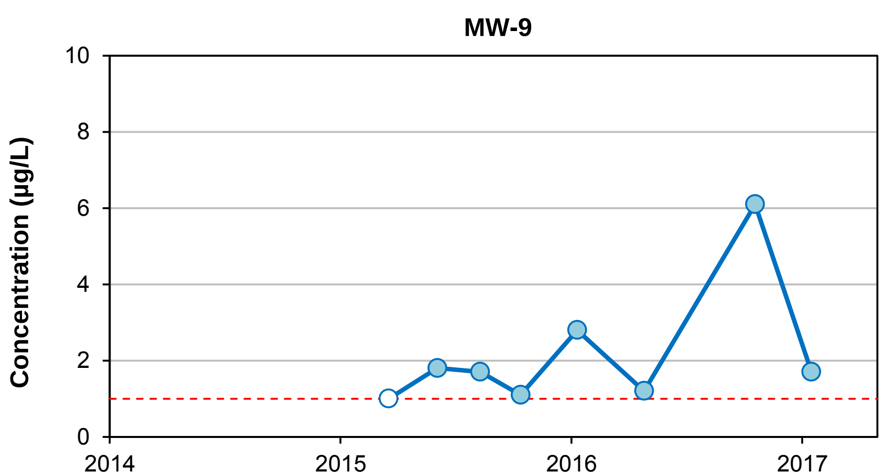

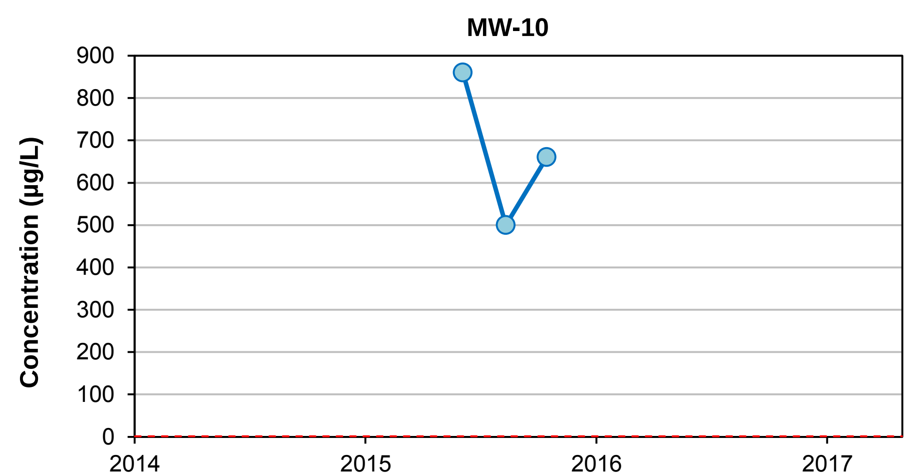

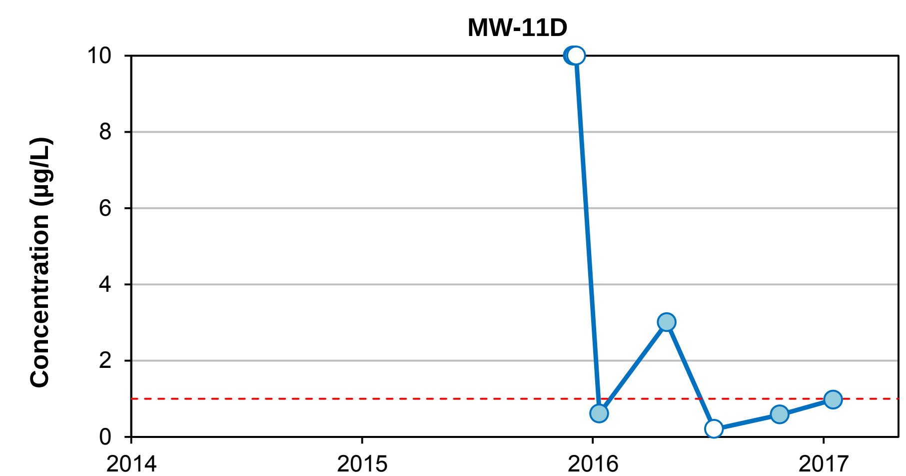

1,4-DIOXANE (CAS No. 123-91-1) [µg/L]

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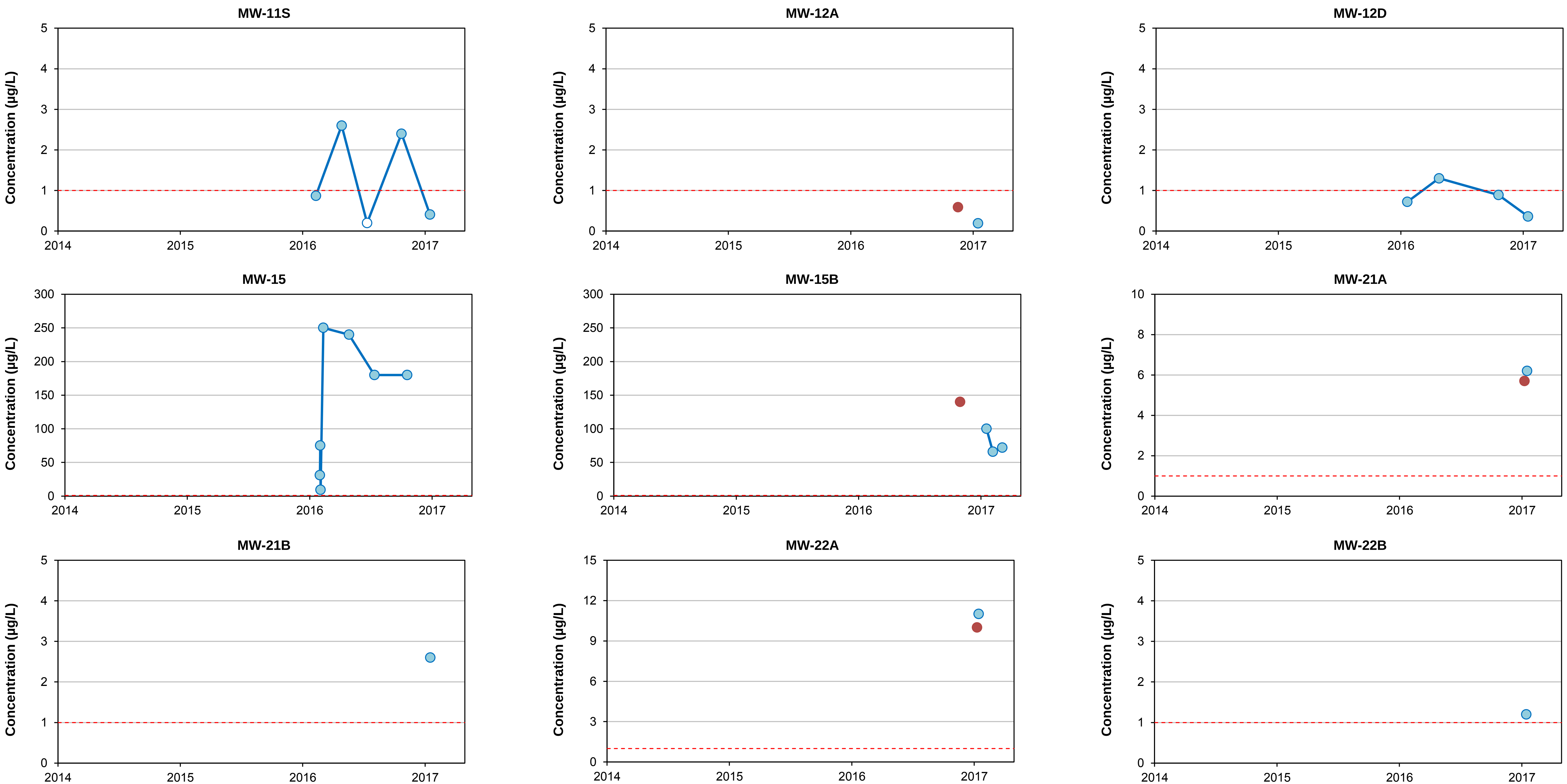

1,4-DIOXANE (CAS No. 123-91-1) [µg/L]

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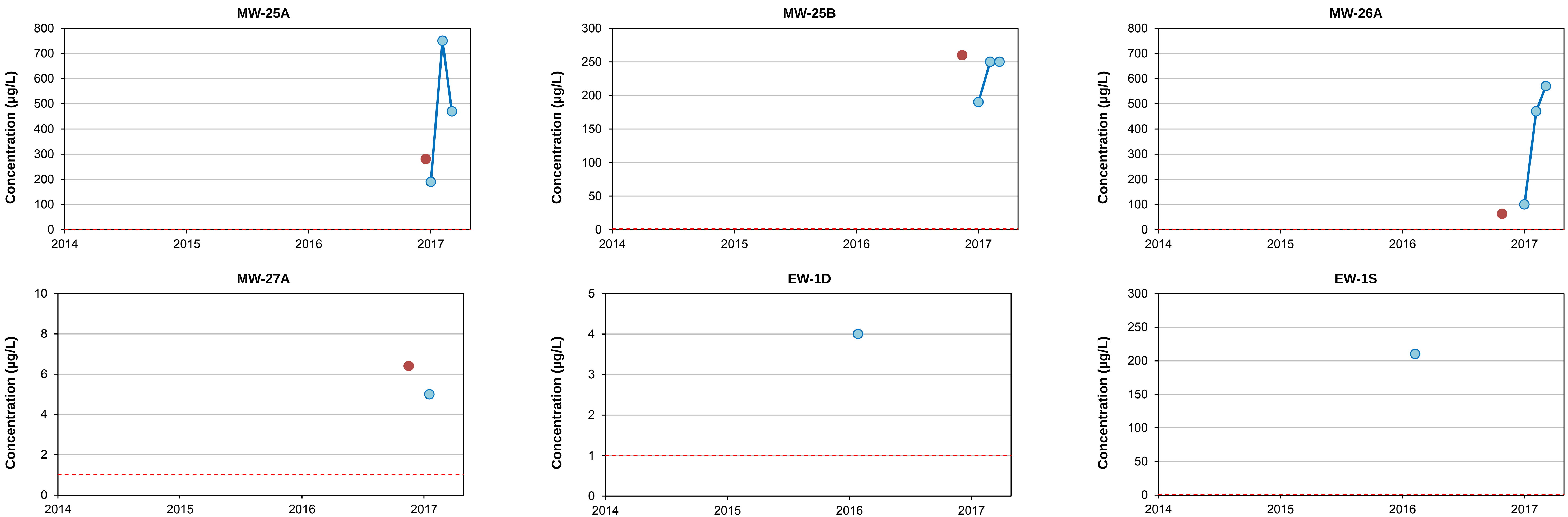

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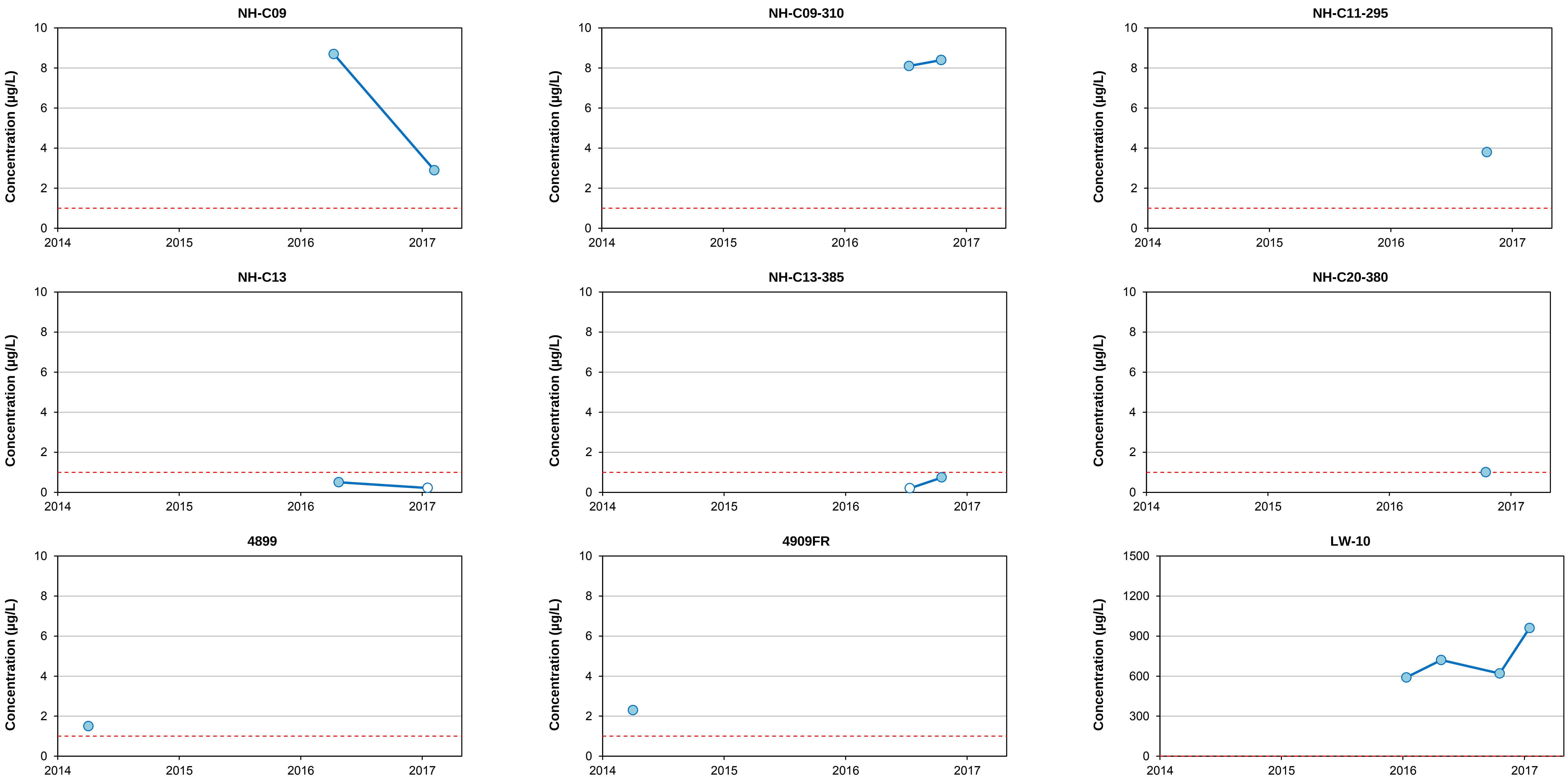

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