GIBSON, DUNN & CRUTCHER LLP
ROBERT W. LOEWEN, SBN 66620, RLoewen@gibsondunn.com
THOMAS A. MANAKIDES SBN 229119, TManakides@gibsondunn.com
3161 Michelson Drive
Irvine, California 92612-4412
Telephone: (949) 451-3800
Facsimile: (949) 451-4220

GIBSON, DUNN & CRUTCHER LLP
PATRICK W. DENNIS, SBN 106796, PDennis@gibsondunn.com
333 South Grand Avenue
Los Angeles, California 90071-3197
Telephone: (213) 229-7000
Facsimile: (213) 229-7520

GIBSON, DUNN & CRUTCHER LLP
ANDREA E. NEUMAN, SBN 149733, ANeuman@gibsondunn.com
200 Park Avenue
New York, NY 10166-0193
Telephone: (212) 351-4000
Facsimile: (212) 351-4035

Attorneys for
DOLE FOOD COMPANY, INC. and
BARCLAY HOLLANDER CORPORATION

BEFORE THE REGIONAL WATER QUALITY CONTROL BOARD

LOS ANGELES REGION

In the Matter of Los Angeles Regional Water Quality Control Board's ("Regional Board") Notice of Opportunity to Submit Comments on Proposed Draft Order in the Matter of Cleanup and Abatement Order No. R4-2011-0046 Former Kast Property Tank Farm (SCP No. 1230, Site ID No. 2040330, File No. 11-043).	**DECLARATION OF JEFFREY V. DAGDIGIAN, PhD**

DECLARATION OF JEFFREY V. DAGDIGIAN, PhD

I, Jeffrey V. Dagdigian, declare as follows:

1. I am Managing Principal Environmental Scientist and owner of Waterstone Environmental, Inc. ("Waterstone"). I was retained by Gibson Dunn & Crutcher LLP ("Gibson Dunn"), on behalf of their client Dole Food Company, Inc. ("Dole Food") and its wholly owned subsidiary Barclay Hollander Corporation ("Barclay"). The following facts are within my personal knowledge and if called as a witness I could and would testify competently thereto. This Declaration relates to Dole's and Barclay's response to the Los Angeles Regional Water Quality Control Board's ("Regional Board") Notice of Opportunity to Submit Comments on Proposed Draft Order in the Matter of Cleanup and Abatement Order No. R4-2011-0046 Former Kast Property Tank Farm (SCP No. 1230, Site ID No. 2040330, File No. 11-043) ("Draft Order").

Introduction

2. I was retained to review and evaluate the materials contained in and attached to Shell Oil Company's ("Shell") June 16, 2014 letter addressed to Dr. Teklewold Ayalew, PG of the California Regional Water Quality Control Board with re line "Comment Letter - Former Kast Property Tank Farm - Revised CAO No. RB4-2011-0046."

3. I have prepared a report, which reflects my evaluations and my scientific opinion with regard to those materials, a true and correct copy of which is attached as Exhibit A ("Report").

Qualifications

4. I have spent the past 33 years using the principles of environmental chemistry, geology, hydrogeology, and engineering as it relates to the investigation and characterization of waste and contamination in soil, soil gas, and groundwater, as well as the remediation, cleanup, and disposal of those media. I am a recognized

expert in these subjects and have provided expert testimony regarding these topics for numerous clients.

5. I hold degrees in biology (B.S.; USC 1975) and chemistry (PhD; USC 1980). I have spent the vast majority of my professional life involved in the evaluation and resolution of environmental issues concerning hazardous chemical releases that resulted in soil, soil vapor, and groundwater contamination. I regularly meet with clients and appear before representatives of various county and municipal environmental health agencies and fire departments, Regional Boards, the Department of Toxic Substances Control (DTSC), the California Environmental Protection Agency (EPA), United States (US) EPA, and the US Department of Justice to provide my expertise on issues related to the extent and nature of contamination in groundwater, fate and transport of chemicals through aquifers, remediation of chemical contamination in aquifers, and costs related to cleanup of soil and groundwater media.

6. From 1997 to present, I have been an owner and Managing Principal of Waterstone. Using my education and the knowledge gained during my 30+ years of experience, I work actively as a consultant performing soil and groundwater investigations, developing remediation and clean-up strategies, and implementing those strategies.

7. A more complete summary of my background is in my expert Report, Exhibit A.

I declare under penalty of perjury under the laws of the State of California and of the United States of America that the foregoing is true and correct. Executed this 30th day of June 2014 at Anaheim, California.

Jeffrey V. Dagdigian

Jeffrey V. Dagdigian, PhD

101653074.2

Gibson, Dunn & Crutcher LLP

EXHIBIT A

Technical Response To Shell's Comment Letter

Former Kast Property Tank Farm
Revised CAO No. RB4-2011-0046
Carousel Housing Tract
Carson, California

June 30, 2014 **Project: 12-219**

Prepared for: **Gibson Dunn & Crutcher, LLP**
333 South Grand Avenue
Los Angeles, CA 90071-3197

Prepared by: Waterstone Environmental, Inc.
2936 E. Coronado Street
Anaheim, California 92806
(714) 414-1122; Fax (714) 414-1166

Technical Response To Shell's Comment Letter

Former Kast Property Tank Farm
Revised CAO No. RB4-2011-0046
Carousel Housing Tract
Carson, California

June 30, 2014 **Project: 12-219**

Prepared by:

Jeffrey V. Dagdigian, PhD
Managing Principal

Waterstone Environmental, Inc.
2936 E. Coronado Street
Anaheim, California 92806
(714) 414-1122; Fax (714) 414-1166

Table of Contents

Section **Page**

Table of Contents ………………………………………………………………………...i

List of Abbreviations …………………….……………………………………..……iii

1.0 Introduction...1
1.1 Background...1

2.0 Response to Comments Provided by Thomas Johnson...3
2.1 Mr. Johnson’s Analysis of Upward Migration Fails to Evaluate All Components of Waterstone’s Theory...4
2.1.1 Clarification No. 1: Waterstone’s Theory Is Not Limited to Capillary Action as the Sole Mechanism for Upward Migration and Moreover, Upward Migration Only Explains Petroleum Contamination in Shallow Soils Above the Former Reservoir Floors, Not Petroleum Found In ALL Shallow Soils As Mr. Johnson Asserts 4
2.1.2 Clarification No. 2: Mr. Johnson Fails to Consider the Varying Lithology Across the Subject Property and the Influence of Lithology on Contamination Patterns...5
2.1.3 Clarification No. 3: Mr. Johnson Oversimplifies the Subject Property’s Lithology...6
2.1.4 Clarification No. 4: Mr. Johnson Incorrectly Uses Information from Dragun to Artificially Reduce the Effects of Upward Migration via Capillary Rise..7
2.1.5 Clarification No. 5: The Calculated Capillary Rise of Petroleum Hydrocarbons in Silty Soil is 5.2 Feet and 7.4 Feet in Clayey Soils. These are Sufficient Distances to Be Responsible for the Upward Migration Patterns that Exist at the Subject Property..9
2.1.6 Clarification No. 6: A Scientific Study with a Finding that Diesel Hydrocarbons can Migrate 6.7 Feet Upward is Not Invalid Merely Because the Purpose of the Study is to Evaluate Downward Movement of Hydrocarbons..10
2.1.7 Summary..12
2.2 Mr. Johnson Fails in his Attempt to Refute Upward Migration of Oil at the Former Wilmington Complex Reservoirs No. 1 and No. 2 12
2.2.1 Clarification No. 1 13
2.2.2 Clarification No. 2 13
2.2.3 Clarification No. 3 14
2.2.4 Clarification No. 4 15
2.2.5 Clarification No. 5 16
2.2.6 Summary of Upward Migration of Oil at Reservoirs 1 and 2...................18
2.3 Occurrence of Petroleum Hydrocarbons in Shallow Soils 19
2.3.1 Clarification No. 1 19
2.3.2 Clarification No. 2 20

Table of Contents – Continued

Section **Page**

2.3.3 Clarification No. 3 20
2.3.4 Clarification No.4 21
2.3.5 Clarification No. 5 22
2.3.6 Clarification No. 6 22
2.4 Site Demolition and Grading Activities....22
2.4.2 Clarification #2: Mr. Johnson Incorrectly Concludes that Soil from Beneath the Floors Containing Petroleum Hydrocarbons Was Mixed Into Fill Soils During the Ripping Process....25
2.4.3 Clarification #3: Mr. Johnson Provides No Evidence that Soil in the Sidewall Berms Contained Petroleum Hydrocarbons and Ignores Deposition Testimony to the Contrary....27

3.0 Evaluation of Information Provided by Douglas Weimer 29
3.1 The Data Provided by Mr. Weimer in Appendix A Create a False Impression 30
3.1.1 Clarification No. 1 30
3.1.2 Clarification No. 2 30
3.1.3 Clarification No. 3 31
3.1.4 Clarification No. 4 31
3.1.5 Clarification No.5 32
3.1.6 Clarification No. 6 32
3.2 Boring Contamination Maps Provided by Mr. Weimer in Appendix B Support Upward Contamination Model 33
3.3 Summary....36

Figures

1 Reservoir 1 – East Berm Profile: Pre and Post Cap Extension

Appendices

A History of 2011 Bach Statement
B Summary of the Waterstone Upward Migration Theory

List of Terms

Term	Description
2011 Statement	A written statement by Mr. George Bach, dated May 13, 2011
ASTM	American Society for Testing and Materials
Barclay	Barclay Hollander Corporation, Barclay-Hollander-Curci (BHC), and Lomita Development Company
bgs	below ground surface
“bottom-up” contamination pattern	A contamination pattern where the highest petroleum hydrocarbon concentrations are detected at depth and concentrations progressively decrease in shallower soil samples.
CAO	Cleanup and Abatement Order
County	County of Los Angeles, Department of Engineering, Building and Safety Division
County Inspectors	Grading inspectors from the County
January 2014 Technical Response	Technical Response to the RWQCB Draft Cleanup and Abatement Order, dated January 21, 2014, prepared by Waterstone Environmental, Inc.
LNAPL	Light Non-Aqueous Phase Liquid
mg/kg	milligrams per kilogram or parts per million
Mr. A. Vollmer	Alfred (Al) Vollmer was an equipment operator employed by Vollmer Engineering who worked in Reservoirs 5 and 6 and who performed ripping of the concrete floors and movement of soil from the berms into the reservoirs and completed grading and compaction in the reservoirs.
Mr. L. Anderson	Lowell Anderson was an employee of Vollmer Engineering and was an equipment operator. Mr. L. Anderson was onsite for most of the project and performed grading work in all three reservoirs.
Mr. G. Bach	Mr. George Bach was employed by Barclay and was the engineer who was onsite daily to oversee all operations.
Mr. L. Vollmer	Leroy Vollmer was the owner of Vollmer Engineering, the contractor hired by Barclay to perform decommissioning and grading of the Subject Property for residential development. Mr. L. Vollmer was onsite on a nearly daily basis performing decommissioning and grading work.
PSE	Pacific Soils Engineering, Inc., the geotechnical engineers of record for the residential development of the Subject Property.
RWQCB	Los Angeles Regional Water Quality Control Board
Shell	Shell Oil Company, Shell Oil Products US
Shell Comment Letter	Shell’s June 16, 2014 letter provided to the RWQCB with its comments on the draft CAO and Waterstone’s January 2014 Technical Response.
Subject Property	Former Kast Property Tank Farm, Carousel Tract
“top-down” contamination pattern	A contamination pattern where the highest petroleum hydrocarbon concentrations are detected near the surface or above deeper samples that show lower concentrations that are progressively decreasing with depth.
TPH	Total Petroleum Hydrocarbons
TPHd	Diesel fraction of petroleum hydrocarbons. Generally within the carbon range of C_{13}-C_{22}.
TPHg	Gasoline fraction of petroleum hydrocarbons. Generally within the carbon range of C_4-C_{12}.

Term	Description
TPHmo	Motor oil fraction of petroleum hydrocarbons. Generally with a carbon range greater than $C_{22.}$
URS	Shell’s environmental consultant who has performed the majority of the Shell Investigations under the Clean-Up and Abatement Order
UVOST	Ultraviolet Optical Screening Tool
Vollmer	Vollmer Engineering
Waterstone	Jeffrey V. Dagdigian, Ph.D.; Waterstone Environmental, Inc.
WMC	Wilmington Manufacturing Complex which includes the former Shell Dominguez Refinery, former Shell Wilmington Refinery, and the former Shell Reservoirs 5, 6, and 7

Section 1.0
Introduction

I, Jeffrey V. Dagdigian, Ph.D. am Managing Principal Environmental Scientist and owner of Waterstone Environmental, Inc. I was retained in December 2012 by Gibson Dunn and Crutcher, LLP on behalf of Dole Food Company, Inc. (Dole) and its wholly-owned subsidiaries Barclay Hollander Corporation (Barclay) and Oceanic Properties, Inc. (Oceanic) to provide my expert scientific evaluation and testimony regarding environmental issues that exist at the Carousel housing tract in Carson, CA (Subject Property).

Barclay is proposed to be named a responsible party for petroleum hydrocarbon contamination on the Subject Property in a draft Cleanup and Abatement Order (draft CAO) issued by the Los Angeles Regional Water Quality Control Board (RWQCB) circulated on October 31, 2013. I prepared a Technical Response dated January 21, 2014 addressing the draft CAO (January 2014 Technical Response). The RWQCB subsequently solicited comments on the draft CAO and Waterstone's January 2014 Technical Response. Shell Oil Company has submitted a letter dated June 16, 2014 with its comments to the RWQCB (Shell Comment Letter).

The purpose of this report is to respond to Shell's Comment Letter which includes the following three submissions:

- A letter from Thomas M. Johnson, PG, CHG, (Shell's Expert) addressing Waterstone's January 2014 Technical Response (Johnson Letter).
- A letter from Douglas J. Weimer of Shell Oil Company dated June 16, 2014 with attachments (Weimer Letter).
- A written statement by George Bach dated May 13, 2011 (2011 Statement).

The submittals from Mr. Johnson and Mr. Weimer are made on behalf of Shell, specifically to address the January 2014 Technical Response. The written statement of Mr. G. Bach from 2011 was made for Plaintiffs' attorneys in the tort litigation pertaining to the Subject Property, Girardi Keese, and does not address the January 2014 Technical Response. Section 2 addresses comments provided by Thomas Johnson and also includes an evaluation of the 2011 Statement of Mr. G. Bach that Mr. Johnson cites in his comments. Section 3 evaluates the submission provided by Douglas Weimer.

1.1 Background

The Subject Property is a residential tract of 285 homes developed in the 1960's. It is located north of the intersection of Neptune Avenue and Lomita Boulevard in Carson, CA. Prior to development, the Subject Property was used by Shell Oil Corp. (Shell) to store crude oil and other petroleum products in three large reservoirs associated with Shell's nearby WMC. During Shell's ownership of the Subject Property from approximately 1923 to 1966, it was known as the Kast Tank Farm.

My January 2014 Technical Response provided a detailed background of the Subject Property's past and current conditions as well as an explanation of the fate and transport of petroleum hydrocarbons that have caused the existing contamination patterns. My January 2014 Technical Response also examined the potential sources of known petroleum hydrocarbon releases and an evaluation of fate and transport of petroleum hydrocarbons currently documented on the Subject Property to determine whether or not Barclay's redevelopment activities as well as Shell's past use of the Subject Property may have caused and/or spread the contamination. In addition, my January 2014 Technical Response also discussed relevant information from documents I have reviewed, my opinions regarding environmental fate and transport and other relevant environmental topics and the scientific basis for my opinions. My January 2014 Technical Response is cited where appropriate rather than repeating that information here.

Section 2.0
Response to Comments Provided by Thomas Johnson

I have completed a technical review of the Johnson Letter. The Johnson Letter: (i) incorrectly describes Waterstone's theory of upward migration of petroleum hydrocarbons in fill soil within the former reservoir footprints, (ii) incorrectly interprets and misstates information that was cited in the Waterstone January 2014 Technical Response, and (iii) erroneously suggests that the petroleum hydrocarbons in shallow soils and soil vapor resulted primarily from Barclay's development activities including reservoir demolition and site grading.

The primary technical flaws in Mr. Johnson's arguments are twofold. First, Mr. Johnson disagrees with Waterstone's theory of upward migration but, in doing so, he fails to consider the varied natural conditions included in Waterstone's theory that govern migration because he evaluates only a single mechanism (capillary force) when other mechanisms such as fluid saturation, buoyancy and pressure also have significant influence on upward migration of petroleum hydrocarbons at the Subject Property. Therefore, the theory Mr. Johnson attributes to Waterstone and disagrees with is not the one described in Waterstone's January 2014 Technical Response. Mr. Johnson has made assumptions and interpretations that indicate he failed to consider key components of or he simply does not understand the Waterstone theory. To provide the correct information regarding Waterstone's theory, I have provided a summary (included as Appendix B to this report) to reiterate the upward migration theory presented in the Waterstone January 2014 Technical Response.

Second, Mr. Johnson's upward migration analysis completely disregards the sampling data and assumes that laboratory-like, artificial conditions exist at the Subject Property. Mr. Johnson demonstrates that upward migration has limited upward movement in homogeneous sand, however, his example is more suited to a laboratory than the Subject Property fill soils which are not homogeneous but exhibit varying soil types. It is not accurate to use a laboratory-like artificial setting that seldom occurs in nature to evaluate the heterogeneous conditions on the Subject Property. Mr. Johnson does not evaluate or explain the data for over 10,000 samples collected on the Subject Property. Inexplicably, Mr. Johnson does not use or consider the data in any way in his analysis. In fact, the only evaluation of Subject Property data in the Shell Comment letter is performed by someone who does not claim to be an expert, Mr. Douglas Weimer of Shell Oil (further discussed in Section 3). Thus, Mr. Johnson's arguments against upward migration are flawed because he assumed artificial conditions exist rather than the Subject Property conditions analyzed by Waterstone.

In addition, while there are technical flaws in Mr. Johnson's analysis of the literature, he acknowledges that the mechanism causing capillary rise functions as "The rise of water or other fluids in soil pores results from the molecular attraction (adhesion) between the soil and the fluid, and the surface tension of the fluid (cohesion)."[1] Therefore, Mr. Johnson agrees that "the

---

[1] Johnson, Thomas. 2014. *Technical Information Responding to the January 21, 2014 Waterstone Environmental, Inc. "Technical Response to the RWQCB Draft Cleanup and Abatement Order."* June 16. p. 4. paragraph 4.

properties of the fluid and the soil" can form "bundles of capillary tubes"[2] under the right conditions, thereby accepting the central point that upward migration is a well-known and naturally-occurring phenomenon.

2.1 Mr. Johnson's Analysis of Upward Migration Fails to Evaluate All Components of Waterstone's Theory

The upward migration pattern described in Waterstone's January 2014 Technical Response, shows the highest petroleum hydrocarbon concentrations exist at a depth below the former reservoir floors, and concentrations decrease at lesser depths (a "bottom-up" contamination pattern). This bottom-up pattern originates from upward migration of the contamination left beneath the former reservoirs by Shell. Waterstone's upward migration theory is more fully described in Appendix B.

Using TPHd as a marker chemical, the contamination pattern at the Subject Property shows the highest TPHd concentrations are generally below the floors of the former reservoirs in the soil left in place by Shell and which were not disturbed by Barclay. Further, the highest concentrations and largest areas of shallow soil impact (caused by upward migration) in the fill soil are observed near the perimeters of the former reservoir floors, in the areas near the sidewall/floor joint connection. The sidewall/floor joint is where the highest and deepest TPHd concentrations exist on the Subject Property. This was described in Waterstone's January 2014 Technical Response in Sections 5.2.2, 5.2.5, 5.2.7 and 6.0 and is not challenged by Shell or its experts in the Shell Comment Letter.

However, even though Mr. Johnson does not evaluate Waterstone's theory corrected defined, he concludes that it is "not valid."[3] The following discussion provides clarifications to correct some of the statements made in the Johnson Letter.

2.1.1 Clarification No. 1: Waterstone's Theory Is Not Limited to Capillary Action as the Sole Mechanism for Upward Migration and Moreover, Upward Migration Only Explains Petroleum Contamination in Shallow Soils Above the Former Reservoir Floors, Not Petroleum Contamination Found In ALL Shallow Soils As Mr. Johnson Asserts

Mr. Johnson incorrectly describes Waterstone's theory in the following statements:

> *"In their January 21, 2014 submittal to the RWQCB, Waterstone presents several arguments purporting to show that petroleum contamination was not present in shallow soils (less than 10 feet deep) when Barclay developed the Site in the late 1960's, and that* ***all petroleum contamination in shallow soils at the Site resulted from upward migration through capillary action from deeper soils.****"*[4] (emphasis added)
>
> *"Waterstone's alleged hypothesis of upward migration of petroleum hydrocarbons from deeper soils*

[2] Ibid.
[3] Ibid. p. 1. paragraph 2.
[4] Ibid.

> *by capillary rise as the only cause of petroleum hydrocarbons in shallow soils at the Site is not scientifically valid."*[5]

Mr. Johnson's description above contains two errors. First, it incorrectly states that Waterstone's theory considers capillary action as the single transport mechanism explaining the contamination in all of the fill material at the Subject Property. Mr. Johnson fails to consider Waterstone's description of the varied natural conditions that govern migration and cause complex patterns of contamination. Other mechanisms such as fluid saturation, buoyancy and pressure also have significant influence on upward migration as described in the summary of Waterstone's upward migration theory in Appendix B.

Second, the Waterstone theory does not state that capillary action is responsible for "all petroleum contamination in shallow soils at the Subject Property." Only fill soils placed above the former reservoir floors are subject to upward migration of petroleum hydrocarbons from leakage left by Shell beneath the reservoir floors. The shallow soil contamination located outside of the reservoir footprints was explained in Waterstone's January 2014 Technical Response as a top-down contamination pattern as a result of near surface releases of petroleum hydrocarbons during Shell operations. The top-down pattern of contamination caused by Shell releases has a different migration mechanism that Mr. Johnson does not evaluate or critique.

Mr. Johnson has significantly misidentified or failed to consider important components of Waterstone's theory of migration and based on his inaccuracies and omissions, Mr. Johnson makes the incorrect conclusion that Waterstone's theory is not valid. Mr. Johnson's conclusions regarding the Waterstone upward migration theory are, therefore, flawed and should not be considered by the RWQCB in making their decision whether to name Barclay as a responsible party for contamination at the Subject Property.

2.1.2 Clarification No. 2: Mr. Johnson Fails to Consider the Varying Lithology Across the Subject Property and the Influence of Lithology on Contamination Patterns

Mr. Johnson acknowledges that at the Subject Property, "soils are not uniform and consist of interbedded layers of soils with vastly differing properties."[6] But because he applies only a single mechanism, capillary action, to evaluate Waterstone's upward migration theory, he disregards this variable lithology and criticizes Waterstone's theory on the ground that capillary action would cause a uniform distribution of contamination that is not observed at the Subject Property:

> "If the theory were valid, there would be a much more uniform distribution in soils of increasing petroleum hydrocarbons with depth across the Site. This uniform distribution of petroleum hydrocarbons in soil has not been observed at the Site." [7]

Mr. Johnson would only be correct if the lithology in the field were the same as it is in the laboratory, like a sand box with capillary rise as the sole mechanism of upward movement. But

---

[5] Ibid. p. 4. paragraph 1.
[6] Ibid. p. 5. paragraph 3.
[7] Ibid. p. 4. paragraph 1.

the Subject Property is not built on a sand box; there are thousands of borings on the Subject Property that indicate the soil type is not uniform, and Mr. Johnson knows it.

In addition, neither the ripped floor pattern nor the amount or pattern of contamination beneath the former reservoir floors are uniform. These variations cause the bottom-up migration pattern at the Subject Property to be varied depending on soil type, distance from a sidewall/floor joint, and concentrations of contamination beneath the reservoir bottom. Because of these multiple and varied real world subsurface conditions, the pattern observed at the surface is not uniform and would not be expected to be uniform. Because Mr. Johnson does not consider actual conditions and criticizes only on the basis of conditions he knows do not exist on the Subject Property, his critique does not affect my opinion about upward migration.

Based on hundreds of borings at the Subject Property, it is known that the specific lithology that exists within the fill material over the former reservoir floors consists mostly of varying amounts of sandy clay and clayey sand. Coarser, sandy materials are found beneath the former reservoir floors. Sands that exist beneath the former reservoir floors have sufficient pore space to provide a significant volume of free phase petroleum hydrocarbons to drive the upward migration of these into the finer-grained soils within the reservoir fill material where the finer-grained fill soils are in contact with this source material. Therefore, the specific lithology and hydrocarbon release patterns at the Subject Property provide the ideal conditions for upward migration to occur.

Mr. Johnson incorrectly assumes that a uniform distribution of increasing petroleum hydrocarbon concentrations in soil with depth across the Subject Property is a requirement for Waterstone's theory to be valid. However, petroleum hydrocarbon contamination does not migrate upward in a perfectly vertical direction under capillary action in any natural setting as Mr. Johnson implies with his over-simplified, laboratory-type model. Waterstone's theory did not assume or imply that upward migration would follow a precisely vertical direction towards the surface and in fact we specifically predicted that a more varied distribution would be seen in our January 2014 Technical Response.

2.1.3 Clarification No. 3: Mr. Johnson Oversimplifies the Subject Property's Lithology

Although he acknowledges the variable lithology of the Subject Property, Mr. Johnson's single-mechanism error gets in his way when he argues that capillary rise will be stopped when fluid rising upward from fine-grained soils moves upward into sand layers:

> "In layered soils, the larger pores in sands layers control and limit the upward movement of water by capillary rise from underlying fine-grained soils, essentially stopping upward fluid movement." [8]

However, while Mr. Johnson is correct that the lithology is varied, he misrepresents the Subject Property lithology, however, when he suggests that sand would be the most representative grain size for the soils within the reservoir fill material. On the contrary, fill soil logged within the

[8] Ibid. p. 5. paragraph 3.

former reservoirs contains significant amounts of silt and clay soil that can cause capillary rise to significant heights to occur within the reservoir fill material at the Subject Property.

Geotechnical borings have been performed within the former reservoir footprints on the Subject Property that have penetrated the fill material, the concrete floor and the undisturbed soil beneath the floor. Logs for these borings indicate the soil consists of clayey sand and sandy clay, with clay and silt also present. The only coarser-grained soils encountered in these borings include silty sand and sand that was present beneath the former reservoir concrete floors. These sandy soils located beneath the former reservoir concrete floors provide ample storage capacity to hold petroleum hydrocarbons which leaked through the former reservoir floors. These petroleum hydrocarbons beneath the floors then provided a sufficient future source for liquid petroleum migration upward into the finer-grained fill material within the former reservoir footprints.

2.1.4 Clarification No. 4: Mr. Johnson Incorrectly Uses Information from Dragun to Artificially Reduce the Effects of Upward Migration via Capillary Rise

Mr. Johnson misrepresents information from the January 2014 Technical Response in his statement:

> "Waterstone reports the following values of capillary rise of water in various soil types based on information from "Soil Chemistry of Hazardous Material" by Dragun (1998). However, Waterstone wrongly suggests that these values would apply to the former Kast Site.

Coarse gravel	0.1 ft
Sandy gravel	1.5 ft
Silty gravel	4.5 ft
Sand	5.0 ft
Silt	11.5 ft
Clay	16.5 ft

* * *

> This is because the values of capillary rise above cited by Waterstone reflect special conditions that do not occur at the former Kast Site. Dragun (1998) states that these capillary rise values occur only where the water table is very shallow (e.g. 5 feet below the surface if a sand), and the combined effects of evaporation and plant root transpiration accelerate the upward movement of water from the shallow water table (Dragun 1998). The depth to groundwater at the former Kast site is more than 40 to 50 feet deep." [9]

Mr. Johnson misinterprets the Dragun text. The cited capillary rise values are generally applicable to the soil types provided in the table and not dependent on the depth of water meaning it is not related to the proximity to the capillary fringe or zones of evapo-transpiration.

To further clarify, the values of capillary rise cited in the January 2014 Technical Response and stated above are taken from Figure 2.30 of Dragun[10] which is provided below with the accompanying text. The title on the figure is "**Typical Values for Capillary Rise in Various Soils**." These typical values for capillary rise in various soils apply to the Subject Property

[9] Ibid. p. 6. paragraph 1.
[10] Dragun, J. 1998. *The Soil Chemistry of Hazardous Materials*, *Second Edition*. p.211 Figure 2-30.

because the site soils within the former reservoirs consists of clays, silts, sands, and mixtures of these various materials.

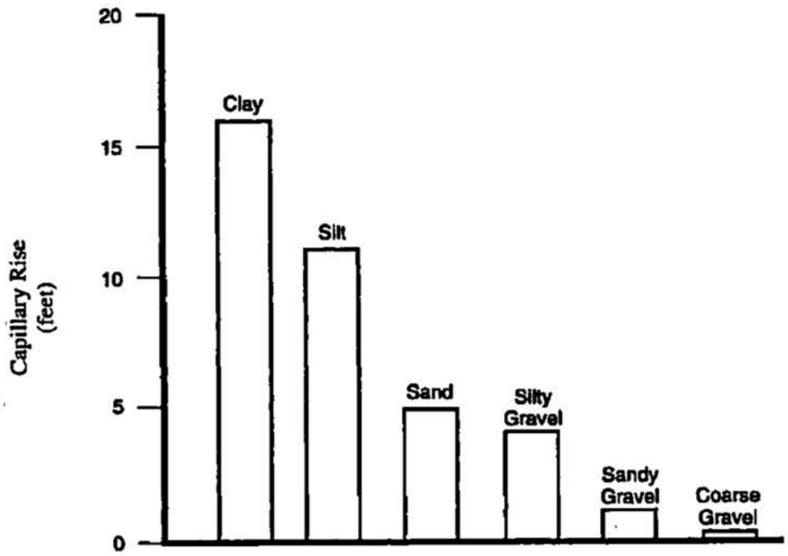


Figure 2.30 Typical Values for Capillary Rise in Various Soils

The capillary fringe does not exert a significant effect, for the most part, on the movement of chemicals in unsaturated zone soils. Even with a fluctuating groundwater table, the movement of the capillary fringe should not exert a significant effect on the movement of chemicals in unsaturated zone soil. The reason can be exemplified by the following conceptual model: In a relatively uniform soil, a rise in the groundwater table toward the soil surface would cause a corresponding upward movement of the capillary fringe. This upward movement would result in the addition of a small amount of water from the capillary fringe to existing water, some quantity of hygroscopic and capillary water will already be within unsaturated zone soil pores. However, when the groundwater table drops, the capillary fringe moves downward. As a result, the net flux of a relatively small amount of water in the capillary fringe passing through a fixed point in the soil is approximately zero. Since the leaching of an organic or inorganic chemical in soil depends on water flux, chemical movement should be negligible because the net flux of water is zero.

There is one condition in which the upward flow of water from the ground water table will affect the transport of a chemical in the unsaturated zone. When the water table is about five feet below the surface of a sandy soil, about eleven feet below a silt soil, or about 16 feet below a clay soil, evapotranspiration causes the upward movement of groundwater through the capillary fringe

(see Figure 2.30). This process is responsible for the upward movement of dissolved salts and chemicals in saline soils[46,47,48,49,50] and salinization of agricultural soils in the western U.S. Under this circumstance, the net migration of a chemical in the unsaturated zone would be upward. Table 2.7 lists evaporation rates in various soils containing different water table depths.

Dragun cites the capillary rise values for different soil types and explains further on page 214 and 215[11] (emphasis added) that "The capillary fringe **does not exert a significant effect**, for the most part, on the movement of chemicals in unsaturated soils." Dragun (p. 214) is now referring to dissolved phased transport of chemical upward through the capillary fringe which has nothing to do with the capillary rise values cited by Waterstone.

Dragun goes on to explain that

> "There is one condition in which the upward flow of water from the ground water table will affect the transport of a chemical in the unsaturated zone. When the water table is about five feet below the surface of a sandy soil, about eleven feet below a silt soil, or about 16 feet below a clay soil, evapotranspiration causes the upward movement of groundwater through the capillary fringe (see Figure 2.30)." [12]

What Dragun is referring to is that in instances where the depth to the water table is less than the typical value of capillary rise for the soil types present, it is possible for the upward transport of dissolved-phase chemicals within the capillary fringe to be significant due to the effects of evapotranspiration. Mr. Johnson cited the sand capillary rise value to **wrongly** infer that this is the representative soil type within the fill material above the reservoir floors. Nowhere does Dragun state or imply that these "Typical Values for Capillary Rise in Various Soils" are for any special circumstances despite Mr. Johnson's position to the contrary.

2.1.5 Clarification No. 5: The Calculated Capillary Rise of Petroleum Hydrocarbons in Silty Soil is 5.2 Feet and 7.4 Feet in Clayey Soils. These are Sufficient Distances to Be Responsible for the Upward Migration Patterns that Exist at the Subject Property

Mr. Johnson attempts to argue that the distance hydrocarbons can migrate as a result of capillary rise is not enough to explain the hydrocarbons in shallow fill soil at the Subject Property. Mr. Johnson attempts to infer from his interpretation of published data on upward movement of water through capillary rise that the possible upward distance of capillary rise of petroleum hydrocarbon fluids is limited in a comparable amount. However, Mr. Johnson's argument is not valid given Dragun's presentation of the capillary rise of water in various soils in Figure 2-30 in his publication.[13]

When I use the correct capillary rise of water in various soils and Mr. Johnson's own equations, I find that the capillary rise of Petroleum Hydrocarbons is 5.2 feet in silty soil materials and 7.4 feet in clayey soil materials. To arrive at these results, I used the same formula cited by Mr. Johnson along with his assumptions. Those assumptions included utilization of the average published values for surface tension and density for the petroleum products. I also used, for consistency; Waterstone's original cited "Typical Values for Capillary Rise in Various Soils" which are valid and representative for the Subject Property. The following calculated heights of capillary rise for petroleum products in the same soil types would be expected:

[11] Ibid. p.214-215.
[12] Ibid.
[13] Ibid. p.211 Figure 2-30.

Soil Type	Capillary Rise Water	Capillary Rise Petroleum
Coarse gravel	0.1 ft	0.05 ft
Sandy gravel	1.5 ft	0.68 ft
Silty gravel	4.5 ft	2.0 ft
Sand	5.0 ft	2.3 ft
Silt	11.5 ft	5.2 ft
Clay	16.5 ft	7.4 ft

As shown by these results, the calculated capillary rise of petroleum hydrocarbons in the fill soil within the former reservoirs would be on the order of 2.3 feet for sand, 5.2 feet for silt, and 7.4 feet for clay. With the dominant soil type within fill material being sandy clay and clayey sand, a capillary rise of petroleum hydrocarbons in a clayey soil would be expected to be on the order of 7 feet within the fill soils placed above the former reservoir floors. These numbers correlate well with the observed depths of contaminants documented in these soils from subsurface data generated by Shell's consultants, even though they do not take into account any additional transport due to buoyancy or other forces. Therefore, Mr. Johnson is incorrect in his conclusion that there is not enough capillary rise at the Subject Property to cause the contamination patterns that exist and the calculations prove capillary rise alone has enough influence on upward migration to be responsible for the contamination patterns in fill soils at the Subject Property.

2.1.6 Clarification No. 6: A Scientific Study with a Finding that Diesel Hydrocarbons can Migrate 6.7 Feet Upward is Not Invalid Merely Because the Purpose of the Study is to Evaluate Downward Movement of Hydrocarbons

Mr. Johnson attacks another source relied upon in Waterstone's January 2014 Technical Response, a technical paper[14] published by Simantiraki et al., which presents laboratory results demonstrating diesel can migrate 6.7 feet upwards into fine sand. Mr. Johnson does not question the science behind this result; instead, he argues the result cannot be used because the purpose of the study is to evaluate downward movement of light petroleum compounds. This argument misses the point. Mr. Johnson does not question the finding by the authors that diesel can migrate upwards into fine sand, which is especially pertinent here given that diesel range hydrocarbons are the dominant petroleum hydrocarbon range representing soil contamination on the Subject Property.

In performing their study, the authors, Simantiraki et. al., made capillary pressure measurements of Soltrol 220 and diesel fuel in fine sand and coarse sand. During the investigation, the authors measured the horizontal and vertical movements of the two petroleum hydrocarbons under various conditions. In Section 4- Results and Conclusions of the paper the authors state:

> "Finally, k-s-p curves were created for each one of the experiments. It was concluded that the fine sand had higher capillary pressure[15] due to the pore size."

---

[14] Simantiraki, F., Aivalioti, M., Gidarakos, E. *LNAPL Infiltration and Distribution in Unsaturated Porous Media – Implementation of Image Analysis Technique.*

[15] Capillary pressure is measured in pressure units; typically hectopascal (hPa) or millimeters of mercury (mmHg). Hectopascal can be converted to millimeters of mercury by using the conversion factor of 0.75.

Next the authors reference Figure 4, which is shown below.

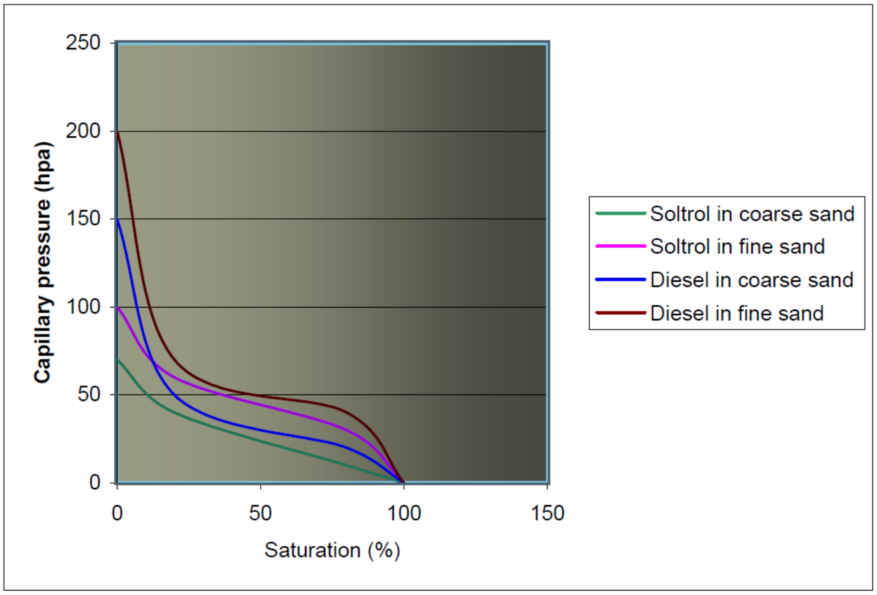


Figure 4. P-S curves for coarse and fine sand and both LNAPL.

Mr. Johnson's statement that the results are not relevant disregards this useful and useable information and is, therefore, another example of a misleading conclusion. The fact that the study investigated the downward movement pattern of various petroleum products is irrelevant. The important part of the study for the issues now before the RWQCB is the use of laboratory data to create pressure saturation curves for various soil types and petroleum products. It is significant and relevant to the Subject Property evaluation that saturation curves for diesel fuel were prepared because diesel-range hydrocarbons are the dominant petroleum hydrocarbon range representing soil contamination on the Subject Property.

The use of pressure-saturation curve results as published in this study are valid for the evaluation of capillary rise distances for petroleum hydrocarbons in various soil types. Based on these results, the authors concluded that the fine sand had a higher capillary pressure and capillary rise as a result of its smaller pore throat size compared to coarse sand. These results indicate a maximum capillary rise for diesel fuel to be approximately 5 feet for coarse sand and 6.7 feet for fine sand, and for Soltrol 220 a maximum capillary rise of 2.18 feet for coarse sand and 3.35 feet for fine sand was observed. (January 2014 Technical Response- Section 6.2). This is another independent confirmation that my calculations (set forth above) regarding the potential rise of petroleum compounds due to capillary action above the former reservoir floors at the Subject Property is the correct order of magnitude and therefore does explain the majority of the distribution of hydrocarbon contaminants in the shallow soils above the former reservoir floors.

Mr. Johnson makes no comments on the other technical articles cited in Section 6.2 of the January 2014 Technical Response which support and document the upward migration of chemicals in soil due to capillary action (wicking).

2.1.7 Summary

Mr. Johnson's critique and his attempt to invalidate the upward migration theory is not scientific, not based on the correct facts, and does not invalidate the upward migration theory by capillary and other forces presented in Waterstone's January 2014 Technical Response. Therefore, there is nothing in Mr. Johnson's analysis that causes me to change my previous opinion regarding the upward migration theory as stated in the January 2014 Technical Response.

Mr. Johnson, in evaluating Waterstone's theory, made no attempt to analyze data patterns which are critical to understanding migration pathways and sources of contamination at the Subject Property. There are over 2,500 sample locations and over 10,000 laboratory analyses that allow a detailed insight into contaminant patterns at the Subject Property. Inexplicably, the only data review performed in Shell's Comment Letter is supplied by Mr. Douglas Weimer of Shell Oil, who does not claim to be an expert. Mr. Weimer also failed to consider key components of or does not understand Waterstone's theory as further discussed in Section 3.

2.2 Mr. Johnson Fails in his Attempt to Refute Upward Migration of Oil at the Former WMC Reservoirs No. 1 and No. 2

In the January 2014 Technical Response, Waterstone verifies its upward migration theory by using the example of Reservoirs 1 and 2 located at the WMC, where petroleum hydrocarbons migrated upward when reservoirs very similar to those operated at the Subject Property were decommissioned. In its 1997 report to the RWQCB, Shell explains that the closure of Reservoirs 1 and 2 "included installation of a low permeability cap over fill soils in each reservoir to inhibit the upward migration of free petroleum hydrocarbons."[16]

Indeed, the upward migration of petroleum hydrocarbons at Reservoirs 1 and 2 is further confirmed because three years earlier, in a December 1994 report to the RWQCB, Shell reported that

> "The berm soil under the concrete liners did not show any free-phase petroleum hydrocarbons nor any oil saturated soils therefore, no soils were removed to be disposed of offsites. (sic)"[17]

Mr. Johnson tries to dispose of this compelling analogy in a single paragraph where he says, in essence, that there was no upward migration at Reservoirs 1 and 2 because, is his view, "the seepage" that required an adjustment to the clay cap

> "reflected petroleum in these sidewall berm soils already present in the surface soils in the berms."

[16] Brown and Caldwell. 1997. *Low Permeability Cap Extension - Addendum 1 of the Backfill and Final Project Completion Report, Reservoirs 1 and 2.* August. p. 1-1.

[17] Shell Oil Company. 1994. *Progress Report #2 Compliance File No. CI 7452 Reservoir Removal Project Shell/Unocal Facility 1520-1622 East Sepulveda Blvd. Carson California*. December 1 to December 31. p. 1.

Mr. Johnson's conclusion is contrary to the facts. In 1997, Shell followed a workplan to expand a low permeability cap, which had been placed over Reservoirs 1 and 2 when they were decommissioned. In its 1997 report to the RWQCB, Shell described "the seepage" described by Mr. Johnson as "already present" in much different terms:

> "In early 1996, soils at grade in the exposed relic berms exhibited **localized bleeding of hydrocarbons to the surface**."[18] (emphasis added)

The express purpose of the clay cap had been to "**inhibit the upward migration of free petroleum hydrocarbons.**"[19] (emphasis added) The cap was expanded because it had failed in its mission.

In addition to documentation of upward chemical migration at Shell Reservoirs 1 and 2, I found documentation of seven other instances of upward contaminant migration at Shell's WMC and provided a summary of these occurrences in Section 7.2.2 of the Waterstone January 2014 Technical Response. Mr. Johnson did not address any of these other instances of upward migration.

A number of Mr. Johnson's statements requiring clarification are further discussed below.

2.2.1 Clarification No. 1

Mr. Johnson describes Reservoirs No. 1 and 2 as "similarly-aged" in comparison to Reservoirs No. 5 through 7 on the Subject Property. The reality is that Reservoirs 1 and 2 were in service for a period of approximately 67 years while Reservoirs 5 through 7 were in service for approximately 40 years. Because Shell Reservoirs 1 and 2 were in service nearly 30 years longer than Reservoirs 5, 6 and 7 the amount of contamination at Reservoirs 1 and 2 should be greater.

2.2.2 Clarification No. 2

Mr. Johnson describes Reservoirs No. 1 and 2 as "covered with a soil cover."[20] The reality is that the initial reservoir closure included the installation of a low permeability cap over fill soil to "**inhibit the upward migration of free petroleum hydrocarbons.**"[21] (emphasis added) According to the August 29, 1994 and November 3, 1994 workplans for the removal of Reservoirs 1 and 2 prepared by Shell and submitted to the RWQCB, Reservoirs No. 1 and 2 were not simply "covered with a soil cover" as claimed by Mr. Johnson but rather were closed using an engineered plan involving:

---

[18] Shell Oil Company. 1994. *Progress Report #2 Compliance File No. CI 7452 Reservoir Removal Project Shell/Unocal Facility 1520-1622 East Sepulveda Blvd. Carson California*. December 1 to December 31. p. 1.

[19] Brown and Caldwell. 1997. *Low Permeability Cap Extension - Addendum 1 of the Backfill and Final Project Completion Report, Reservoirs 1 and 2*. August. p 1-1.

[20] Johnson, Thomas. 2014. *Technical Information Responding to the January 21, 2014 Waterstone Environmental, Inc. "Technical Response to the RWQCB Draft Cleanup and Abatement Order."* June 16. p. 3. paragraph 4.

[21] Brown and Caldwell. 1997. *Low Permeability Cap Extension - Addendum 1 of the Backfill and Final Project Completion Report, Reservoirs 1 and 2*. August. p 1-1.

- The installation of a "**low permeability cover"** that has a maximum relative permeability of $1x10^{-6}$ cm/sec. (emphasis added)
- Final grading and drainage controls as specified in a County of Los Angeles approved grading plan.
- Post-closure maintenance.

The work plans further detail the low permeability cover installation as involving:

- Predominately clay, classified as SC, CL or CH (in accordance with ASTM standard D 2487).
- A minimum compaction of 95% of the maximum dry density of the clay cover (in accordance with ASTM standard D 1557).
- A compacted moisture range of -1 to +3% optimum moisture corresponding to the maximum dry density with field in-place density being determined in accordance with ASTM standard D 1556.
- A minimum compacted thickness of 12-inches.
- A maximum hydraulic conductivity of $1x10^{-6}$ cm/sec (in accordance with ASTM standard D 5084).

The low permeability cap was further protected with a 12-inch thick top soil layer installed to provide drainage control and prevent any ponding of water.

2.2.3 Clarification No. 3

Mr. Johnson asserts that "**Shortly after** the cover was installed, seepage of petroleum at the surface was observed from sidewall berm soils at the edges of the soil cover." [22](emphasis added) Mr. Johnson is incorrect. The reality is that "at-surface petroleum impacted soils" **were not present** at the time of closure; the seepage occurred about a year after closure, and interim inspections identified no seepage.

Prior to capping the reservoir to complete decommissioning Reservoirs 1 and 2, RWQCB Order No. 94-122 ordered Shell to "remove all soils which exhibit the presence of free-phase petroleum hydrocarbon."[23] Shell documented compliance with this very specific RWQCB requirement as follows:

1. Shell Progress Report #1 for the period between October 31, 1994 to November 30, 1994 notified the RWQCB that

[22] Johnson, Thomas. 2014. *Technical Information Responding to the January 21, 2014 Waterstone Environmental, Inc. "Technical Response to the RWQCB Draft Cleanup and Abatement Order."* June 16. p. 3. paragraph 5.
[23] California Regional Water Quality Control Board Los Angeles Region. 1994. *Order No. 94-112 Waste Discharge Requirements for Shell Oil Company 1520 through 1622 East Sepulveda Boulevard Carson California Closure of Two Surface Impoundments (File No. 85-19).* October 31. p. 5.

> "The berm soil under the concrete liners **did not show any free-phase petroleum hydrocarbons nor any oil saturated soils therefore, no soils were removed to be disposed of offsite**."[24] (emphasis added)

2. Shell Progress Report #2 for the period between December 1, 1994 to December 31, 1994 notified the RWQCB that

   > "The soil under the floor concrete liners **did not show any free-phase petroleum hydrocarbons nor any oil saturated soils therefore, no soils were removed to be disposed of offsite**."[25] (emphasis added)

3. The Shell *Backfill and Final Project Completion Report* submitted to the RWQCB at the completion of the reservoir closure, includes Shell's certification stating

   > "I certify under penalty of law…the reservoirs closure was completed in accordance with the requirements and provisions of Order No. 94-122."[26]

Construction of the low permeability clay cap on both reservoirs was completed on August 8, 1995. Post-closure maintenance of the low permeability cap required quarterly inspections for the first year after closure.[27] No "seepage of petroleum at the surface was observed" [28] at the time of closure or during the initial quarterly mandated inspections. The seepage that Mr. Johnson refers to was observed in 1996, not "shortly after closure."

2.2.4 Clarification No. 4

Mr. Johnson contends that

> "In other words, the seepage observed around the caps of Reservoirs Nos. 1 and 2 was from **at-surface petroleum impacted soils**, not from capillary migration."[29] (emphasis added)

Although no free-phase hydrocarbons were present at the time of closure or noted during the initial quarterly inspections, a post-closure subsurface investigation was initiated in March 1996 to address the **newly occurring** phenomenon of petroleum seeping to the surface and **"estimate**

[24] Shell Oil Company. 1994. *Progress Report #1 Compliance File No. CI 7452 Reservoir Removal Project Shell/Unocal Facility 1520-1622 East Sepulveda Blvd. Carson California*. October 31 to November 30. p. 1.
[25] Shell Oil Company. 1994. *Progress Report #1 Compliance File No. CI 7452 Reservoir Removal Project Shell/Unocal Facility 1520-1622 East Sepulveda Blvd. Carson California*. October 31 to November 30. p. 1.
[26] Brown and Caldwell. 1995. *Backfill and Final Project Completion Report, Reservoirs 1 and 2*. October. p. 1-2.
[27] Shell Oil Company. 1994. *Work Plan Reservoir Removal Project Shell/Unocal Facility 1520-1622 East Sepulveda Blvd. Carson, California*. November 3. p. 5.
[28] Shell Oil Company. 1995. *Progress Report #9 Compliance File No. CI 7452 Reservoir Removal Project Shell/Unocal Facility 1520-1622 East Sepulveda Blvd. Carson California*. July 1 to July 31. p. 1.
[29] Johnson, Thomas. 2014. *Technical Information Responding to the January 21, 2014 Waterstone Environmental, Inc. "Technical Response to the RWQCB Draft Cleanup and Abatement Order."* June 16. p. 4. paragraph 1.

the extent of free-phase hydrocarbons present in the reservoir perimeter soils."[30] (emphasis added)

Data collected during the 1996 investigation at the perimeter of the low permeability cover shows that 5% of the samples collected at a depth of 2 feet below ground surface were "wet with hydrocarbons;" 28% of the samples collected at a depth of 5 feet below ground surface were "wet with hydrocarbons;" and 45% of the samples collected at a depth of 8 feet below ground surface were "wet with hydrocarbons."[31]

This data further demonstrates:

1. A greater percentage of samples "wet with hydrocarbons" were found to be present at greater depths clearly indicating an upward migration pattern.
2. The depth of some "wet with hydrocarbons" sample locations is below the former reservoir floor (see Figure 1) at a depth of 8 feet bgs and not limited to "at-surface petroleum impacted soils" as claimed by Mr. Johnson.

2.2.5 Clarification No. 5

Mr. Johnson states as a fact that

> "separate-phase petroleum and high concentrations of petroleum were present in shallow soils at the surface **immediately outside the area of the initial soil covers**, and the seepage that was observed from these soils reflected petroleum in these sidewall berm soils already present in surface soils in the berms."[32] (emphasis added)

This is not what Shell's reports to the RWQCB say.

The reality is that separate-phase petroleum and high concentrations of petroleum required the removal of a minimum of 5 lateral feet of the existing clay cap.[33] The removal of the minimum 5 lateral feet of existing clay cap was designated as "planned excavation areas" and generally extended 2.5 to 4 feet below ground surface. In addition to "planned excavation" of 5 lateral feet of the pre-existing low permeability cap, a significant amount of "over-excavation" was required to address "soils exposed during excavation which contained residual liquid hydrocarbons or were wet with hydrocarbons were removed for subsequent off-site treatment…The removed soils were combined with the soils from the planned excavation areas and exported to an off-site thermal treatment facility."[34] As illustrated on the figure below (Figure 1-2 from the 1997 *Low*

---

[30] Brown and Caldwell. 1996. *Perimeter Investigation Summary Report Former Reservoirs #1 and #2*. April 24. p. 1.

[31] Brown and Caldwell. 1996. *Perimeter Investigation Summary Report Former Reservoirs #1 and #2*. April 24.

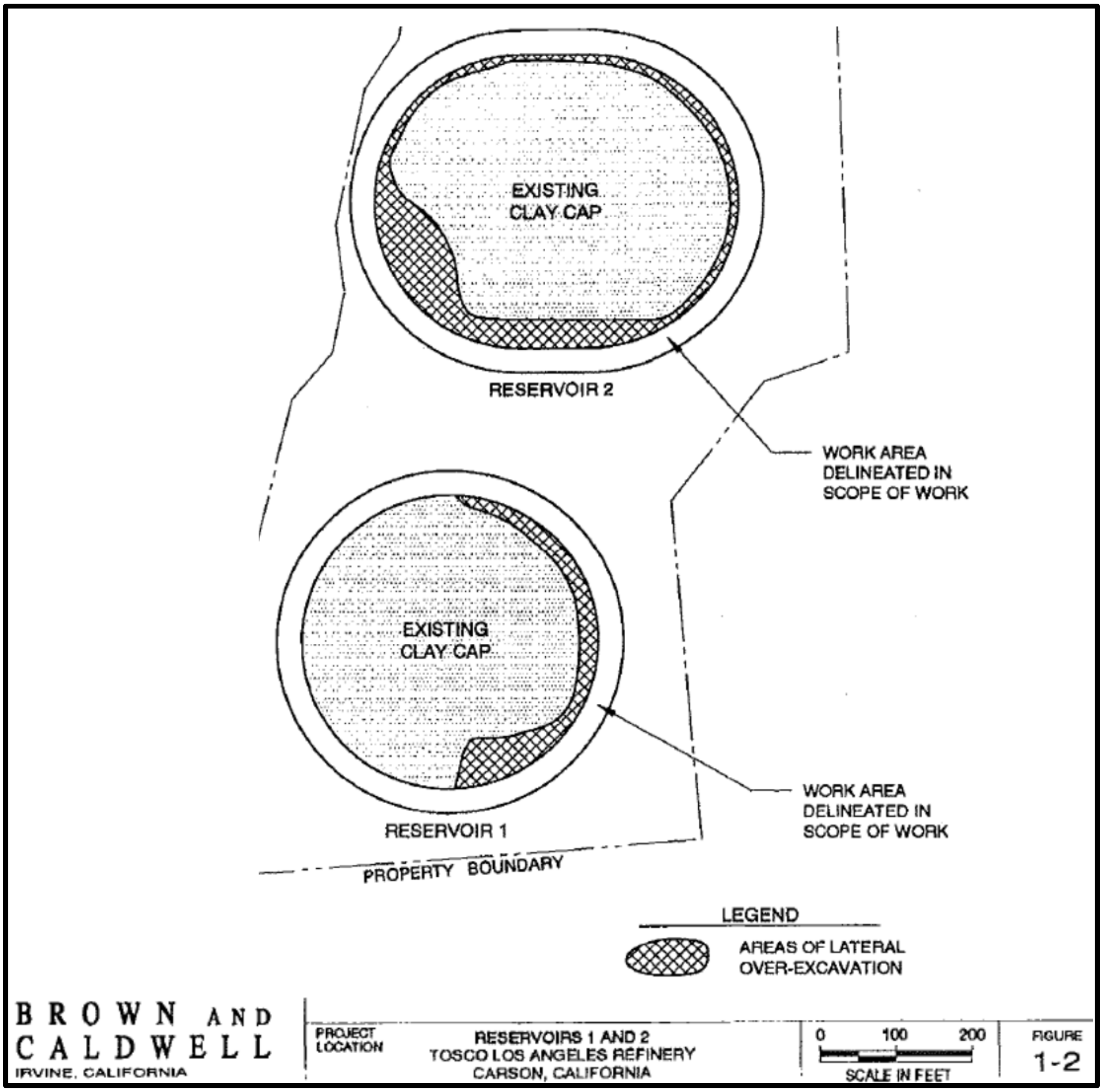
[32] Johnson, Thomas. 2014. *Technical Information Responding to the January 21, 2014 Waterstone Environmental, Inc. "Technical Response to the RWQCB Draft Cleanup and Abatement Order."* June 16. p. 4. paragraph 1.

[33] Brown and Caldwell. 1997. *Low Permeability Cap Extension - Addendum 1 of the Backfill and Final Project Completion Report, Reservoirs 1 and 2.* August. p. 1-3.

[34] Brown and Caldwell. 1997. *Low Permeability Cap Extension - Addendum 1 of the Backfill and Final Project Completion Report, Reservoirs 1 and 2.* August. p. 2-1.

Permeability Cap Extension - Addendum 1 of the Backfill and Final Project Completion Report, Reservoirs 1 and 2) the area of "over-excavation" beyond the initial 5 feet of "planned excavation" is extensive and not "<u>immediately outside the area of the initial soil covers</u>" (emphasis added) as claimed by Mr. Johnson but rather what appears to be as much as 15 feet ***inside*** the original cap perimeter.

The free-phase hydrocarbons that moved up into the fill soils and surfaced at Reservoirs 1 and 2 requiring the removal of the 5 lateral feet of the pre-existing clay cap and the additional "over-excavation" resulted from the same upward migration phenomenon that occurred at Reservoirs 5 through 7 on the Subject Property.



2.2.6 Summary of Upward Migration of Oil at Reservoirs 1 and 2

The timeline of documentation related to upward migration of oil at Reservoirs 1 and 2 is as follows:

- October 1994 - RWQCB Order No. 94-122, ordered Shell to "remove all soils which exhibit the presence of free-phase petroleum hydrocarbon."[35]
- November 1994 - Shell notified the RWQCB that "The berm soil under the concrete liners **did not show any free-phase petroleum hydrocarbons nor any oil saturated soils therefore, no soils were removed to be disposed of offsite**."[36] (emphasis added)
- December 1994 - Shell notified the RWQCB that "The soil under the floor concrete liners **did not show any free-phase petroleum hydrocarbons nor any oil saturated soils therefore, no soils were removed to be disposed of offsite**."[37] (emphasis added)
- August 1995 - The low permeability clay cap on both Reservoirs 1 and 2 was completed.[38]
- October 1995 - Shell certifies that all requirements of RWQCB Order No. 94-122 (including the RWQCB order to "remove all soils which exhibit the presence of free-phase petroleum hydrocarbon") have been met.
- Fourth Quarter 1995 - The initial post-closure inspection of the low permeability cap is conducted.[39]
- First Quarter 1996 - The second post-closure inspection of the low permeability cap is conducted. It is likely that during this inspection the surfacing of hydrocarbons was noted.
- April 1996 - The results of a subsurface investigation conducted at the perimeter of the low permeability cap shows that hydrocarbons are present at depths greater than the former reservoir floor and display an upward migration pattern.
- May 1996 - A Report titled *Subgrade Berm Soil Sampling at Reservoirs 1 and 2*, detailed the work performed to determine the nature and extent of hydrocarbon seeps. This report is not available in the RWQCB files and has not been produced by Shell.
- August 1997 - A report summarizing that the removal of the pre-existing low permeability cap involved a minimum 5 lateral feet plus "additional areas were excavated

[35] California Regional Water Quality Control Board Los Angeles Region. 1994. *Order No. 94-112 Waste Discharge Requirements for Shell Oil Company 1520 through 1622 East Sepulveda Boulevard Carson California Closure of Two Surface Impoundments (File No. 85-19)*. October 31. p. 5.
[36] Shell Oil Company. 1994. *Progress Report #1 Compliance File No. CI 7452 Reservoir Removal Project Shell/Unocal Facility 1520-1622 East Sepulveda Blvd. Carson California*. October 31 to November 30. p. 1.
[37] Shell Oil Company. 1994. *Progress Report #1 Compliance File No. CI 7452 Reservoir Removal Project Shell/Unocal Facility 1520-1622 East Sepulveda Blvd. Carson California*. October 31 to November 30. p. 1.
[38] Shell Oil Company. 1995. *Progress Report #9 Compliance File No. CI 7452 Reservoir Removal Project Shell/Unocal Facility 1520-1622 East Sepulveda Blvd. Carson California*. July 1 to July 31. p. 1.
[39] Shell Oil Company. 1994. *Work Plan Reservoir Removal Project Shell/Unocal Facility 1520-1622 East Sepulveda Blvd. Carson, California*. November 3. p. 5.

> where soils were visibly impacted with residual liquid hydrocarbons." The report depicts these "additional areas" as extending as much as 15 lateral feet into the fill area.

In summary, no liquid hydrocarbons were found to be present at Reservoirs 1 and 2 at the time of closure. One year later, liquid hydrocarbons that migrated upward to the surface near the perimeter of the former reservoirs resulted in the need to remove and replace as much as 15 lateral feet of the pre-existing clay cap and the extension of the clay cap an additional 37 feet to "inhibit future hydrocarbon seepage."[40] Therefore, Mr. Johnson is incorrect in his conclusion that there was no upward movement of petroleum hydrocarbons at Reservoirs 1 and 2.

2.3 Occurrence of Petroleum Hydrocarbons in Shallow Soils

On page 3 of his letter, Mr. Johnson asserts, "The occurrence of petroleum hydrocarbons in shall soils reflects the history of the developers' filling and grading activities." Mr. Johnson fails to prove this proposition. I provide the following clarifications to several of Mr. Johnson's statements in that part of his letter.

2.3.1 Clarification No. 1

Mr. Johnson, in his opening paragraph of this section in his letter, says:

> "Overall, there is a general pattern of increasing concentrations of petroleum hydrocarbons with depth, with much lower concentrations in shallow soils at depths of 0 to 5 feet."

To the extent the bottom up-pattern Mr. Johnson describes is observed in the fill soils above the former reservoir bottoms, this statement fully supports Waterstone's chemical transport theory.

Mr. Johnson later says:

> "However, the distribution of petroleum hydrocarbons in shallow soils at the Site (less than 10 feet bgs) is often highly variable."

This statement appears to contradict his earlier statement, and it also demonstrates his confusion about the localized extent of Waterstone's upward migration theory. As mentioned above, the Waterstone theory anticipates that because the fill soil is heterogeneous, the petroleum hydrocarbons beneath the former reservoir bottoms would be pulled upward and into the finer grained soils and would migrate upward and, at times, laterally in a tortuous path following the interconnected smaller diameter soil pores. This only occurs in the fill soil placed in the areas previously occupied by the reservoirs. Because Mr. Johnson provided no analysis of the existing data as Waterstone did in its January 2014 Technical Response, it is not possible to know whether he is even considering the correct locations when he makes his criticisms.

---

[40] Brown and Caldwell. 1997. *Low Permeability Cap Extension - Addendum 1 of the Backfill and Final Project Completion Report, Reservoirs 1 and 2.* August. p1-1.

2.3.2 Clarification No. 2

Mr. Johnson makes another incorrect statement on the first paragraph of page 3:

> "If Waterstone's hypothesis were correct, concentrations would increase with depth at **all** locations, and that is not the case." (emphasis added)

As previously discussed, Waterstone's upward migration theory does not indicate that bottom-up patterns will occur everywhere; they are only expected to occur in the fill soil above the former reservoir bottoms. As demonstrated in my analysis of the data attached to Mr. Weimer's letter, which Mr. Johnson has not analyzed, when the data is separated into the proper categories, especially by location, a substantial trend toward the bottom-up pattern appears. Insofar as Mr. Johnson contends that unanimity is required and a substantial trend is not sufficient to prove the theory, he is simply wrong.

As discussed earlier, transport of petroleum hydrocarbons into the clean fill material within the former reservoirs occurs primarily through capillary forces and buoyancy forces. These forces, combined with the fine-grained nature of the fill soils and their inherent heterogeneities that are not uniform, result in an overall bottom-up contamination pattern. This is a complex and dynamic process that is oversimplified by Mr. Johnson.

Waterstone's hypothesis does not require concentrations to increase with depth in **all** locations as Mr. Johnson states. On the smaller scale vertically, there could be many instances where the vertical profile of contamination may vary greatly due to the non-uniform nature of the fill material. In these cases, contamination can migrate both laterally and vertically as it moves upward. In addition, the petroleum distribution due to buoyancy forces can cause shallower levels of relatively high contamination levels compared to sample results immediately above and below. This is an expected phenomenon due to historical variations in high water levels that left mobile petroleum hydrocarbon product "stranded" at these shallower levels that appear to be separated from similar concentrations above and below.

Also the ripping and cracking pattern of the reservoir floors, and the contamination pattern beneath the reservoir floors, both of which may have a highly variable and non-uniform distribution pattern, will also result in variability in the final contaminant pattern in the clean fill soils.

2.3.3 Clarification No. 3

Mr. Johnson says on page 3, paragraph 1 of the Johnson Letter:

> "…high concentrations of petroleum hydrocarbons are often found in shallow soils above buried concrete floors that could only have been placed there as fill by the grading contractor. Since the trenches through the concrete reservoir floors were reportedly only 8 inches wide and 15 feet apart. it is completely unrealistic to suggest that all the petroleum contamination in these soils migrated upward from beneath the concrete floors."

This is speculation, not science. Waterstone has reviewed all of the evidence that is available and has found nothing to support the conclusion that the grading contractor placed petroleum hydrocarbons on top of the floors of the former reservoirs. It does not refute the Waterstone upward migration theory to make up facts that are not supported by the evidence. By contrast, the facts are well established concerning the minimum contact points available for below-bottom hydrocarbons to move upward into the newly placed fill soils. Even assuming that grading machinery in the field did not rip more forcefully to create bigger, winder openings than called for by the soils engineers, the amount of ripped concrete surface area and cracked concrete on the former reservoir floor, and the exposed deep soil in the unaltered berm soil, provides more than adequate surface contact area for the underlying petroleum contamination to migrate upward and laterally into the fill material (it certainly was enough of an opening to allow water to drain down and there is no reason to believe that the opening would be sufficient for downward water migration, but not for upward hydrocarbon migration, see below). This would cause the deepest soil just above the concrete floor to, in general, have the highest levels of soil contamination within the fill soil, and slightly lower but very similar to levels just beneath the former reservoir floors, which is in good agreement with the existing soil data collected to date.

Furthermore, the County Engineer acknowledged that the size and frequency of rips planned for the concrete floors was more than adequate to properly drain all the overlying soil from irrigation and rainfall and testing was performed to demonstrate adequate drainage. Therefore, it makes scientific sense that this surface area of ripped and cracked concrete is more than adequate to allow the upward transport of petroleum hydrocarbons from beneath the reservoir floor into the fill soil placed above it. In addition to the vertical direction upward from the exposed area of soil beneath the reservoir floor, capillary action also can easily spread the contamination laterally throughout the reservoir fill soil that was placed on top of the former reservoir floor.

2.3.4 Clarification No. 4

Mr. Johnson incorrectly assumes that the berm soil surrounding the reservoirs only accounted for the first five feet of fill soil placed within the reservoirs, and that the top five feet of fill soil within the reservoirs came from the outer berms surrounding the Subject Property.

First, Mr. Johnson is incorrect because there was not always 10 feet of fill placed within the reservoirs. Only 7 feet of fill was required over the reservoirs floors by the County and in part of Reservoir 5 they had to remove the concrete floor because only 5 feet of fill was required over the floor to bring the fill to final grade. As discussed in the January 2014 Technical Response, there are many areas within the reservoir footprint where there is less than ten feet of fill over the reservoir floors.

Second, the berms surrounding each reservoir were created from the excavation of the reservoir itself, so backfilling that soil to its original location would have filled the reservoir to the current level grade. Therefore, soil from the outer berms would not have been required to fill the reservoirs back to grade.

2.3.5 Clarification No. 5

Mr. Johnson assumes that in areas where no fill was required at the Subject Property, that the contractor automatically excavated and then re-compacted soils to a depth of 3 feet. There is no support for this assumption. In contrast, there is eyewitness testimony indicating no over excavation occurred on the Subject Property.[41]

2.3.6 Clarification No. 6

Mr. Johnson uses an over-simplified model to suggest petroleum hydrocarbon contamination travels in a perfectly vertical direction. A consistent vertical pattern of contamination within the soil matrix is not part of Waterstone's theory.

Many variables are responsible for the final contamination pattern in the fill soil. Parameters such as the grain size of the fill material (soil types), the inter-connectedness of these grains, and the ripped concrete pattern of the reservoir floor will affect the upward and lateral transport in the fill soils through capillary action and buoyancy forces. These forces would be expected to act in a non-uniform and non-linear pattern, pushing and pulling petroleum hydrocarbon contamination upward through a tortuous path into the overlying fill soils. Capillary forces favor migration within the finer-grained soils, buoyancy forces act more quickly on coarser-grained soils, and contamination tends to stick to finer-grained soils. This is a complex system of chemical transport.

2.4 Site Demolition and Grading Activities

On pages 1 and 2 of the Johnson Letter, Mr. Johnson provides his view of the facts concerning what occurred in the 1960s when the reservoirs at the former Kast Property were dismantled and the berm soil was graded and compacted to prepare the property for residential development. In the Waterstone January 2014 Technical Response, this subject is addressed in some detail and will not be repeated here. Mr. Johnson, however, makes several specific errors, which are clarified below.

[41] Dagdigian, Jeffrey. 2014. *Technical Response to the RWQCB Draft Cleanup and Abatement Order*, January 21. p. 89.

2.4.1 Clarification No. 1 - Mr. Johnson Relies on Outdated Information to Incorrectly Conclude that Hydrocarbon Soil Was Mixed into the Fill and Disregards More Detailed and Accurate Testimony by Eyewitnesses G. Bach, L. Vollmer, A. Vollmer and L. Anderson

The Johnson Letter asserts that the following occurred at the Subject Property:

> "After removal of free liquids, some of the sand contaminated with oil was mixed with the fill material in the reservoir (George Bach 2011 Statement, p. 7; Leroy Vollmer Deposition 2013, p. 167)."[42]

Mr. Johnson cites two items of evidence to support this statement, a document prepared by Mr. G. Bach in collaboration with Plaintiffs' counsel, which he signed in May 2011 (2011 Statement) and the deposition testimony of Mr. L. Vollmer, the grading contractor owner. For context, the background of the 2011 Statement is discussed Appendix A, which is attached. Neither of the cited authorities supports the facts asserted by Mr. Johnson. First, the 2011 Statement indicates "The most contaminated sand was exported"[43] which I interpret to mean taken offsite for disposal, and the "sand" that is said to have been blended is never said to contain hydrocarbons of any sort. In his deposition testimony, moreover, Mr. G. Bach indicates that no contaminated soils were left onsite from the cleaning of Reservoir 7 or from any other activities on the Subject Property. As Mr. G. Bach explains in his 2014 Declaration, his 2013 Deposition supersedes his 2011 Statement because a significant portion of the information contained in the latter is not based on first-hand knowledge. In this instance, Mr. G. Bach was not present when the final disposition of materials used in the cleanup of residual products from Reservoir 7 was made, so his 2011 Statement cannot be used as a source of information on that subject, leaving no need to speculate about the status of the "sand." The following deposition testimony by Mr. G. Bach is therefore what we know based on his first-hand accounts:

[42] Johnson, Thomas. 2014. *Technical Information Responding to the January 21, 2014 Waterstone Environmental, Inc. "Technical Response to the RWQCB Draft Cleanup and Abatement Order."* June 16. p. 2. paragraph 1.

[43] Bach, G. 2011. Unsigned Declaration. Page 7: 17-27

```
14:18:39
14:18:51
14:19:06
```

A Well, it was the on-site soil, sand. And if you look, it often describes the soil as sandy. And it was that sandy material that we made the dike out of. We picked some of that up there. We didn't want to use the clay material because it wouldn't really -- you couldn't roll it over like you could sand.

Q I see. And what happened to the sand and clayey material after you were done cleaning out the liquids?

A That was the final cleanup and that all went to the dump.

Q So that went the way of the saturated soils?

A Yes, with the final cleanup it all went.

Q I see.

Mr. L. Vollmer was responsible for the hands-on work in Reservoir 7 and is much more likely to know what became of the sandy soil materials that he used to form an eathen dam to "crowd" the residual materials toward the Chancellor & Ogden vacuum trucks for disposal. In his 2013 Deposition[44], included below, and also cited by Mr. Johnson, Mr. L. Vollmer makes it clear that all soil containing hydrocarbon materials from Reservoir 7 were removed from the Subject Property.

[44] Vollmer, L. 2013. *Volume II Videotaped Deposition of Leroy H. Vollmer*. April 1. p. 167.

Q And at some point in time was -- was then -- did that work?
A It worked very well at first, and then we had a problem develop.
Q Okay. And I'll -- I'm going to ask you about that problem in a minute.
And the -- eventually when the -- there was a time after every -- after the problems were solved and after everything was done when all of the liquids were removed from reservoir No. 7; is that right?
A Yes.
Q Okay. And after the liquids were removed, what happened to the earthen -- the dirt from the earthen dam?
A The -- any of the dirt that had been contaminated with the gunk was hauled off-site and the rest of it that was clean was used in the fill.
Q So on the backside there was still some clean dirt I take it?
A Oh, yes.

Thus, Mr. L. Vollmer, the person directly responsible for the hands-on work of cleaning Reservoir 7, provides detailed, reliable testimony (above) that only clean soil from cleaning Reservoir 7 was retained as fill and the soil containing residual materials was hauled off. This is consistent with Mr. G. Bach's 2011 Statement and 2013 Deposition testimony indicating that saturated, hydrocarbon soils were hauled offsite.

The testimony of Mr. G. Bach and Mr. L. Vollmer both contradict Mr. Johnson's statement quoted above. And, although Mr. Johnson cites testimony only from Mr. G. Bach and Mr. L. Vollmer, there are actually four eyewitnesses to Barclay's grading and demolition activities between 1966 and 1968. All four eyewitnesses indicate that any petroleum hydrocarbons observed were collected and removed from the Subject Property and no petroleum hydrocarbons were observed in fill soil at the Subject Property. This sworn eyewitness testimony from Mr. G. Bach, Mr. L. Vollmer, Mr. A. Vollmer, and Mr. L. Anderson is discussed in detail in Sections 3 and 4 of my January 2014 Technical Response.

2.4.2 Clarification #2: Mr. Johnson Incorrectly Concludes that Soil from Beneath the Floors Containing Petroleum Hydrocarbons Was Mixed Into Fill Soils During the Ripping Process

Mr. Johnson asserts:

> "During the process of "ripping" the concrete trenches in the reservoir floors, **soil from beneath the reservoirs was brought to the surface**, **mixed with the broken concrete and incorporated into the fill materials over the reservoir floors** (Alfred Vollmer Deposition 2014, P. 53, George Bach Depositions 2013, p. 188)." (emphasis added)

This is an erroneous interpretation of the cited and Mr. Johnson compounds his error by making the following misleading and incorrect conclusion:

> "Therefore, it is reasonable to conclude that soil backfill brought to the surface during the trenching process contained petroleum hydrocarbons."[45]

The references Mr. Johnson cites from deposition testimony given by Mr. A. Vollmer and Mr. G. Bach to make this improper conclusion do not support Mr. Johnson's re-interpretation of the facts. In the pages cited by Mr. Johnson, Mr. A. Vollmer discusses the process of bringing the former reservoir walls down and placing them on the reservoir floors and breaking them up and mixing them with clean fill from the berms and compacting them, and Mr. G. Bach says that the soil that was exposed during the ripping of concrete was visible in the ripper cut and it did not contain any visible oil. There is no testimony from either party that the soil that was exposed in the ripper cut had visible oil or was mixed into the fill material. Mr. A. Vollmer and Mr. G. Bach do testify that clean fill and concrete from the sidewalls was placed on top of the in-place ripped concrete and compacted as the first layer of fill within the former reservoirs. An excerpt from Mr. G. Bach's 2013 Deposition below demonstrates this testimony. [46] Further information corroborating the testimony by Mr. A. Vollmer and Mr. G. Bach is included in the deposition testimony by Mr. L. Anderson and Mr. L. Vollmer. This testimony was not included by Mr. Johnson in his analysis. Sworn testimony from all four eyewitnesses indicated there was no observation of petroleum hydrocarbons beneath the reservoir floors. This is consistent with the observations Shell made at its Reservoirs 1 and 2.

```
11:31:23     Q    When you were -- when Mr. Vollmer's crews
were ripping the floors of the reservoirs, were you
able to see the dirt underneath and see whether
there was oil in the dirt underneath?
             A    In the trenches, yes, we could, uh-huh.
11:31:46     Q    You could see dirt underneath?
             A    No, we could see -- well, the dirt -- as
he ripped it, the dirt came up with the concrete.
There would be a certain amount of turnover from the
ripper tooth.
11:31:57     Q    And did you see oil in it?

                                                      188
ELITE COURT REPORTING (949) 829-9222
```

```
11:31:59     A    No, I never did.
```

[45] Johnson, Thomas. 2014. *Technical Information Responding to the January 21, 2014 Waterstone Environmental, Inc. "Technical Response to the RWQCB Draft Cleanup and Abatement Order."* June 16. p. 2. paragraph 1.

[46] Bach, G. 2013. *Volume I Videotaped Deposition of George Bach.* March 7. p. 188-189.

Other than the small amount of soil removed from geotechnical test pits and borings[47] and the very small amount of soil that might have been disturbed when ripping the concrete floors, at no time was soil beneath the floors visible to Barclay and its subcontractors nor was it brought to the surface and mixed with fill soils. Therefore, the soil beneath the reservoir floors was not graded or disturbed by Barclay during site development activities and Barclay did not spread or otherwise distribute this soil on the Subject Property. Mr. Johnson ignores relevant, eyewitness testimony by Mr. G. Bach, Mr. L. Vollmer, Mr. A. Vollmer, and Mr. L. Anderson when he makes his incorrect conclusion that hydrocarbon soils were mixed in the fill.

2.4.3 Clarification #3: Mr. Johnson Provides No Evidence that Soil in the Sidewall Berms Contained Petroleum Hydrocarbons and Ignores Deposition Testimony to the Contrary

Mr. Johnson says that "soils in these sidewall berms were likely impacted by petroleum hydrocarbons,"[48] however, he provides no evidence to support his statement. In fact, Mr. Johnson ignores significant eyewitness testimony that is contrary to his statement. Deposition testimony from onsite eyewitnesses including Mr. L. Vollmer, Mr. L. Anderson[49] and Mr. G. Bach, as well as geotechnical reports prepared by the geotechnical engineer hired by Barclay, Pacific Soils Engineering (PSE) indicate there were no observations of oily or stained soil in the berms during the grading process. The testimony consistently indicates that no petroleum hydrocarbons were observed in the soil of the berms from Reservoirs 5, 6, and 7 (Waterstone January 2014 Technical Response, Section 4.2.2).

Mr. Johnson states that the soils used from "the earthen berms were covered with a preexisting layer of oil or asphalt, and these soils from the sidewall berms were used to fill the lower portions of the reservoirs"[50] implying that this constitutes contamination that was placed in the fill by Barclay. Mr. Johnson's implication is erroneous because a thin layer of asphalt material was used only on the outside of the berms for dust control. To clarify, "oil" that may have leaked from the reservoirs is not the same material as that purposely applied to the berms by Shell as the asphalt used for dust control/slope stabilization. This asphalt material was a very light coating that became pulverized on contact when graded as described below in Mr. G. Bach's deposition testimony: [51]

---

[47] Pacific Soils Engineering, Inc. 1966. *Subsurface Drainage Study for Reservoir Located in the Southwest Corner of Tract No. 24836 in the County of Los Angeles, California.* March 11.

[48] Johnson, Thomas. 2014. *Technical Information Responding to the January 21, 2014 Waterstone Environmental, Inc. "Technical Response to the RWQCB Draft Cleanup and Abatement Order."* June 16. p. 2. paragraph 2.

[49] Mr. L. Anderson was an equipment operator with Vollmer Engineering who performed grading in all three reservoirs.

[50] Johnson, Thomas. 2014. *Technical Information Responding to the January 21, 2014 Waterstone Environmental, Inc. "Technical Response to the RWQCB Draft Cleanup and Abatement Order."* June 16. p. 2. paragraph 2.

[51] Bach, G. 2013. *Volume I Videotaped Deposition of George Bach.* March 7. p. 59, 3-19

Q By the way, this -- this wall, what -- was
it just soft dirt or what was on the outside of it,
11:54:17 the -- when you're talking about the berm that went
all the way around the reservoir?

A There was some kind of a protective
coating on it. It had just -- perhaps they had
sprayed oil on it. When I say "sprayed oil," oil --
11:54:31 we talk about like an asphalt -- light asphalt oil
to keep the dust down. It's not a lot of oil, but
it preserves it and keeps the dust from blowing off
and sort of gives it a little protection against
rainfall and all. It was a very light protective
11:54:47 coating on the thing, not heavy.

Oil is a term in the industry. We use it
for asphalt, we call it oil. The black stuff that
you spray down on the road and all. We call it road
oil.

This thin asphalt covering did not contribute to the petroleum hydrocarbon concentrations observed at the Subject Property today.

Section 3.0
Evaluation of Information Provided by Douglas Weimer

Below is a response to Mr. Weimer's letter to which he has attached TPH soil data tables (Appendix A of the Weimer Letter) highlighting the samples that exceeded five times that of a deeper sample in the same boring and two figures (Appendix B of the Weimer Letter) showing TPHd and TPHmo concentration data at boring locations at various depths throughout the Subject Property.

Although Mr. Weimer provides no explanation in his letter, it appears that he is using these "examples" shown in data tables of Appendix A in an attempt to disprove Waterstone's theory of upward contaminant migration by attacking the bottom-up contamination profiles identified by Waterstone in the January 2014 Technical Response. The discussion below will show not only that Mr. Weimer's data fails to refute the Waterstone theory of upward migration but also that when properly analyzed, the data supports the Waterstone theory. Although Mr. Weimer does not make any attempt to refine his data set by evaluating only those borings subject to upward migration within the reservoir footprints, I have performed this refinement of the data. My analysis of the data indicates that, out of the approximately 1,000 borings installed within the former reservoir footprints, the criteria Mr. Weimer has created to refute upward migration is only present at 250 locations, or 25% of the locations.

The remaining 75% of the data do not meet Mr. Weimer's chosen criteria, and therefore, either demonstrate the bottom-up contamination profile identified by Waterstone and thus support the Waterstone theory or show no specific pattern.

Mr. Weimer's only analysis was to compare the TPH concentrations within individual soil borings. This is a one dimensional analysis in that he did not discuss or present the results of related nearby borings or groups of borings. The contaminant patterns at the Subject Property or within an individual residential parcel are not defined by an individual boring. By limiting his study only to results within individual borings, he does not account for the lateral movement of contaminants through the soil.

With regard to Appendix B, which shows TPHd and TPHmo concentration data at boring locations at various depths throughout the Subject Property. Mr. Weimer claims that TPH contaminants are present not just within the former reservoir footprints, but outside the footprints and at varying depths. No analysis is presented and no further explanation is provided by Mr. Weimer.

It is important to evaluate the data in the context of its location on the Subject Property, most importantly to separately consider the borings located within the footprints of the former reservoirs and those that are not. A comparison of the data and vertical profile between these two areas shows that the patterns are very different and that upward migration is not occurring outside the footprints of the former reservoirs to the degree that it is inside.

3.1 The Data Provided by Mr. Weimer in Appendix A Create a False Impression

Mr. Weimer's letter says "many examples may be seen in the data summarized in Appendix A for borings where one or more of the TPH carbon ranges exhibited concentrations 5x or higher in shallow samples than in deeper samples from the same boring." The facts below provide clarification regarding Mr. Weimer's letter and the data set attached as Appendix A. Each clarification results in a reduction in the number of "examples" listed by Mr. Weimer such that, upon the final analysis, there are actually only a limited number of "examples" which carry some validity and warrant further evaluation.

My further evaluation of the remaining "examples" shows that the contaminant patterns at the Subject Property or within an individual residential parcel are not defined by an individual boring. By limiting his study only to results within individual borings, Mr. Weimer does not account for the lateral movement of contaminants through the soil. When one performs a three dimensional analysis and considers more than just a comparison of TPH results within individual borings, the pattern becomes very clear that upward migration of contaminants is occurring within the footprints of the former reservoirs.

My clarifications to Mr. Weimer's "examples" are provided below.

3.1.1 Clarification No. 1

Mr. Weimer presents his "examples" in three different tables: TPHg; TPHd; and TPHmo – effectively counting the borings which supposedly do not show upward migration contamination patterns three times in some cases. Waterstone has combined the three tables into one for all three TPH compounds. This reduces the number of Weimer "examples" from approximately 1,300 to 685.

Regardless of the number of chemical compounds exhibiting the trend at the same location, it still only represents a single sample location.

3.1.2 Clarification No. 2

In Waterstone's January 2014 Technical Response, Waterstone stated that the contamination profile for shallow soil on the Subject Property shows an upward migration pattern <u>within the footprints of the former reservoirs</u> (including a 15-foot extension beyond the reservoir floor edge) (January 2014 Technical Response - Section 5.2.2 and 5.2.7) This is exhibited by having the highest concentrations near the bottom, just beneath the former reservoir floors, and where concentrations are lower in shallower soil samples (a "bottom-up" contamination pattern) that originates from the contamination left beneath the former reservoirs by Shell.

This upward migration pattern is not found, nor was it expected to be found, in the borings located outside of the former reservoirs. (January 2014 Technical Response - Section 5.2.5.2 and

5.2.5.3) In this area of the Subject Property the contamination pattern is related to the location of the source hydrocarbons released by Shell during it operations and is primarily “top-down.”

In addition, as described in Section 6.0 of the Waterstone Technical Response, it is known that upward capillary movement (wicking) is greater in fine-grained materials – thus the upward movement due to capillary forces may not be straight up and instead would be expected to follow finer-grained lithology patterns in the soil. Additionally, buoyancy forces add another layer of complexity to the upward movement of contaminants in soil.

Therefore, Weimer’s “examples” have been further reduced to include only those borings located within the footprints of the former reservoirs (including those located within 15 feet outside the former reservoir floor) because “examples” outside the former reservoir footprints are not relevant to a discussion of upward migration. This reduces the number of Weimer “examples” to 275 of the approximately 1,000 borings that have been installed within the reservoirs.

3.1.3 Clarification No. 3

Although Mr. Weimer includes it in his “examples,” TPHg cannot be used as a representative indicator compound. The reasons for this were discussed in the Waterstone January 2014 Technical Response (Section 5.2.4) and are as follows:

1) TPHg can easily be the result of common activities and chemical use associated with recent homeowner surface use activities including:
    - Spills or releases associated with filling lawn mowers or gas-powered recreational vehicles or crafts (motor cycles, scooters, all-terrain vehicles, boats, etc.) with gasoline.
    - Spills or releases associated with maintenance of lawn mowers or gas-powered recreational vehicles or crafts.
    - Application of gasoline to ground surface for controlling grass or weed growth.

2) TPHg is more susceptible to volatilization and decomposes more quickly than TPHd.

Therefore, Mr. Weimer’s “examples” have been further reduced to eliminate those that were based on TPHg only. This reduces the number of “examples” to 246.

3.1.4 Clarification No. 4

Mr. Weimer’s data tables are so far reaching that the “examples” include sample locations in above-grade planters (as shown below).

M-24703SB	-1	TPH as Diesel	5000
M-24703SB	0.5	TPH as Diesel	340
M-24703SB	2	TPH as Diesel	30
M-24703SB	5	TPH as Diesel	0
M-24703SB	10	TPH as Diesel	9.3

After the data was reduced to this point,[52] there was one instance of this type of "example" used by Mr. Weimer. Waterstone has corrected the data set by excluding "examples" where the higher TPH concentration is located in an above grade planter and clearly was not the result of any historical activities.

3.1.5 Clarification No.5

Mr. Weimer's "examples" include sample locations where the higher TPH concentration is at the ground surface (as shown below).

244-305SBD	0.5	TPH as Motor Oil	1100
244-305SBD	2	TPH as Motor Oil	0
244-305SBD	5	TPH as Motor Oil	0
244-305SBD	10	TPH as Motor Oil	28

The presence of a higher concentration of TPH found only at a depth of 0.5 feet with no other TPH-impacted soil identified at greater depths directly below that location does not conclusively represent impacted soil resulting from historic operations. This is more likely the result of more recent activities at the site including minor fragments of asphalt from the nearby asphalt-covered surfaces, leaks from landscaping equipment, and/or auto repairs by residents.

Therefore, Waterstone has corrected Mr. Weimer's data set to exclude "examples" where the sole elevated TPH concentration is at a depth of 0.5 feet. This resulted in the elimination of two additional "examples."

3.1.6 Clarification No. 6

Mr. Weimer's letter says that his "examples" include locations "where one or more of the TPH carbon ranges exhibited concentrations 5x or higher in shallow samples than in deeper samples from the same boring."

[52] In Mr. Weimer's original data set, there were six "examples" located in planters filled with soil placed by homeowners and not the developer.

R-24749SFF	0.5	TPH as Motor Oil	580
R-24749SFF	2	TPH as Motor Oil	3700
R-24749SFF	3	TPH as Motor Oil	7600
R-24749SFF	5	TPH as Motor Oil	950
R-24749SFF	10	TPH as Motor Oil	15000
R-24518SFA	0.5	TPH as Motor Oil	520
R-24518SFA	2	TPH as Motor Oil	240
R-24518SFA	3.5	TPH as Motor Oil	1900
R-24518SFA	5	TPH as Motor Oil	350
R-24518SFA	10	TPH as Motor Oil	6400

However, many of his "examples" are similar to those above that have a higher concentration at the bottom of the boring near the reservoir floor and clearly show the upward migration pattern described by Waterstone. Although the sample immediately below the highlighted example sample may have a concentration 5x lower, the concentrations of samples collected at a greater depth at or below the historic reservoir bottom in the same boring have the highest concentrations.

The reason for this apparent decrease in TPH concentration at an intermediate depth is the lateral migration of contaminants. This lateral movement may be related to capillary breaks due the presence of larger-grained material forcing capillary movement to follow finer-grained soil material. Or it may be due to temporal buoyancy forces pushing the TPH contamination through larger grained materials.

I evaluated a number of these "examples" on a three dimensional basis to better understand whether a bottom-up contamination pattern exists when the boring is examined as a part of a collection of nearby borings. This analysis was performed by evaluating groups of data that included the "example" boring and other neighboring borings. The results of this analysis show that when the three dimensional analysis is performed, the upward migration profile is predominant.

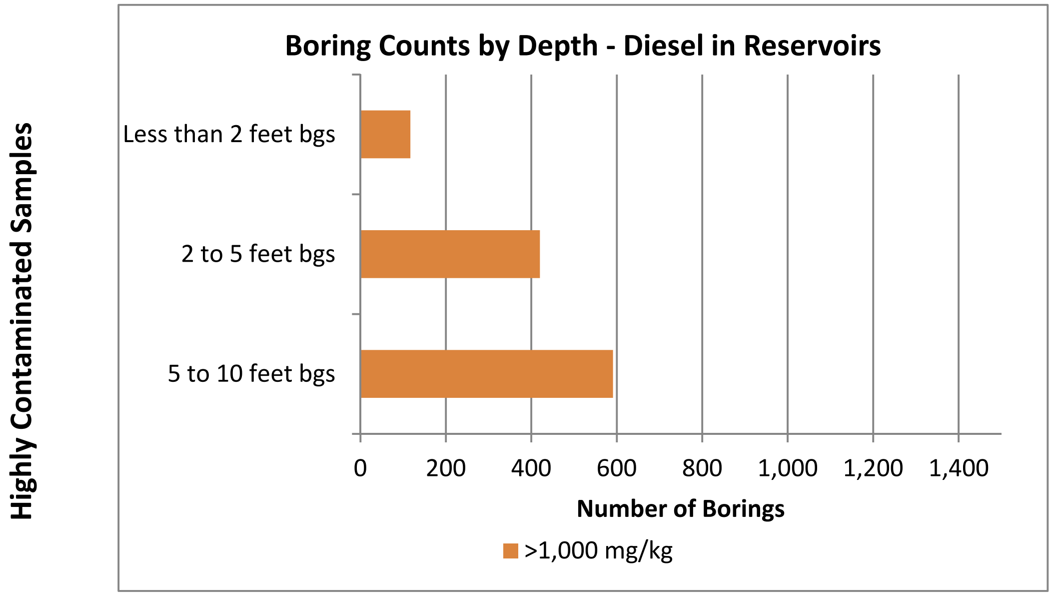
3.2 Boring Contamination Maps Provided by Mr. Weimer in Appendix B Support Waterstone's Upward Contamination Model

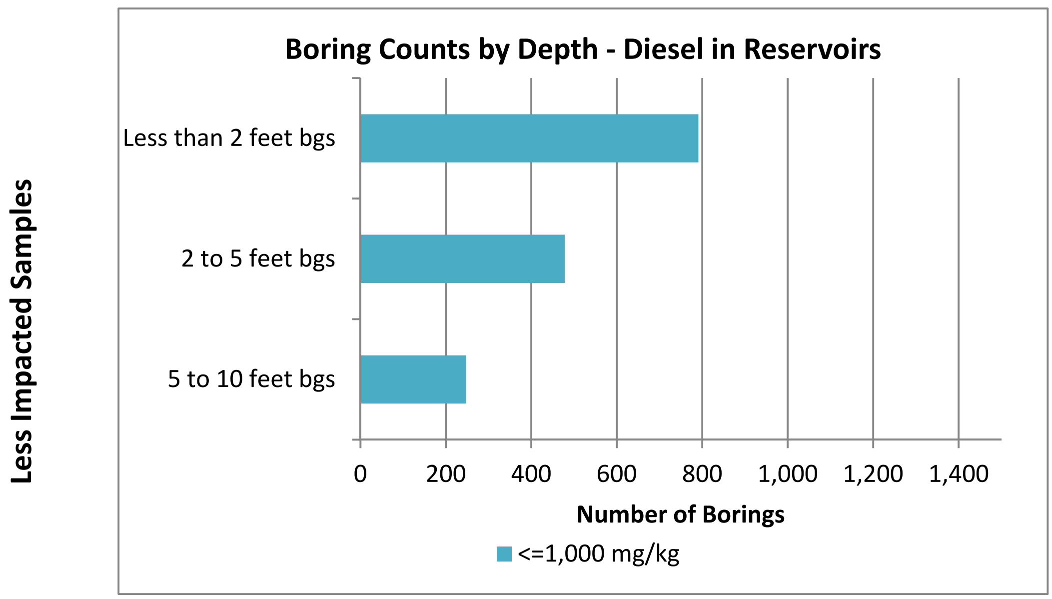
To perform my evaluation of the maps provided in Appendix B of Mr. Weimer's submittal, I created the bar graphs below that show the number of samples at each depth exceeding 1000 mg/kg TPHd. The first bar-graph shows the information for borings within the reservoir footprints. The second bar-graph shows the same information for borings outside the reservoir footprints. Because most of the soil impact was detected within the footprints of the former reservoirs, the results from those samples located inside the footprint of the former reservoirs and those located outside were analyzed separately. There were approximately 1,008 soil borings/sample locations located inside the footprints of the former reservoirs and approximately 1,601 outside.

3.2.1 Analysis Inside the Footprint of the Former Reservoirs

Of the approximately 1,008 locations within the reservoir footprints, my analysis of the distribution by depth and concentration is shown below.

Within Former Reservoir Footprint





Within the footprint of the former reservoirs, 591 borings had samples exceeding a TPHd concentration of 1,000 mg/kg in the five to ten-foot depth range. This number decreased to 420 borings in the two-foot to five-foot depth range, and further decreased to 117 borings in the less than two-foot depth range. The graphic clearly shows that soil in the five to ten-foot depth range is significantly more impacted than the soil above and that the number of samples with TPHd exceeding 1,000 mg/kg decreases significantly approaching the surface illustrating the bottom-up pattern.

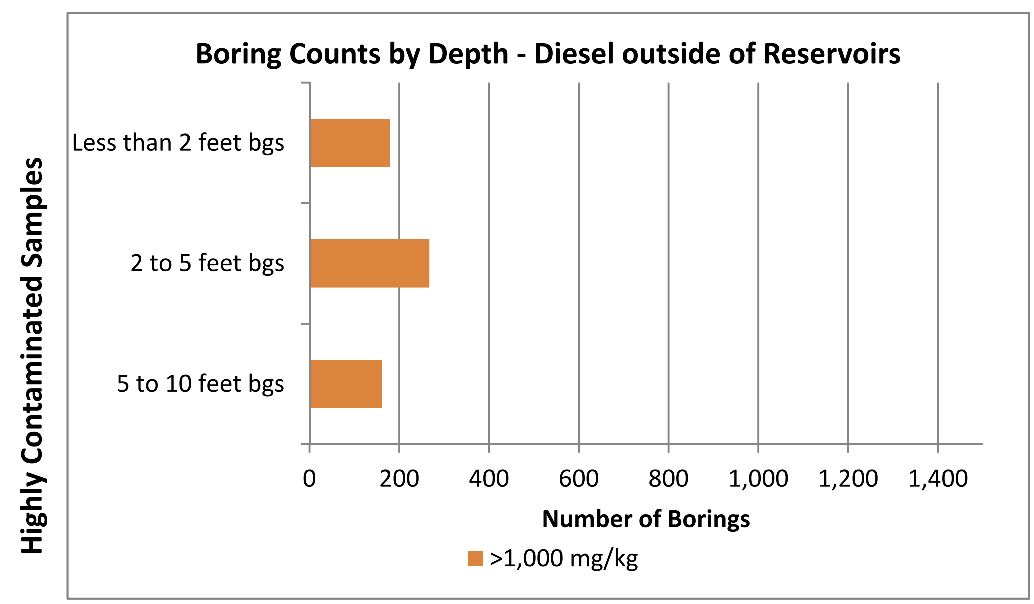
The pattern is the opposite for samples with TPHd of less than 1,000 mg/kg. Samples with this lower concentration were more commonly found near the surface in the upper two feet than at depth.

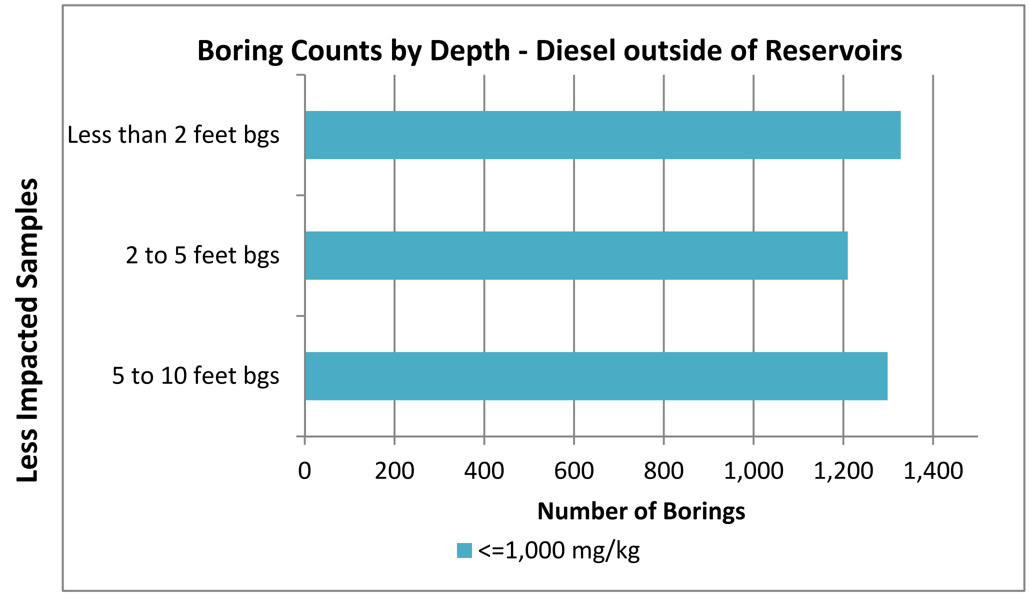
The patterns of contamination for TPHmo are similar to the TPHd patterns. Both the patterns of contamination for TPHd and TPHmo are indicative of an upward contamination profile and support the Waterstone theory of upward migration. This fact is omitted from Mr. Weimer's letter.

3.2.2 Analysis Outside the Footprint of the Former Reservoirs

Of the approximately 1,601 locations outside the reservoir footprints, the distribution by depth and concentration is shown below.

Outside Former Reservoir Footprint





Outside the footprint of the former reservoirs, the distribution of TPHd with depth is markedly different than that observed within the reservoir footprint. My analysis shows that the amount of contamination was generally lower outside compared to within the reservoirs and fairly even across all three depth intervals. However, for the two to five-foot depth range, the number of borings having TPHd greater than 1,000 mg/kg and TPHmo greater than 10,000 mg/kg is slightly more than the other depths. This is likely attributable to the samples located in the former sump area east of Reservoir No. 5, where soil impact was concentrated at that intermediate depth interval.

This shows that the mechanism for distribution of contaminants outside the reservoir footprint was different than that within the reservoir footprint. My January 2014 Technical Response details the source of contaminants within various areas outside of the former reservoir footprint.

3.3 Summary

Mr. Weimer's accounting in his number of "example" locations used in his attempt to disprove Waterstone's theory of upward migration of petroleum hydrocarbons was inflated by his inclusion of:

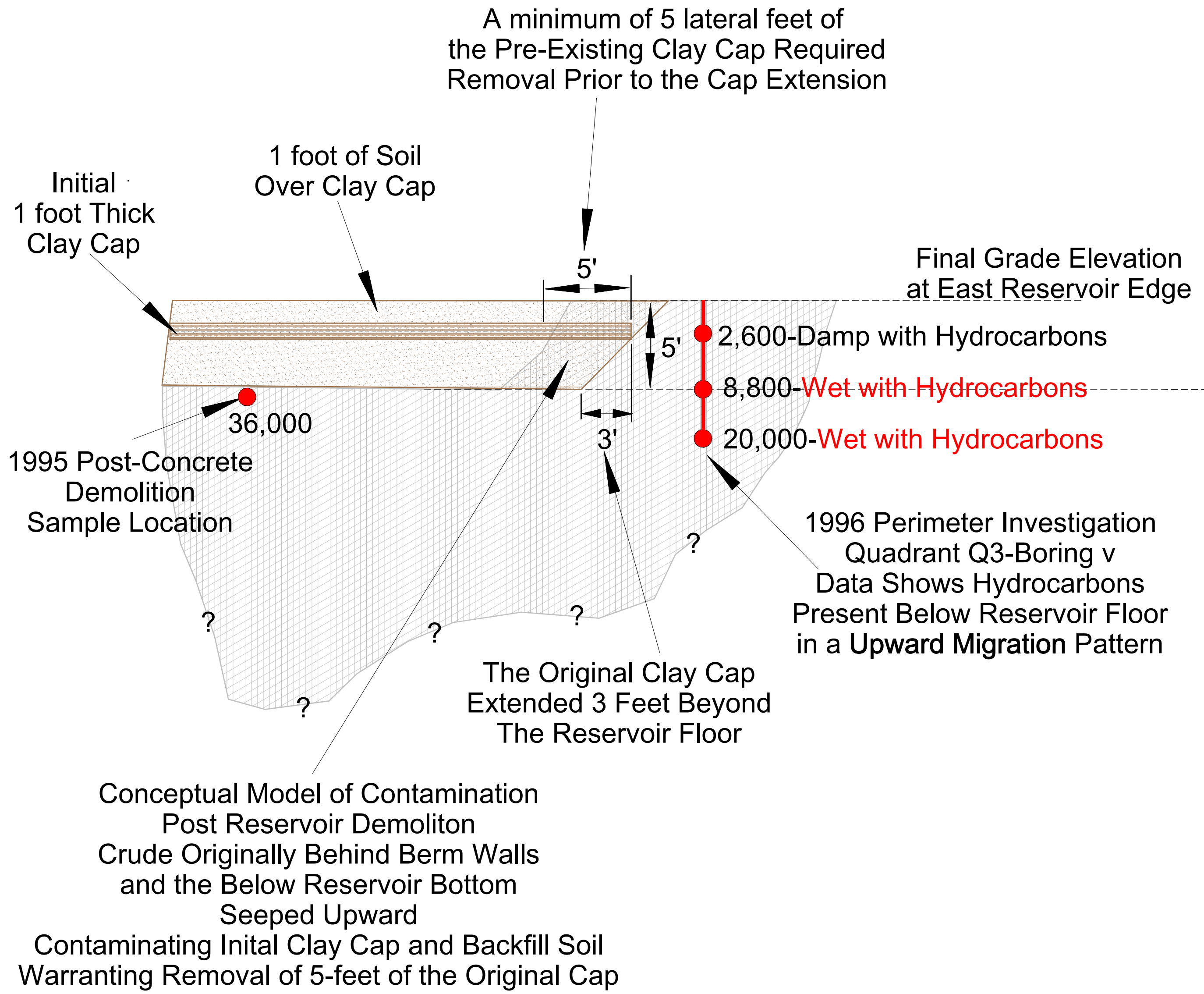
- Samples from the same location and depth using different TPH compounds.
- Locations outside of the former reservoir footprints.
- Elevated detections in locations such as planter boxes.

After excluding these extraneous locations/samples, the number of Mr. Weimer's "examples" is reduced to approximately 250 that meet his criteria. This leaves approximately 75% of the data within the footprints of the former reservoirs that do not meet Mr. Weimer's chosen criteria, and therefore, either demonstrate the bottom-up contamination profile identified by Waterstone and thus support the Waterstone theory, or show no specific pattern.

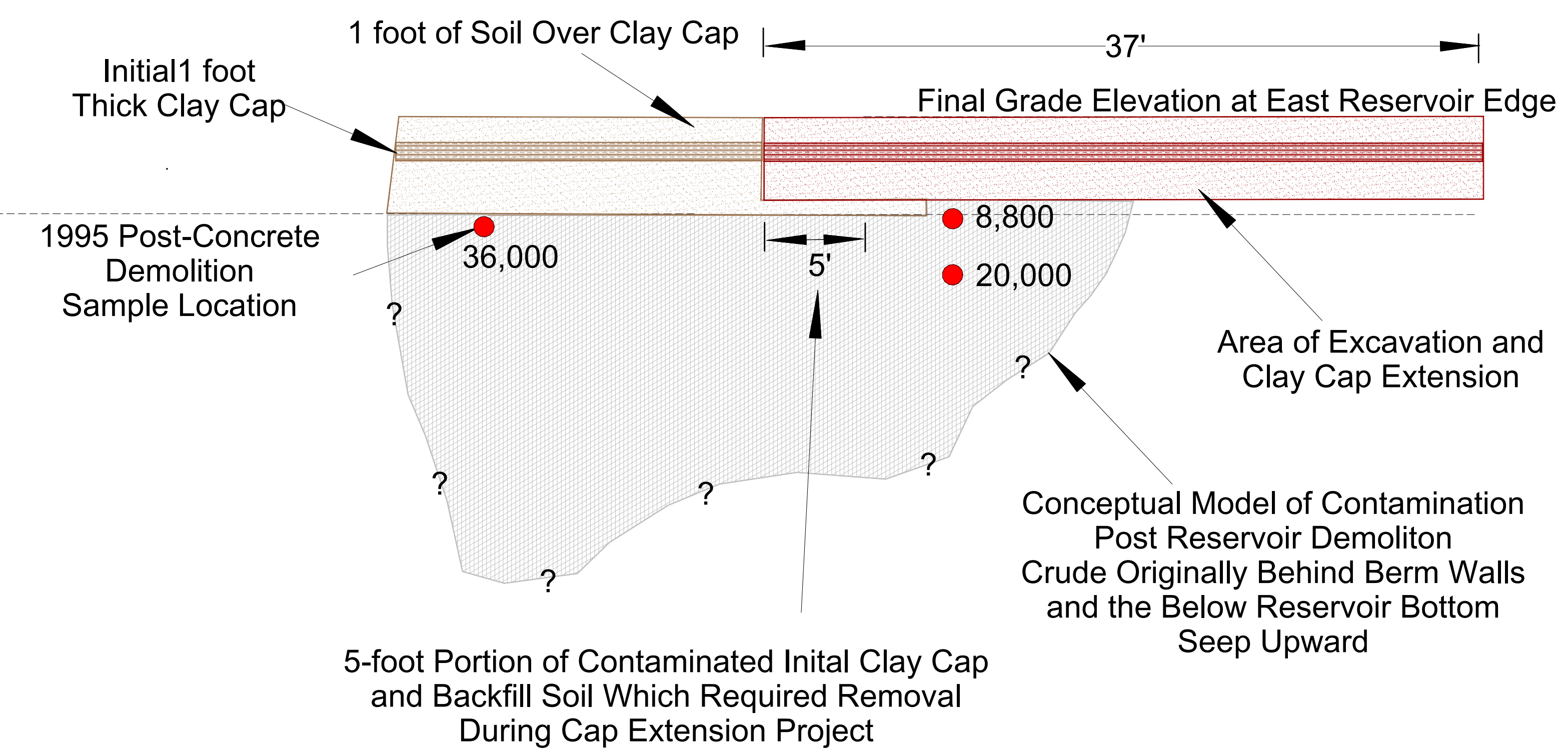
An analysis of TPHd in samples located within the former reservoirs footprints shows that the number of more highly contaminated samples is greatest at depth and that the contamination profile shows lower concentrations in an upward direction.

Mr. Weimer's analysis was further flawed by considering the vertical profile only within individual soil borings and not in conjunction with neighboring locations, and therefore does not account for the lateral movement of contaminants through the soil. Without a three-dimensional analysis to evaluate the vertical profile of contaminants in the soil column, Mr. Weimer's data provides no support to Shell's comments refuting Waterstone's upward migration theory.

Cross Section
Reservoir 1 East Berm Profile
Prior to Cap Extension



Cross Section
Reservoir 1 East Berm Profile
After Cap Extension



Waterstone Environmental, Inc.
2936 E. Coronado St.
Anaheim, California 92806

Drawn By: EG	Project No: 12-219
Approved By: JVD	Date: 12/20/2013

Legend

Note : 1995 Post Concrete Demolition
Sample Data is TPHd in mg/kg

1996 Post Backfill
Sample Data is TPHd in mg/kg

NORTH

Approximate Scale
0 5' 10'

Figure 1
Reservoir 1 - East Berm Profile
Pre and Post Cap Extension

Former Shell Wilmington Complex
Carson, CA 90744

Appendix A
History of 2011 Bach Statement

Mr. Johnson's letter references several portions of the 2011 George Bach Statement (2011 Statement). The purpose of this summary is to provide background regarding the 2011 Statement and the proper context for my discussion of Mr. Johnson's letter (Section 2).

A.1 History of 2011 Bach Statement and Bach's Later Testimony

Mr. George Bach was the in-house engineer for Barclay who oversaw all demolition and grading activities on the Subject Property from 1966-1968. Between 2011 and the present, Mr. G. Bach prepared a statement and gave deposition and declaration testimony regarding his eyewitness observations during the redevelopment of the Subject Property. The earliest documentation provided by Mr. G. Bach describing his observations is a 2011 Statement that Mr. G. Bach prepared with the assistance of and for attorneys for plaintiffs in the litigation brought by Carousel homeowners, Girardi Keese. Further details of his involvement as well as clarification of the 2011 Statement have been provided by Mr. G. Bach in later testimony including:

- Deposition taken on March 7 and 11, 2013 (2013 Deposition) and
- Declaration dated June 24, 2014 (June 2014 Declaration, provided with this submittal).

In his June 2014 Declaration, Mr. G. Bach stated he has read the Johnson Letter. Mr. G. Bach goes on to state that the Johnson Letter names Mr. G. Bach as a source of certain facts and that the June 2014 Declaration is submitted to clarify those facts.[1]

Mr. G. Bach indicates in his 2014 Declaration that the 2011 Statement was clarified by information he provided in the 2013 Deposition as follows:

> "*In the 2011 Statement I did not attempt to distinguish facts known to me from what I had personally observed and information derived from hearsay or surmise*."[2] He goes on to state "*…my best recollection of what occurred at the former Kast Property from 1966 through 1968 based on my first-hand knowledge is in my 2013 Deposition*"[3] and "*…my deposition testimony covers far more detail than the 2011 Statement and unlike the 2011 Statement, my deposition testimony is based on my personal knowledge*."[4]

A.2 Mr. G. Bach's Testimony in the 2013 Deposition and the 2014 Declaration Provide Clarification of Information in the 2011 Statement

In his 2014 declaration, Mr. G. Bach corrects certain errors in the Johnson Letter. For example, Mr. G. Bach states that certain facts attributed to him by Mr. Johnson are: "*…contrary to what I said in my deposition…*"[5] and "*…mistaken...*"[6] Mr. G. Bach also states: "*Johnson relied on*

[1] Bach, George, 2014, "Declaration of George Bach," June 26. p. 2, Paragraph 2.
[2] Bach, George, 2014, "Declaration of George Bach," June 26. p. 3, Paragraph 4.
[3] Bach, George, 2014, "Declaration of George Bach," June 26. p. 3, Paragraph 5.
[4] Bach, George, 2014, "Declaration of George Bach," June 26. p. 7, Paragraph 11.
[5] Bach, George, 2014, "Declaration of George Bach," June 26. p. 3, Paragraph 6.

conjecture…,"[7] "Johnson is "*…confused…,*"[8] and "*Johnson sometimes misstates facts that I know did not occur at the Carousel site,*"[9] and "*Johnson is …wrong…*"[10] While Mr. G. Bach's 2014 Declaration is detailed and speaks for itself, some of the inaccuracies in the Johnson Letter pointed out by Mr. G. Bach are summarized below to provide a basis for a technical discussion of the Johnson Letter in Section 2.0.

A.2.1 Mr. G. Bach Did Not Observe Hydrocarbons in Soil beneath the Concrete Floors

Mr. G. Bach's 2014 Declaration indicates:

> "*Mr. Johnson asserts… "it is reasonable to conclude that soil backfill brought to the surface during the trenching process contained petroleum hydrocarbons." This is contrary to what I said in my deposition…*"[11]

Mr. G. Bach follows this statement with a quote from his deposition indicating he never saw oil in the trenches that brought up some dirt from beneath the concrete floors of the former reservoirs and mentions that the Johnson Letter does not cite this testimony but cites information from the 2011 Statement. Mr. G. Bach further states:

> "*…if Mr. Johnson inferred from the 2011 Statement that I had seen oil immediately beneath the concrete slabs, he was mistaken…I never saw oil beneath the reservoir floor, and nothing in the 2011 Statement was intended to mean I had.*"[12]

Mr. G. Bach's 2014 Declaration testimony indicating he did not observe oil beneath the reservoir floor on the Subject Property is consistent with Shell's observations of soil conditions below the concrete floors of Reservoirs 1 and 2 at Shell's Wilmington Manufacturing Complex (WMC or Shell Refinery). Shell dismantled Reservoirs 1 and 2 in 1994 and provided the following description to the RWQCB of the soil beneath the concrete reservoir floors:

> "The soil under the floor concrete liners **did not show any free-phase petroleum hydrocarbons nor any oil saturated soils therefore, no soils were removed to be disposed of offsite**."[13]

Therefore, Shell's observations that there was no free-phase hydrocarbons nor oil saturated soils below the floors of Reservoirs 1 and 2 is consistent with the information provided by Mr. G.

---

[6] Bach, George, 2014, "Declaration of George Bach," June 26. p. 4, Paragraphs 6 and 7.
[7] Bach, George, 2014, "Declaration of George Bach," June 26. p. 5, Paragraph 7.
[8] Bach, George, 2014, "Declaration of George Bach," June 26. p. 6, Paragraph 8.
[9] Bach, George, 2014, "Declaration of George Bach," June 26. p. 6, Paragraph 9.
[10] Bach, George, 2014, "Declaration of George Bach," June 26. p. 7, Paragraph 9.
[11] Bach, George, 2014, "Declaration of George Bach," June 26. p. 3, Paragraph 6.
[12] Bach, George, 2014, "Declaration of George Bach," June 26. p. 4, Paragraph 6.
[13] Shell Oil Company. 1994. *Progress Report #1 Compliance File No. CI 7452 Reservoir Removal Project Shell/Unocal Facility 1520-1622 East Sepulveda Blvd. Carson California*. October 31 to November 30. p. 1. Emphasis added.

Bach that he did not observe hydrocarbons beneath the floors of the former Reservoirs 5, 6, and 7.

A.2.2 No Soil with Residual Hydrocarbon Materials from Reservoir 7 was Blended with Fill Material that Remained Onsite - All Soil with Residual Hydrocarbon Materials from Reservoir 7 was Hauled Offsite

Mr. G. Bach further describes a "*similar mistake*"[14] Mr. Johnson makes when he relies on the 2011 Statement to support the inference that the fill material was contaminated by the process used to clean out Reservoir 7. Mr. G. Bach corrects this error by stating:

> "*In my deposition, I was clear that all waste materials, even including the earthen dam material, were cleaned up from Reservoir 7*." [15]

Mr. G. Bach follows this statement with a quote from his 2013 Deposition indicating all sand and clayey materials went to the dump along with the saturated soil and that the bottom of Reservoir 7 was clean and no residual material remained to even be stuck to his shoe when walking on the cleaned bottom.[16] Mr. G. Bach states that Mr. Johnson "*relied on conjecture*" from the 2011 Statement to make the statement that contaminated soil left over from cleaning Reservoir 7 was mixed with fill soil at the site.[17]

In Section 2.2.1 of this report I provide a summary of deposition testimony from Mr. L. Vollmer. Mr. L. Vollmer provides detailed testimony that only clean soil from cleaning Reservoir 7 was blended in the fill and the dirty soil was hauled offsite. This is consistent with Mr. G. Bach's 2011 Statement indicating that the hydrocarbon-saturated soil was hauled offsite.

A.2.3 Soils in the Sidewall Berms Were Not Impacted with Petroleum Hydrocarbons

In his 2014 Declaration, Mr. G. Bach indicates the following:

> "*Mr. Johnson is also confused about how the sidewall berms were covered*."[18]

Mr. G. Bach indicates that the Johnson Letter incorrectly states the berms were covered with a preexisting layer of **<u>oil or asphalt</u>** citing testimony from the 2013 Deposition "*none of which is accurately portrayed by Mr. Johnson*."[19] Mr. G. Bach states:

[14] Bach, George, 2014, "Declaration of George Bach," June 26. p. 4, Paragraph 7.
[15] Bach, George, 2014, "Declaration of George Bach," June 26. p. 5, Paragraph 7.
[16] Ibid.
[17] Bach, George, 2014, "Declaration of George Bach," June 26. p. 6, Paragraph 7.
[18] Bach, George, 2014, "Declaration of George Bach," June 26. p. 6, Paragraph 8.
[19] Ibid.

> *"…when the sidewalls came down, I saw only clean fill dirt, no asphalt or oil beneath the concrete. I was clear about this in my deposition.*"[20]

To further clarify this point, Mr. G. Bach provides testimony in his 2013 Deposition identifying an asphaltic layer that was very thin used to coat the outside of the dirt berms for dust control,[21] not "oil" as Mr. Johnson describes. This is further discussed in Section 4.2.2.

A.2.4 Fill Soils that Were Moved During Grading Were Not Contaminated and No Over-excavation and Recompaction Occurred at the Site

Mr. G. Bach also states in his 2014 Declaration:

> "*Mr. Johnson sometimes misstates facts that I know did not occur at the Carousel site*."[22]

He goes on to state:

> "*Mr. Johnson is also wrong when he assumes that the fill soils that were moved during grading were contaminated….I viewed the fill soils as they were being graded and compacted and did not observe oil in them.*"[23]

A further example of Mr. Johnson's inaccurate interpretation of deposition testimony is noted by Mr. G. Bach in his 2014 Declaration wherein he states, contrary to what is asserted in Mr. Johnson's letter, Barclay did not engage in the over-excavation and recompaction of the top three feet of soil at the site.[24]

A.2.5 Mr. G. Bach did not have Personal Knowledge of Areas that Might Have Been More Contaminated from Previous Shell Activities

Mr. G. Bach's 2014 Declaration goes into details about the reasons that some information in the 2011 Statement is not factual and was only the result of what Mr. G. Bach "*surmised*" at the time. Mr. G. Bach describes the portion of the 2011 Statement wherein he identified areas Mr. G. Bach believed might have contamination from Shell activities. He states this was surmised and based on "*an interest shown by Plaintiff's counsel*"[25] regarding areas that should be further explored for contamination.

[20] Ibid.
[21] Bach, G. 2013. *Volume I Videotaped Deposition of George Bach.* March 7. p. 59, 3:29
[22] Bach, George, 2014, "Declaration of George Bach," June 26. p. 6, Paragraph 9.
[23] Bach, George, 2014, "Declaration of George Bach," June 26. p. 7, Paragraph 9.
[24] Ibid.
[25] Bach, George, 2014, "Declaration of George Bach," June 26. p. 7, Paragraph 10.

A.2.6 The 2011 Statement Regarding "Blending" of Contaminated Soil with Fill Soil is Surmised by Mr. G. Bach and He has No Personal Knowledge of These Facts

Mr. G. Bach's 2014 Declaration references a portion of the 2011 Statement wherein Mr. G. Bach discusses his thoughts about Shell's use of retention dikes to create sumps and the resultant effect on contamination that may have caused. Mr. G. Bach indicates:

> "*The entire paragraph* (referencing Shell's use of retention dikes)*is surmise on my part, including a reference to blending contaminated soil with fill soil…because I was not there and have no personal knowledge of those facts*."[26]

Mr. G. Bach goes on to state that during his deposition, he testified about a related point based on what he had personally observed. He discusses the removal of piping in the swing pipe pit area and how spilled oil from the pipes resulted in soil saturated with some oil and some water. Mr. G. Bach then explained the removal of saturated soils in the swing pipe pit area:

> "*…was the original basis for a stockpile, and it became standard practice to move saturated soil to the stockpile and then move the contents of the stockpile off site for disposal*."

***

> "*Although I did not personally observe other oil coming from pipes found on site, I knew that our people followed the same protocol of taking any oil-contaminated soil off site, because "I just saw the results of it" when I observed additional saturated soil on the stockpile. Based on these observations, I testified that "all of the soil that had what we considered, I considered to be contaminated with petroleum was exported from the property." I never saw anyone "blend" contaminated soil into fill soil."*[27]

My comments and clarifications of specific portions of the Johnson Letter are further discussed in Section 4.

A.3 Summary

As support for his incorrect conclusions, Mr. Johnson makes statements indicating his position that Barclay knew about hydrocarbon contamination and spread it at the site in spite of numerous facts to the contrary available via deposition testimony as well as Waterstone's January 2014 Technical Response to the RWQCB Draft Cleanup and Abatement Order report. I have identified Mr. Johnson's most significant misstatements and corrected his errors as summarized below:

- Mr. G. Bach's 2011 Statement contains hearsay and information regarding events and conditions he did not have first-hand knowledge of. The 2011 Statement was clarified

[26] Bach, George, 2014, "Declaration of George Bach," June 26. p. 7, Paragraph 11.
[27] Bach, George, 2014, "Declaration of George Bach," June 26. p. 8, Paragraph 11.

and superseded by his more detailed 2013 Deposition testimony which relates information of which he has first-hand knowledge as he clarifies in his 2014 Declaration.

- Neither Mr. G. Bach nor the other three eyewitnesses who worked on the site during demolition and grading activities (L. Vollmer, A. Vollmer, and L. Anderson) observed petroleum hydrocarbons in fill soil.
- Neither Mr. G. Bach nor the other three eyewitnesses who worked on the site during demolition and grading activities observed petroleum hydrocarbons in the few areas where soil beneath the reservoirs could be observed.
- All soil used to remove residual materials from Reservoir 7 was hauled offsite. None of the materials used to clean Reservoir 7 remained onsite.
- Soils in the sidewall berms were not impacted with petroleum hydrocarbons as observed by the four eyewitnesses. There was a coating of asphalt on the outside of the berms purposely placed by Shell for dust control during operations. This was a very thin coating that became pulverized on contact. Therefore, no hydrocarbon materials were spread by the demolition and grading activities.

Appendix B

Summary of the Waterstone Upward Migration Theory

The purpose of this summary is to reiterate the Waterstone upward migration theory presented in the January 2014 Technical Response (Sections 5.2.2, 5.2.5, 5.2.7 and 6.0) and used to describe how the shallow fill soil within the footprint of the former oil reservoirs became impacted with petroleum hydrocarbons originating from Shell's operation of the Subject Property.

This clarification has been prepared to address misstatements and incorrect descriptions of Waterstone's upward migration theory included in Mr. Johnson's letter .

B.1 Summary of Waterstone Upward Migration Theory

Shell's historic operation of the Subject Property caused significant petroleum releases to the soil beneath the former reservoirs, especially along the perimeter where the sidewalls met the floor (sidewall/floor joint). The reservoirs' sidewalls were removed to approximately the original grade (the berm soil below surface grade comprising the reservoirs' sidewalls was never moved or disturbed); and the floors were ripped and cracked to allow surface drainage to occur. The contaminated soils which were below the reservoir floors were minimally disturbed during this process and the sworn testimony of eyewitnesses indicates no hydrocarbons were noted in the soil that came up with the concrete pieces during ripping. Once the floors were ripped and the sidewalls pushed into the bottom of the former reservoirs, the underlying petroleum impacted soil was in direct contact with the visually clean fill placed in the reservoirs creating the necessary conditions for petroleum hydrocarbons to migrate upward and laterally into the former berm soil that was used as fill to bring the Subject Property to grade by Barclay. The upward and lateral migration of petroleum into the fill soils initially occurred primarily through capillary forces and buoyancy forces.

The Role of Capillary Action or Wicking

As the former reservoirs were filled with the visually clean berm soil, the soil came in contact with the in-place soil within the cracked and ripped bottom and the inside of the former berms that were below grade. This contact allowed the wicking of oil that was present in these soils to move upward and laterally into the fill soil as a result of capillary forces. This upward and lateral migration of crude oil may have continued until equilibrium was reached and the "mobile" oil volume beneath the former reservoir floors was exhausted. Much of the soil beneath the former reservoir floors is sandy and would act as a natural reservoir for the leaked oil, and the finer grained silty and clayey soils used as fill within the former reservoirs was capable of transporting any mobile petroleum hydrocarbons upward on the order of 2-7 feet, and much greater distances laterally.[1] Since the fill soil was still somewhat heterogeneous, the petroleum would be pulled upward and into the finer grained soils and would migrate upward and laterally in a tortuous path following the interconnected smaller diameter soil pores.

[1] Although much of the soil beneath the former concrete reservoirs did contain some sandy zones, much of the soil used as fill within the former reservoirs contained significant amounts of clayey and silty finer-grained soil that have a much greater potential for a larger capillary rise.

Appendix B

Summary of the Waterstone Upward Migration Theory

The Role of Buoyancy

In the decades that followed the completion of grading, the petroleum hydrocarbons that had migrated into the fill soil placed inside the former reservoirs were transported upward numerous times - whenever there was a very significant rainfall event within a short period of time (e.g. days). During these rainfall conditions coupled with landscape irrigation, I believe that water-saturated conditions were present just above the former reservoir bottoms for a number of feet into the fill material.

Significant rainfall events were documented in the Los Angeles area in January 1969 (wettest calendar month [14.94”] since December 1889), 1977-78 (wettest water year [33.44”] since 1883-84), 1983 El Nino year (34.04”), 1991 heavy late February and March rains, 1998 El Nino year (13 ¾” rain in February), and 2004-05 which was the wettest year (37.25”) since 1883-84 and second wettest year in recorded history.[2] Several inches of rainfall within a day or two would have produced the necessary soil saturation levels within the former reservoirs.

During these temporary instances of subsurface fluid saturation within the reservoir fill soils, any liquid petroleum hydrocarbons that are present within this zone of saturation would be forced upward to the top of the temporary zone of saturation within the soil sediments as a result of the buoyancy force created between the petroleum hydrocarbons and water. Unlike capillary forces, buoyancy forces pushing petroleum hydrocarbons to the surface would occur to a greater extent in coarser soil materials than finer materials.

The Effect is Complex

In addition, the more soluble portions of the hydrocarbons that become dissolved in the pore water that makes up the saturated zone disperse throughout the temporary saturated zone and adsorb to the soil particles within the fill material. Once water levels within the fill materials used to grade the former reservoirs return to normal levels, the petroleum hydrocarbons that were lifted upward by the buoyancy forces smear throughout the fill material with the falling water levels if they are still mobile, or are stranded at these shallower depths if they become immobile due to residual saturation levels.

Transport of the petroleum hydrocarbons throughout the engineered fill material could occur during each major rise in water levels (from rainfall and/or irrigation), provided there are still globules of liquid hydrocarbons present, and dissolved transport would occur each and every time, thus leaving a complex pattern of smeared hydrocarbons and contamination throughout the engineered fill material that was placed on top of the former reservoir floors.

[2] ClimateStations.com. 2014. *Graphical Climatology of Los Angeles: (1921-Present)*. April 3.

Appendix B

Summary of the Waterstone Upward Migration Theory

Bottom-up Versus Top-Down Contamination Profiles

These combinations of transport mechanisms were responsible for the resultant complex bottom-up contamination within the fill sediments placed above the former reservoir floors. The bottom-up contamination pattern of petroleum hydrocarbons within former Reservoirs 5 through 7 can only be explained by upward migration of Shell's residual petroleum hydrocarbons from beneath the former reservoirs floors into the visually clean berm soil used as fill within the former reservoirs by Barclay during development activities.

However, outside the former reservoirs footprints, a top-down contamination profile is observed. This type of contamination pattern is observed in areas where Shell's historic activities contaminated the soil, including the former sump east of Reservoir 5, the pump house, and the area surrounding the pump house.