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**Citrus Fruit Sampling and Analysis Plan
Cawelo Water District
Bakersfield, California**

Revised by:

**Cawelo Water District &
Dr. William T. Stringfellow**

March 28, 2017

Prepared by:

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1.0 Introduction

The Cawelo Water District (Cawelo), located just north of Bakersfield, California, provides irrigation water to approximately 34,000 acres of orchards, vineyards, and other crops. Cawelo has many sources of water used for irrigation that include State Water Project, Kern River and Poso Creek water, Friant-Kern water, groundwater and recycled oilfield produced water.

The inclusion of recycled oilfield produced water (RPW) into Cawelo's irrigation water supplies has raised concerns about the potential of petroleum based chemicals, metals and oilfield operational chemicals being present in the RPW and therefore their potential absorption into crops. The District receives approximately 32,000 acre-feet of water a year from regional oil producers which is regulated by Waste Discharge Requirement Orders issued by the Central Valley Regional Water Quality Control Board (Regional Board). The RPW is received into Cawelo water distribution facilities and blended with other traditional irrigation water sources prior to being delivered to agricultural fields for irrigation.

The purpose of this Citrus Fruit Sampling and Analysis Plan (SAP) is to provide a methodology to collect data for the evaluation of uptake of these potential chemicals of concern into citrus fruit grown with irrigation water containing RPW. This SAP presents the objectives, recommended field activities, analyses to be performed and the specific methods and procedures that will be used to determine the presence of the chemicals of concern in the edible portions of the citrus. This SAP will be applied to collect and analyze samples from within Cawelo that are known to use RPW and areas outside of the Cawelo area that are known to not use RPW for irrigation.

This guidance will be followed for all sampling and analysis procedures unless unanticipated conditions dictate a change. Variations from this SAP that may affect the amount or quality of data will be approved in advance, where possible, by Project Managers and the District and documented accordingly.

1.1 Objectives

RPW is known to contain traces of petroleum hydrocarbons as documented in Amec's (2015) report. According to Amec, traces of petroleum hydrocarbons were observed in water samples collected at one location within the Kern Front Oil Field (Station 36 water plant) and four locations within the Cawelo Ponds. Amec's water analytical results are presented in Table 1. Organic chemical concentrations detected in water samples were very low, in the parts per million and parts per billion range. In fact, organic chemical concentrations detected in pond outflow were all within levels considered acceptable for drinking water (Enviro-Tox 2016).

Additionally, the Regional Board and the Food Safety Panel, due to concerns regarding the potential of any operational oilfield chemicals entering the RPW, has requested information regarding all chemicals that are used by oil producers in their normal oilfield operations. The Regional Board has received this information and Cawelo and the Regional Board are currently evaluating this information to determine their level of concern and potential to be present in the RPW.

The objective is to determine if any of the currently determined chemicals of concern derived from either the petroleum hydrocarbons or oilfield operations are being absorbed into the fruit and if they are detected in the fruit to determine if they are at levels that differ from baseline data developed from fruit that is not irrigated with RPW. The list of chemicals of concern may change and evolve as more is learned about their potential health risks and potential presence in the RPW. Fruit samples collected will be analyzed for constituents listed in this SAP.

Additionally, it is the intent of this SAP to conduct the sampling and analysis using a methodology that employs a certified independent third-party to collect the samples and a certified independent analytical laboratory to analyze the samples. Samples will be sealed at the sampling locations and all chain-of-custody procedures will be followed. The Regional Board staff and /or Dr. William T. Stringfellow will be present to supervise the sampling effort and transportation of the samples to the analytical laboratory.

1.2 Health and Safety

Before initiating sampling activities, sampling personnel will become familiar with the site-specific Health and Safety Plan (HASP) and emergency response plan included in the HASP. Safety requirements are addressed in detail in the site-specific HASP, included as Appendix A.

The sampling contractor will conduct mandatory health and safety tailgate meetings before each day's fieldwork. The site health and safety officer will document the topics covered and personnel in attendance.

1.3 Recommended Field Activities

Citrus fruit samples will be collected from:

1. A minimum of three (3) sampling locations for each of the three (3) different citrus types, oranges, lemons, and mandarins (9 samples total) will be selected at random from separate discrete orchards known to be irrigated with RPW. Samples collected from these trees will be known as Test Samples.

2. A minimum of three (3) sampling locations for each of the three (3) different citrus types, oranges, lemons, and mandarins (9 samples total) will be selected at random from separate discrete orchards located outside of the Cawelo area that are known to not be irrigated with RPW. Samples collected from these trees will be known as Control Samples.

All samples will be submitted to the laboratory “blind” and will be assigned unique sample identification numbers so that they are not readily identifiable as Test or Control samples by the laboratory. Proposed Test and Control sampling locations are presented in Figure 1.

2.0 Analyses

Citrus samples provided to the analytical laboratories are to be peeled to remove the rind and only the flesh of the fruit or the more commonly edible portion of the fruit will be analyzed for the constituents described in this SAP. The separated rind shall be discarded. The analytical laboratory shall use best practices for separating the rind from the edible portion of the fruit to prevent the potential cross-contamination of the rind and edible portions of the fruit.

Test and Control citrus fruit samples will be analyzed by Weck Laboratories, Inc., a California state-certified analytical laboratory for selected volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) and Metals.

The VOCs to be analyzed for include:

- 1,2,4-Trimethylbenzene
- Acetone
- Benzene
- Chloroform
- Ethylbenzene
- Methanol
- Toluene
- o-, m-, and p-Xylene

VOCs will be analyzed using U.S. Environmental Protection Agency (EPA) Methods 8260B.

The SVOCs to be analyzed for include:

- 2-Methylnaphthalene
- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzo (a) anthracene
- Benzo (a) pyrene

- Benzo (b) fluoranthene
- Benzo (g,h,i) perylene
- Benzo (k) fluoranthene
- Bis(2-ethylhexyl) phthalate
- Chrysene
- Dibenzo (a,h) anthracene
- Fluoranthene
- Fluorene
- Indeno (1,2,3-cd) pyrene
- Naphthalene
- Phenanthrene
- Pyrene
- *Carbazole*
- *Phenol*
- *Pyridine*

SVOCs will be analyzed using U.S. EPA Method 8270C-SIM.

The Metals to be analyzed for include:

- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium
- Chromium (total)
- Chromium (hexavalent)
- Cobalt
- Copper
- Lead
- Lithium
- Mercury
- Molybdenum
- Nickel
- Selenium
- Silver
- Strontium
- Thallium
- Vanadium
- Zinc

Metals will be analyzed for using U.S. EPA Method

Samples to be analyzed for VOCs, SVOCs and Metals will be collected, preserved and analyzed in accordance with U.S. EPA protocols.

Contact information for Weck Laboratories, Inc. is as follows:

Weck Laboratories, Inc.
114859 East Clark Avenue
City of Industry, California 91745-1396
Ph: 626-336-2139
Contact: Chris Samatmanakit

3.0 Methods and Procedures

3.1 Pre- and Post-Sampling Activities

3.1.1 Identification of Test and Control Sampling Locations

Each sample location will be labeled and mapped on a preliminary sampling locations drawing. The geographic coordinates of sampling locations will be identified in the field using a portable Global Positioning System (GPS) device. The horizontal location of each sampling location will be identified to the nearest 1.0 meter. The ground elevation will also be determined using the portable GPS to the nearest 1.0 meter. Sampling location coordinates and elevations will be recorded for each sampling location on the field logbook.

3.1.2 Permitting & Permissions

No environmental permits will be required for this study.

In order to collect fruit samples, proper permission is required to enter any non-Cawelo owned property. Cawelo does not authorize the trespassing or collection of samples without the consent of the landowner and the owner of the fruit. Cawelo will only provide sampling locations that have proper permissions to enter and allow collection of fruit samples as described in this SAP.

3.2 Citrus Fruit Sampling

This section describes the fruit sampling methods and associated activities for collecting citrus fruit samples. A detailed log of the sampling activities and materials encountered will be maintained by the field technician.

Test and Control samples should be collected from trees located away from potential source(s) of environmental contaminants such as agricultural chemicals, fuels, oils, grease, lubricants and

combustion emissions and fumes. Potential sources of ambient contaminants include storage sheds, barns, agricultural machinery, roadways, railroad tracks, residential and industrial areas, farm equipment, earth moving equipment, gasoline/diesel generators, and burn sites. Samples should not be collected from trees showing evidence of soot accumulation.

Test and Control samples should not be collected from fields where agricultural chemicals (insecticides, herbicides, fungicides, nutrients, etc.) have been recently (last 48 hours) sprayed or applied directly to the tree canopy. Any and all “Do Not Enter” postings should be obeyed at all times by the sample collection team (see the HASP in Appendix A).

Only an approved certified independent third-party sampler shall collect the samples and handle all sample containers and shipping containers until such time the sampling and packaging process can be completed as describe in this SAP and properly transferred to the shipping overnight delivery company officer, courier, or Regional Board staff member using the proper chain-of-custody documentation. Third-party sampler and any other approved participants shall walk into the sample field. No vehicles of any type shall be allowed to approach the sample location and no other personnel can handle the samples or sample containers.

Sample fruit location within the Test or Control field shall generally be located in the central area of the field. Sample fields can vary by shape and size and selection of the sample location should consider these factors along with consideration of avoiding potential contamination sources as described above.

A single designated fruit sample will be a composite of fruit taken from three different adjacent trees (minimum of two (2) from each tree) in the selected central sampling location. The composite should be a balanced representation of fruit from all three trees. If there is insufficient fruit on three adjacent trees then the three nearest trees with sufficient fruit can be selected. This potential deviation shall be noted in the field book. Fruit samples shall be intact and whole with no obvious damage or decay. The fruit selected for samples should be considered generally ripe and representative of commercial fruit that is available for the public consumer.

Citrus fruit samples will be cut from the tree and placed inside approved pre-cleaned 32 oz. wide-mouth glass jars provided by the certified third-party sampler or the certified analytical laboratory. No citrus fruit samples are to be pulled from the tree, they must be cut from the branch. Sampling process shall be conducted in a manner to minimize potential dust contamination and observe all reasonable dust control measures. All samples containers are to be closed and sealed with tamper proof material immediately after desired sample volume has been placed in the container. All fruit samples will be stored on ice in a thermally insulated shipping container (i.e., cooler) immediately after sample collection and until the samples reach the laboratory to ensure that the samples are maintained at 4 °C +/- 2 °C. Each sample within a

shipping container will be listed on the chain-of-custody form for that container (Section 4.4) and container tamper seal noted.

Field duplicate samples will be collected for quality control. One duplicate sample will be collected for every 10 samples (10% of samples) with a minimum of one duplicate sample. Each duplicate will be analyzed for the same parameters as its corresponding sample. Field duplicates will be collected from both, Test and Control fields. Field duplicate samples will be submitted to the laboratory “blind” and will be assigned unique sample identification numbers so that they are not readily identifiable as duplicates by the laboratory.

3.4 Equipment Decontamination

All equipment that comes into contact with fruit samples will be thoroughly cleaned. After the collection of each sample and prior to further sampling, sampling equipment that will come into direct contact with samples, (i.e., knives, samplers, utensils) will be decontaminated. The certified third-party shall use certified best practices for equipment decontamination and to prevent potential of cross-contamination.

4.0 Sample Documentation and Shipment

4.1 Field Notes

4.1.1 Field Logbook

Field personnel will maintain a field logbook that will be a waterproof, bound book with consecutively numbered pages. Entries in the logbook will be made in waterproof ink and will include at least the following:

- Name and address of the field contact (on logbook cover);
- Date on each page and military time for each entry;
- Time of site arrival and departure;
- Names, affiliations, and responsibilities of personnel on the site;
- Summary of important meetings or discussions, including regulatory agencies;
- General description of each day’s field activities;
- Documentation of weather conditions during sampling;
- Site sketch showing sample locations;
- Photograph information;
- Sampler’s name;
- Chain-of-custody seal numbers;
- Shipping arrangements (e.g., tracking number for overnight courier service);
- Recipient laboratories;

- Deviations from the SAP; and
- Changes in personnel and responsibilities, along with reasons for the changes.
- All associations between and names of samples, duplicates or replicates.

The bottom of each page in the logbook will be signed or initialed by the person making the entries.

4.1.2 Sampling Record

A sampling record will be created for each sample taken. Each record will provide the rationale for the selection of the specific sample interval. Each record will include at least the following:

- Sample location descriptions (i.e., GPS coordinates);
- Sampling location photographs;
- Sampling day and time;
- Field sample identification number;
- Type of sample (e.g., oranges, pistachios);
- Date and time of sample collection;
- Sampler's name;
- Preliminary sample descriptions;
- Preservative(s) used for sample, if applicable;
- Verification of sample container tamper seal;
- Chain-of-custody seal numbers;
- Shipping arrangements (e.g., tracking number for overnight courier service);
- Recipient laboratories; and
- Deviations from the SAP.

4.2 Bottles and Preservatives

Any necessary bottles and preservatives for the study will be provided by the certified independent third-party sampler or the analytical laboratory. Request bottles and preservatives for U.S. EPA Method 8270C-SIM and U.S. EPA Method 8260B. Proper preservation of samples is required to retain study quality integrity.

Contact information for Weck Laboratories, Inc. is as follows:

Weck Laboratories, Inc.
114859 East Clark Avenue
City of Industry, California 91745-1396
Ph: 626-336-2139
Contact: Chris Samatmanakit

4.3 Sampling Security

All fruit samples will be stored in a cooler. The cooler will be under the control of the sampler. At lunch or during other breaks in the activity the cooler will be placed into a secured environment (locked-up) out of direct sunlight.

4.4 Chain-Of-Custody

Emphasis should be placed on careful documentation of sample collection and sample transfer. To ensure that important information pertaining to each sample is recorded, the documentation procedures described in the following sections should be implemented during collection of edible fruit samples.

Sample custody should be maintained by a “chain-of-custody record.” The chain-of-custody record is completed by the individual collecting the sample. Information recorded on this record will include the following:

- Date the chain-of-custody was filled out;
- Page number and total number of pages;
- Name and address of the laboratory where the samples will be sent for analysis;
- Client’s name and address
 - Client’s name: McMurtrey, Hartsock & Worth
 - Client’s address: 2001 22nd Street, Suite 100, Bakersfield, California 93301);
- Project name;
- Shipment number – this will be a consecutive number initiated from the beginning of the project;
- Project manager;
- Telephone number of the Project Manager;
- Sampler’s signature;
- Field sample identification number;
- Sample location;
- Date and time the sample was taken;
- Sample type;
- Type of sample container (e.g., 32 oz. glass jar);
- Condition of sample container tamper seal;

- Type of preservation, if applicable;
- Number of sample containers;
- Analyses required;
- Relinquished by – the signature and printed name of the person giving up the samples to the appropriate overnight delivery company officer or courier;
- Date and time – the date and time when the samples were relinquished;
- Received by – the signature and printed name of the laboratory personnel who receives the samples;
- Company – the name of the receiving laboratory; and
- Comments – any special instructions to the laboratory such as “Rush Turnaround” or other relevant information concerning the samples.

4.5 Transfer of Custody

The field personnel who takes the samples is responsible for the care and custody of the samples until it is properly transferred or delivered to the delivery agent, Regional Board staff, or analytical laboratory. All samples should be accompanied by a chain-of-custody record. When transferring the possession of the samples, the individual relinquishing and receiving the samples will sign, date, and note the time on the chain-of-custody record. The company relinquishing the sample, the company receiving the sample, and the reason for transfer, will be noted. This record documents the transfer of samples from the custody of the sampler to that of another person.

The relinquishing individual will record specific shipping data (airway bill number, time, and date) on the original and duplicate chain-of-custody forms. The Project Manager or a specific designee is responsible for ensuring that all shipping data are consistent and placed in the permanent job file. If sent by mail, the package will be sent by registered mail with a return receipt requested. If sent by common carrier, a bill of lading will be retained as part of the permanent documentation. The relinquishing individual will retain a copy of the chain-of-custody record.

Contact information for Weck Laboratories, Inc. is as follows:

Weck Laboratories, Inc.
114859 East Clark Avenue
City of Industry, California 91745-1396
Ph: 626-336-2139
Contact: Chris Samatmanakit

4.6 Photographs

Photographs, if taken, will be recorded in the field logbooks. Information to be recorded will include the following elements:

- Time and date;
- Photographer;
- Details of the location of the photograph;
- Subject of the photograph;
- Any significant or relevant features to note in the photograph; and
- The names of any personnel included in the photograph.

4.7 Labeling, Packaging, and Shipment

4.7.1 Sample Identification

Sample identification numbers will be designated with a multi-part code. Examples of sample designations would be:

For Test field samples:	A-OC-O-001
Interpreted as:	Test field, organic compound analysis, orange citrus, sampling location #1.
For Control field samples:	B-OC-L-007
Interpreted as:	Control field, organic compound analysis, lemon citrus, sampling location #7.
For Test field samples:	A-MA-M-001
Interpreted as:	Test field, metal analysis, mandarin citrus, sampling location #1.
For Control field samples:	B-MA-L-007
Interpreted as:	Control field, metal analysis, lemon citrus, sampling location #7.

Duplicates will be given a unique sample identification that does not indicate to the laboratory that it is a quality control sample. This identification will be determined by the project manager.

4.7.2 Sample Labeling

A sample label will be affixed to each sample container (e.g., stainless steel sleeve, glass jar). The information on the sample label will include the following information:

- Project identifier;
- Sample location;
- Field sample identification number;
- Date and time of sample collection;
- Name or initials of the sampler;
- Sample type;
- Analyses to be performed on the sample; and
- Preservatives used.

4.7.3 Sample Packaging

All samples will be packaged carefully to avoid breakage or contamination, and will be shipped to the laboratory at proper temperature. The following sample packaging requirements will be followed:

- Sample lids will be secured to avoid spills or leakage.
- All sample containers will be wrapped in bubble pack or similar inert material and placed in plastic bags to minimize the potential for breakage or cross-contamination during shipment.
- All sample containers will be packed in a chilled cooler. Empty space in the cooler will be filled with bubble wrap or StyrofoamTM peanuts. Under no circumstances will locally obtained material (sawdust, sand, etc.) or newspaper be used.
- The chain-of-custody record will be placed in a plastic bag and taped to the inside of the cooler lid.

4.7.4 Sample Shipment

Samples will be hand-delivered to the laboratories within 24 hours of sample collection or shipped by 24-hour air courier (e.g., Federal Express) following all Department of Transportation (DOT) regulations.

4.8 Corrections to the Field Logbook and Other Documents

All original data recorded in field logbooks, on sample labels, or on chain-of-custody records, as well as other data sheet entries, will be written with waterproof ink. If an error is made on a

document or in the logbook, corrections will be made simply by crossing a line through the error in such a manner that the original entry can still be read, and the correct information added as the change. All corrections will be initialed by the author and dated.

4.9 Deliverables

Field documentation will be furnished in the study report and will include daily field logs, and edible fruit sampling logs.

5.0 Quality Control

The field quality control samples to be collected by field personnel include field duplicates. Sample duplicates should be collected simultaneously from the same tree as its associated sample. In this way the samples will be exact duplicates of each other. Field duplicates will be collected at both the Test and Control fields. One field duplicate will be collected for every 10 samples (10% of samples). Each duplicate will be analyzed for the same parameters as its corresponding sample.

Field duplicate samples will be submitted to the laboratory “blind” and will be assigned unique sample identification numbers so that they are not readily identifiable as duplicates by the laboratory.

5.1 Field Variances

As conditions in the field may vary, it may become necessary to implement minor deviations from the SAP. Field personnel will notify the Project Manager when deviations from the SAP are necessary. When appropriate, the Project Manager will be notified of the deviations and verbal approvals will be obtained from these entities before implementing the deviations. Deviations from the SAP will not be conducted without final approval by the Project Manager. Deviations from the approved SAP will be documented in the field logbook and in the final report.

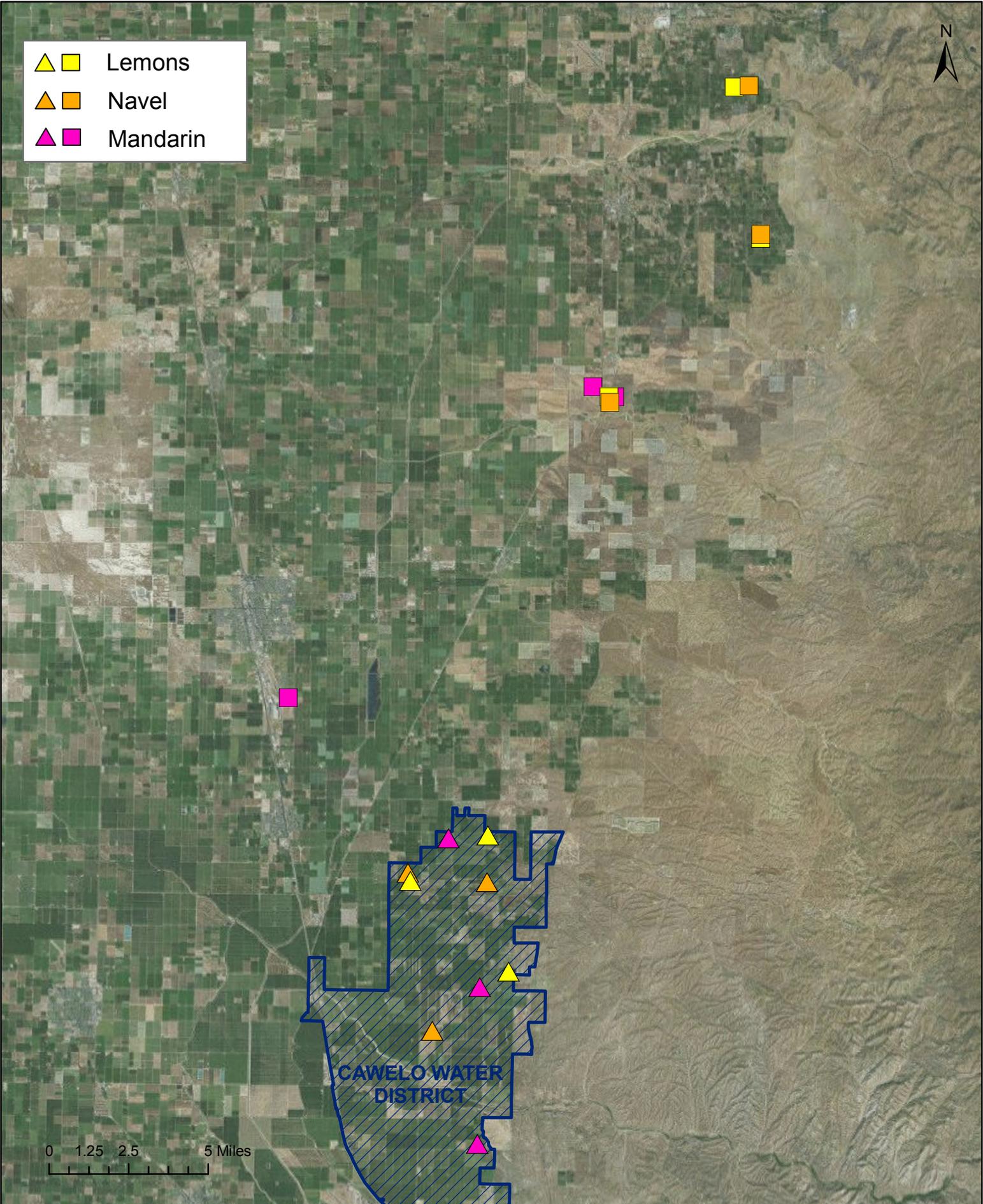
6.0 References

Enviro-Tox Services, Inc. 2016. Irrigation Water Quality Evaluation Report. Cawelo Water District, Bakersfield, California. January.

U.S. Environmental Protection Agency (USEPA). 1990. Test Methods for Evaluating Solid Waste. EPA SW-846, Third Edition. November.

U.S. Environmental Protection Agency (USEPA). 1997. Updates to EPA SW-846, Third Edition. June.

- ▲ □ Lemons
- ▲ □ Navel
- ▲ □ Mandarin



0 1.25 2.5 5 Miles

Table 1. Analytical Results Summary, Volatile Organic Compounds, Semivolatile Organic Compounds, and Total Petroleum Hydrocarbons

Well/Sample ID	Sample ID	Volatile Organic Compounds ¹ (ug/L)							Polycyclic Aromatic Hydrocarbons ² (ug/L)						TPH ³ (mg/L)	
		Acetone	Benzene	Ethyl-benzene	m,p-Xylene	o-Xylene	Toluene	Total Xylenes	Acenaphthene	Acenaphthylene	Chrysene	Fluorene	Naphthalene	Phenanthrene		Pyrene
Plant 36	W039	31	0.47 J	0.71	2.6	1.3	0.67	3.9	0.63	<0.098	<0.098	0.37	0.11 J	0.38	<0.098	0.12
Polish Pond	W042	86	0.33 J	0.39 J	1.3	0.74	0.49 J	2.0	0.53	<0.097	<0.097	0.29	0.11 J	0.27	<0.097	0.19
Polish Pond	W043 ⁴	100	0.31 J	0.38 J	1.2	0.59	0.47 J	1.8	0.57	<0.097	<0.097	0.35	0.12 J	0.28	<0.097	0.097
Reservoir B	W044	150	<0.25	0.25 J	0.75 J	0.43 J	0.39 J	1.2	0.49	<0.097	<0.097	0.50	<0.097	0.29	<0.097	0.15
Reservoir B Outflow	W045	50	<0.25	<0.25	<0.50	<0.25	<0.25	<0.50	<0.096	<0.096	<0.096	<0.096	<0.096	<0.096	<0.096	0.080

Notes:

1. Volatile organic compounds analyzed using U.S. EPA Method 8260B.
2. Polycyclic aromatic hydrocarbons analyzed using U.S. EPA Method 8270C SIM.
3. Total Petroleum Hydrocarbons (TPH; carbon range C29-C40) analyzed using U.S. EPA Method 8015B.
4. Duplicate sample of W042.

Abbreviations:

< = less than the Reporting Limit.
 J = result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value
 TPH = total petroleum hydrocarbons
 ug/L = micrograms per liter

August 10, 2016

Health and Safety Plan

Edible Crop Sampling

Almond Orchards, Pistachio Orchards and Vineyards

Kern County, California

Prepared for:

McMurtrey, Hartsock & Worth

2001 22nd Street; Suite 100

Bakersfield, California 93301

Prepared by:

Advanced Environmental Concepts, Inc.

220 East Truxtun Avenue

Bakersfield, California 93305

HEALTH AND SAFETY PLAN DISCLAIMER

This Health and Safety Plan (HSP) was designed to help preserve and protect the health and safety of the workers involved in the scope of work that is proposed for this project. As the work is performed or if alternative work is proposed, conditions on site could differ, warranting the need for modification of the HSP. Therefore, AEC makes no representations or warranties as to the adequacy of the HSP, except for warranties specifically stated in the HSP itself.

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Health and Safety Plan Approvals and Acknowledgment_____

Approvals

I have read and approved this Health and Safety Plan (HSP) with respect to project hazards, regulatory requirements, and AEC procedures.

Project Name: Edible Crop Sampling Almond Orchards, Pistachio Orchards and Vineyards	Contract Number:
---	------------------

Project Manager / Date

Acknowledgments

The final approved version of this HSP has been provided to the Site Manager. I acknowledge my responsibility to provide the Site Manager with the equipment, materials, and qualified personnel to implement all safety requirements set forth in this HSP. I will formally review this plan with the Health and Safety Staff every 6 months until project completion.

Project Manager / Date

I acknowledge receipt of this HSP from the Project Manager and that it is my responsibility to explain its contents to all site personnel and to cause these requirements to be fully implemented. Any change in conditions, scope of work, or other change that could affect worker safety requires me to notify the Project Manager and/or the Health and Safety Representative.

Site Manager / Date

1.0 Introduction

This site-specific health and safety plan (HSP) is introduced with general statements about project objectives, site description, and policy statements.

1.1 Objective

The objective of this HSP is to provide a mechanism for establishing safe working conditions at the site. The safety organization, procedures, and protective equipment have been established based on an analysis of potential hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential for accidents or injuries.

1.2 Site Description

AEC will collect samples from various almond orchards, pistachio orchards and vineyards irrigated by water supplied by the Cawelo Water District and outside of the Cawelo Water District in the McFarland area of Kern County, California.

1.3 Policy Statement

The policy of AEC is to provide a safe and healthful work environment for all employees. AEC considers no phase of operations or administration to be of greater importance than the prevention of injury and illness. Safety takes precedence over expediency and shortcuts. AEC believes that all accidents and injuries are preventable and will take every reasonable step to reduce the possibility of injury, illness, or accident.

This HSP prescribes the procedures that will be followed during referenced site activities. Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager and the Project Health and Safety Officer.

The provisions of this plan are mandatory for all personnel and subcontractors assigned to the project. All visitors to the work site will abide by the requirements of the plan.

1.4 References

This HSP complies with applicable regulations established by the California Division of Occupational Safety and Health (Cal/OSHA); U.S. Environmental Protection Agency (EPA); and California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC).

This plan follows the guidelines established in the following documents:

- *Standard Operating Safety Guides* (EPA, November 1984)
- Title 29, Code of Federal Regulations, Part 1910 (29 CFR 1910) (U.S. Department of Labor/Occupational Safety and Health Administration [OSHA] Occupational Safety and Health Standards)
- Title 8, California Code of Regulations (CCR), Chapter 4, Subchapter 7, Section 3200 *et seq.* (Cal/OSHA General Industry Safety Orders)
- Title 22, California Code of Regulations (CCR), Division 2, Chapter 3, Section 12000 *et seq.* (California Health and Welfare Agency)
- Title 8, California Code of Regulations (CCR), Industrial Relations Division 1, Chapter 4, Subchapter 4, Construction Safety Orders.

The contents of this plan are consistent with AEC Health and Safety Policies and Procedures. The referenced AEC Health and Safety Policies and Procedures are available for review upon request.

2.0 Responsibilities

This section describes the health and safety responsibilities of project personnel.

2.1 All Personnel

All personnel will adhere to these health and safety procedures during the performance of their work. Each person is responsible for completing tasks safely and reporting any unsafe acts or conditions to the immediate supervisor or to the Site Manager. No person may work in a manner that conflicts with the letter or the intent of the safety and environmental precautions expressed in these procedures. After due warnings, the Project Manager will dismiss from the site any person who violates safety procedures. If necessary, AEC's employees will be subject to progressive discipline and can be terminated for blatant or continued violations.

All on-site personnel will receive training in accordance with 29 CFR 1910.120 and with the requirements and procedures presented in this document.

2.2 Health and Safety Manager

The Health and Safety Manager (HSM) is responsible for technical health and safety aspects of the project, including review and approval of this HSP. The HSM is responsible for preparing and modifying the HSP, approving any HSP changes made by others, advising the Project

Manager on health and safety issues, establishing and overseeing the project air monitoring program.

2.3 Site Health and Safety Officer

The Site Health and Safety Officer will assist the project management team in the implementation of this HSP on the job site.

2.4 Project Manager

The Project Manager is ultimately responsible for ensuring that all project activities are completed in accordance with the requirements and procedures in this plan. The Project Manager is responsible for providing the Site Manager with the equipment, materials, and qualified personnel to implement all safety requirements in this HSP.

The Project Manager is responsible for thoroughly investigating all accidents and incidents on the project. The Project Manager will perform at least one on-site safety review during the project.

The Project Manager will approve in writing any addenda or modifications to the HSP and will formally review this plan with the Health and Safety Coordinator or Health and Safety Manager every 6 months until the project is completed.

2.5 Site Manager

The Site Manager is responsible for implementation of the HSP, including communication of site requirements to all on-site project personnel (including subcontractors) and consultation with the Site Health and Safety Officer. As required by AEC procedures, the Site Manager will be responsible for informing the Health and Safety Coordinator and the Project Manager of any changes in the work plan or procedures so that those changes can be addressed in the HSP. Other responsibilities of the Site Manager include the following:

- Stopping work, as required, to ensure personal safety and protection of property or in cases of life- or property-threatening safety noncompliance
- Determining and posting routes to medical facilities and emergency telephone numbers and arranging emergency transportation to medical facilities
- Notifying local public emergency officers of the nature of the site operations and posting their telephone numbers in an appropriate location
- Observing on-site project personnel for signs of chemical or physical trauma
- Ensuring that all site personnel have the proper medical clearance, have met applicable training requirements, and have the appropriate training documentation

available in the office.

2.6 Subcontractors

On-site subcontractors and their personnel that are contracted directly to AEC will understand and comply with the site requirements established in this HSP. Subcontractors will attend and participate in the daily tailgate safety meetings and all other site safety meetings.

2.7 On-Site Personnel and Visitors

All personnel will read and acknowledge their understanding of this HSP, abide by the requirements of the plan, and cooperate with site supervision in ensuring a safe and healthful work site. Site personnel will immediately report any of the following to the Site Manager or Health and Safety Coordinator:

- Accidents and injuries, no matter how minor
- Unsafe or malfunctioning equipment
- Changes in site conditions that could affect the health and safety of project personnel.

3.0 Project Hazards and Control Procedures

This section summarizes the scope of work; describes field activities, hazards, and control procedures; and addresses hazards associated with the work.

3.1 Scope of Work

AEC will collect samples from various almond orchards, pistachio orchards and vineyard that are irrigated by water supplied from the Cawelo Water District in accordance with the Sampling and Analysis Plan prepared by Enviro-Tox Services, Inc. Samples will also be collected at locations outside of the Cawelo Water District.

3.1.1 Job Hazard Assessment

A job hazard assessment is necessary to identify potential safety, health, and environmental hazards associated with each type of field activity. Because of the complex and changing nature of field projects, supervisors will continually inspect the work site to identify hazards that could harm site personnel, the community, or the environment. The Site Manager will be aware of these changing conditions and discuss them with the Health and Safety Manager and the Project Manager whenever such changes impact the health, safety, or performance of the project. The Site Manager will keep subcontractors informed of the changing conditions, and the Health and

Safety officer will prepare addenda as necessary to revise the job hazard analysis and associated hazard controls.

3.2 Field Activities, Hazards, and Control Procedures

This section describes field activities, associated hazards, and procedures for the control of project-related hazards.

3.2.1 Mobilization

Site mobilization will include establishing work, and support zones. A break area will be set up at the site. During this initial phase, project personnel will walk the site to identify safety issues that may have arisen subsequent to preparation of this plan.

The hazards of this phase of activity are associated with heavy equipment movement, manual materials handling, and manual site preparation. Manual materials handling and manual site preparation could cause blisters, sore muscles, and joint and skeletal injuries and can present eye, contusion, and laceration hazards. The flora and fauna of the site could present hazards of poison ivy, poison oak, ticks, fleas, mosquitoes, wasps, spiders, and snakes. Work area hazards include slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Freezing-weather hazards include frozen, slick, and irregular walking surfaces. Wet weather could result in wet, muddy and slick walking surfaces.

Environmental hazards may include weather effects such as sunburn, lightning, rain, heat, and cold, and pathogens such as bloodborne pathogens from medical waste. Control procedures for these hazards are discussed in Section 4.0.

3.2.2 Demobilization

Demobilization will involve the removal of all tools, equipment, supplies, and vehicles brought to the site. All signs of temporary construction facilities will be removed, and the project site will be restored as necessary to permit the growth of vegetation.

The physical, biological and environmental hazards associated with this phase of activity are the same as for mobilization.

3.3 Chemical Hazards

No chemical exposure hazards are anticipated during the collection of crop samples. The Cawelo Water District receives water derived from oil extraction activities from regional oil producers. The water is treated by oil extraction companies, filtered and then delivered by pipeline to the District where it is blended with other water supplies. Organic chemical concentrations detected in produced water samples have been reported to be very low, in the

parts per million and parts per billion range. In fact, organic chemical concentrations detected in produced water were all within levels considered acceptable for drinking water.

Do not enter fields where agricultural chemicals (insecticides, herbicides, fungicides, nutrients, etc.) have been recently (last 48 hours) sprayed or applied directly to the tree canopy. Any and all “Do Not Enter” postings should be obeyed at all times by the sample collection team.

4.0 General Hazards and Control Procedures

This section describes hazards and details the control procedures that will be implemented to minimize or prevent such hazards or occurrences.

4.1 General Practices

- At least one copy of this plan will be made available at the project site, in a location readily accessible to all personnel.
- All site personnel will use the buddy system (working in pairs or teams).
- Containers will be moved using the proper equipment and will be secured to prevent dropping or loss of control during transport.
- Emergency equipment will be removed from storage areas and staged in readily accessible locations (if required).

Buddy System

All on-site personnel will use the buddy system. Visual contact will be maintained between crew members at all times.

Team members will also be aware of potential exposure to possible safety hazards, unsafe acts, or noncompliance with safety procedures. Any and all “Do Not Enter” postings should be obeyed at all times by the sample collection team.

If protective equipment or noise levels impair communication, prearranged hand signals will be used for communication. Personnel will stay within the line of sight of another team member.

4.2 Heat Stress

Heat stress effects range from transient heat fatigue to serious illness and death. Heat stress is caused by a number of interacting factors including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is one of the most common and potentially serious illnesses during field operations, alertness to the symptoms and knowledge of preventive measures are vital.

Heat stress monitoring will be implemented when the temperature reaches 85°F. Heat stress conditions could develop in workers at this site during the summer months.

4.2.1 Heat Stress Prevention

One or more of the following control measures can be used to help control heat stress and are mandatory if any site worker has a heart rate (measure immediately prior to rest period) exceeding 110 beats per minute:

- Site workers will be encouraged to drink plenty of water and electrolyte- replacement fluids throughout the day.
- On-site drinking water will be kept cool (50 to 60°F) to encourage personnel to drink frequently.
- A work regimen that provides adequate rest periods for cooling down will be established, as required; generally, a one-third work shift reduction will be implemented as necessary until pulse rates remain below 110 beats per minute.
- All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps.
- Employees will be instructed to monitor themselves and coworkers for signs of heat stress and to take additional breaks as necessary.
- A shaded rest area will be provided. All breaks should take place in the shaded rest area.
- Employees will not be assigned to other tasks during breaks.
- Employees will remove impermeable garments during rest periods, if wearing.
- All employees will be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress disorders.

Heat Cramps: Heat cramps are caused by heavy sweating and inadequate electrolyte replacement. Signs and symptoms include muscle spasms and pain in the hands, feet, and abdomen. Workers at this site could be vulnerable to heat cramps during the summer months.

Heat Exhaustion: Heat exhaustion occurs from increased stress on various body organs. Signs and symptoms include: pale, cool, moist skin; heavy sweating; dizziness; nausea; and fainting. Workers at this site could be vulnerable to heat exhaustion during the summer months.

Heat Stroke: Heat stroke is the most serious form of heat stress and should always be treated as a medical emergency. The body's temperature regulation system fails, and the body temperature rises rapidly to critical levels. Immediate action will be taken to cool the body before serious injury or death occurs. Signs and symptoms of heat stroke include red, hot, usually dry skin; lack of, or reduced, perspiration; nausea; dizziness and confusion; strong, rapid pulse; and coma. Workers at this site could be vulnerable to heat stroke during the summer months.

4.3 Biological Hazards

Biological hazards could include poison oak or ivy, snakes, thorny bushes and trees, ticks, mosquitoes or other pests, and medical waste. *Biological hazards are not anticipated at this location.*

4.3.1 Tick-Borne Diseases

Lyme disease and Rocky Mountain spotted fever (RMSF) are diseases transmitted by ticks and occur throughout the United States during spring, summer, and fall. *Tick-borne diseases are not anticipated.*

4.3.2 Poisonous Plants

Poison oak or ivy are not anticipated for this location.

4.3.3 Snakes

Poisonous and non-poisonous snakes may be encountered in the orchards and/or vineyards. It is recommended to remain alert when walking to the various sampling locations and taking care not to step through large accumulations of leaves and/or brush.

4.3.4 Medical Items

Medical Items are not anticipated.

4.4 Noise

Exposure to noise exceeding the OSHA action level can cause temporary impairment of hearing; prolonged and repeated exposure can cause permanent damage to hearing. The risk and severity of hearing loss increase with the intensity and duration of exposure to noise. In addition to damaging hearing, noise can impair voice communication, thereby increasing the risk of accidents on site.

4.5 Hearing Conservation

All personnel working around heavy equipment will be required to wear foam hearing protection.

4.6 Sanitation

Site sanitation will be maintained according to OSHA and Cal/OSHA requirements.

4.6.1 Break Area

Breaks will be taken in a clean zone away from the active work area. No smoking, eating, drinking, or gum or tobacco chewing will be permitted in the work area.

4.6.2 Potable Water

The following rules apply for all project field operations:

- An adequate supply of potable water will be provided at each work site.
- Portable containers used to dispense drinking water will be capable of being tightly closed and will be equipped with a tap dispenser. Water will not be consumed directly from the container or dipped from the container.
- Containers used for drinking water will be clearly marked and will not be used for any other purpose.
- Disposable cups will be supplied; both a sanitary container for unused cups and a receptacle for disposing of used cups will be provided.

4.6.3 Sanitary Facilities

Access will be provided to wash facilities before eating, drinking, or smoking.

4.6.4 Lavatory

If permanent toilet facilities are not available, an appropriate number of portable chemical toilets will be provided.

4.7 Electrical Hazards

Electricity could pose a particular hazard to site workers if portable electrical equipment is used. If wiring or other electrical work is needed, it will be performed by a qualified electrician.

General electrical safety requirements include the following:

- All electrical wiring and equipment will be a type listed by Underwriters Laboratories (UL), Factory Mutual Engineering Corporation (FM), or other recognized testing or listing agency.
- All installations will comply with the National Electrical Safety Code (NESC), the National Electrical Code (NEC), or U.S. Coast Guard regulations.
- Portable and semiportable tools and equipment will be grounded by a multiconductor cord having an identified grounding conductor and a multicontact polarized plug-in receptacle.
- Tools protected by an approved system of double insulation, or its equivalent, need not be

grounded. Double-insulated tools will be distinctly marked and listed by UL or FM.

- Live parts of wiring or equipment will be guarded to prevent persons or objects from touching them.
- Electric wire or flexible cord passing through work areas will be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.
- All circuits will be protected from overload.
- Temporary power lines, switchboxes, receptacle boxes, metal cabinets, and enclosures around equipment will be marked to indicate the maximum operating voltage.
- Plugs and receptacles will be kept out of water unless they are of an approved submersible construction.
- All extension outlets will be equipped with ground-fault circuit interrupters (GFCI).
- Attachment plugs or other connectors will be equipped with a cord grip and will be constructed to endure rough treatment.
- Extension cords or cables will not be fastened with staples, hung from nails, or suspended by bare wire. Flexible cords will be used only in continuous lengths, without splice, with the exception of molded or vulcanized splices made by a qualified electrician.

4.8 Lifting Hazards

Back strain or injury can be prevented by using proper lifting techniques. The fundamentals of proper lifting are as follows:

- Consider the size, shape, and weight of the object to be lifted. Two persons must lift an object if it cannot be lifted safely alone (e.g., greater than 60 pounds [lbs]).
- The lifter's hands and the object should be free of dirt or grease that could prevent a firm grip.
- Gloves will be used, and the object will be inspected for metal slivers, jagged edges, burrs, and rough or slippery surfaces.
- Fingers will be kept away from points that could crush or pinch them, especially when putting an object down.
- Feet will be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear.
- The load should be kept as low as possible, close to the body, with the knees bent.
- The load should be lifted with a firm grip, using the legs and keeping the back as straight as possible.
- Workers should not carry loads they cannot see around or over.
- When putting an object down, the stance and position should be identical to that for lifting; the legs should be bent at the knees, and the back should be straight as the object is lowered.

4.9 Confined-Space Entry

No confined-space entry is expected to be necessary on this project. If confined-space entry is required, work will cease and the AEC Health and Safety Manager will be contacted.

A confined space is defined as a space that is large enough and so configured that an employee can enter and perform assigned work, has limited means for entry or exit, and is not designed for continuous employee occupancy. Confined spaces will not be encountered at this site.

4.10 Excavation and Trenching Safety

No excavation or trenching activities are expected to be conducted on this project.

5.0 Personal Protective Equipment

Personal protective equipment (PPE) is required to safeguard site personnel from biological hazards. At minimum, onsite workers should wear long pants and long-sleeve shirts.

The minimum level of protection that will be required of AEC personnel and subcontractors at the site. The following equipment will be used:

- Work clothing as prescribed by weather
- Surgical gloves (when sampling)
- Safety-toe work boots
- Safety glasses or goggles
- Hard hat
- Striped, reflective, traffic vest (around heavy equipment operations)
- Hearing protection.

Equipment for personal protection is selected based on site condition and the judgment of supervising site personnel and health and safety professionals.

6.0 First-Aid and Medical Treatment

All persons on site will report any near-miss incident, accident, injury, or illness to their immediate supervisor or the Site Manager. First aid will be provided by the designated first-aid provider on site. Injuries and illnesses requiring medical treatment will be documented. The Site Manager will conduct an accident investigation as soon as emergency conditions no longer exist and first-aid and/or medical treatment has been ensured. These two reports will be completed and submitted to the Health and Safety Manager within 24 hours of the incident.

First-aid kits will be kept at AEC's truck. If treatment beyond first aid is required, the injured should be transported to the medical facility. If the injured is not ambulatory or shows any sign of not being in a comfortable and stable condition for transport, an ambulance/paramedics should be summoned. If there is any doubt as to the injured worker's condition, it is best to let the local paramedic or ambulance service examine and transport the worker.

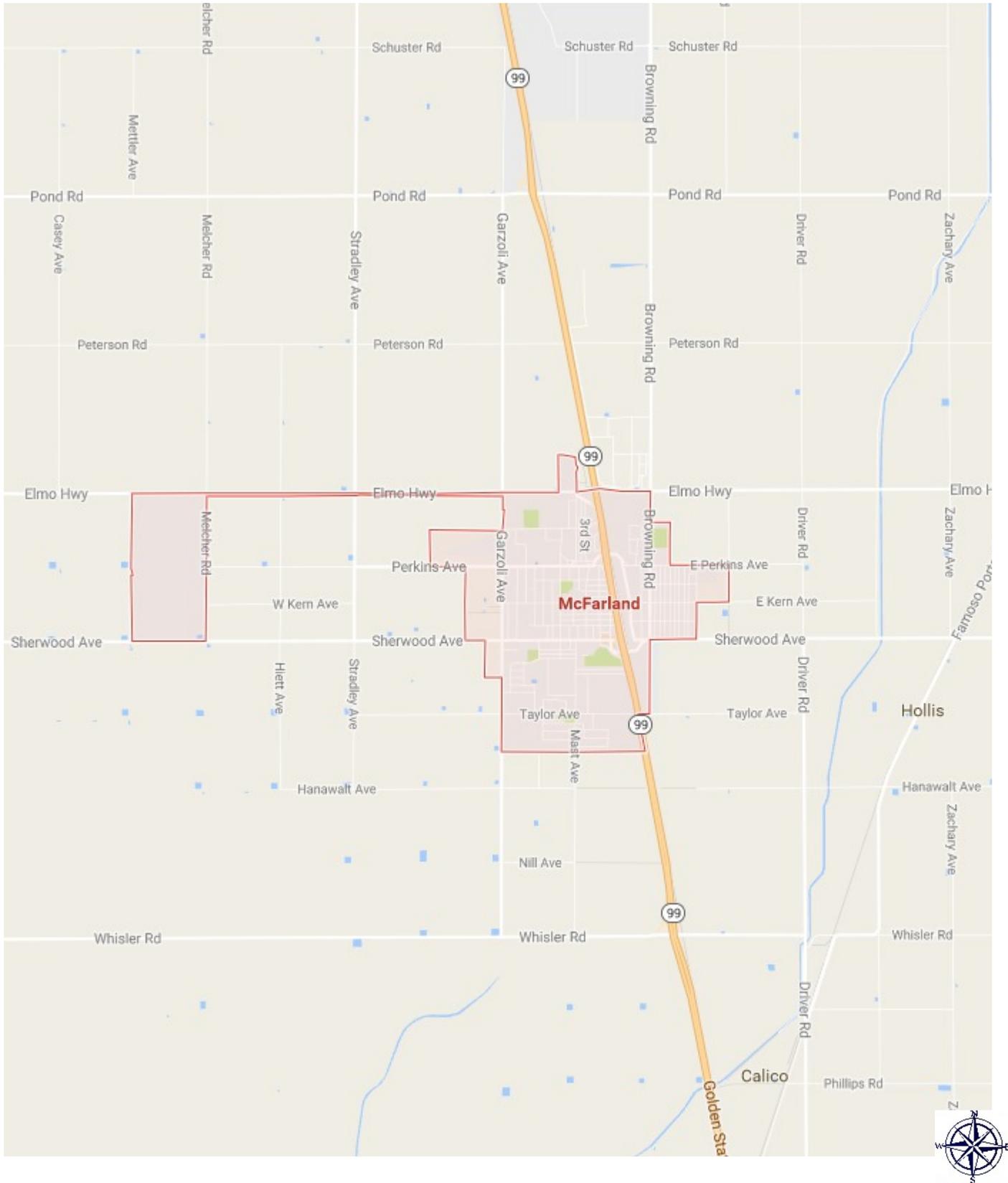
6.1 Emergency Information

Local public response agencies will be reviewed during the daily tailgate safety meeting. (See table of emergency information on next page.) Figure 1 presents a site vicinity map, and Figure 2 shows the route to the nearest medical facility.

EMERGENCY INFORMATION

Agency	Telephone Number
Ambulance	911
Hospital Emergency Care (Delano Regional Medical Center)	661-725-4800
Poison Control Center	911
Fire	911
Police	911
Explosives	911
Other Phone Numbers:	
Technical Manager, AEC	Jon Buck, 661-395-1646
Project Manager, AEC	Jon Buck, 661-395-1646
Site Manager, Health and Safety Officer	TBD
Health and Safety Manager, AEC	Jon Buck, 661-395-1646 Cell 661-979-1828
OCCUPATIONAL PHYSICIANS	Dr. Albert Peinado AEC Medical Director 661-327-9617
Site Resources:	
Water Supply	Readily Available
Phone	Locations Noted Prior to Work and Covered
Radio	in the Tailgate Safety Meeting

FIGURE 1
VICINITY MAP




 -ADVANCED ENVIRONMENTAL CONCEPTS INC -
 220 East Truxtun Avenue
 Bakersfield, California 93305
 (661) 395-1646

Vicinity Map
Cawelo Water District
Various Locations
McFarland, California

FIGURE
1

FIGURE 2
HOSPITAL ROUTE MAP

McFarland, CA

Get on CA-99 N from 2nd St and W Perkins Ave

- 1 Head east on W Kern Ave toward 2nd St 2.4 mi
- 2 Turn left at the 1st cross street onto 2nd St 18.1
- 3 Turn left onto W Perkins Ave 0.2 mi
- 4 Turn right onto Perkins Ave 174.1
- 5 Turn left to merge onto CA-99 N 89.5 mi

Follow CA-99 N to Woodlawn Ave in Delano. Take exit 54 from CA-99 N

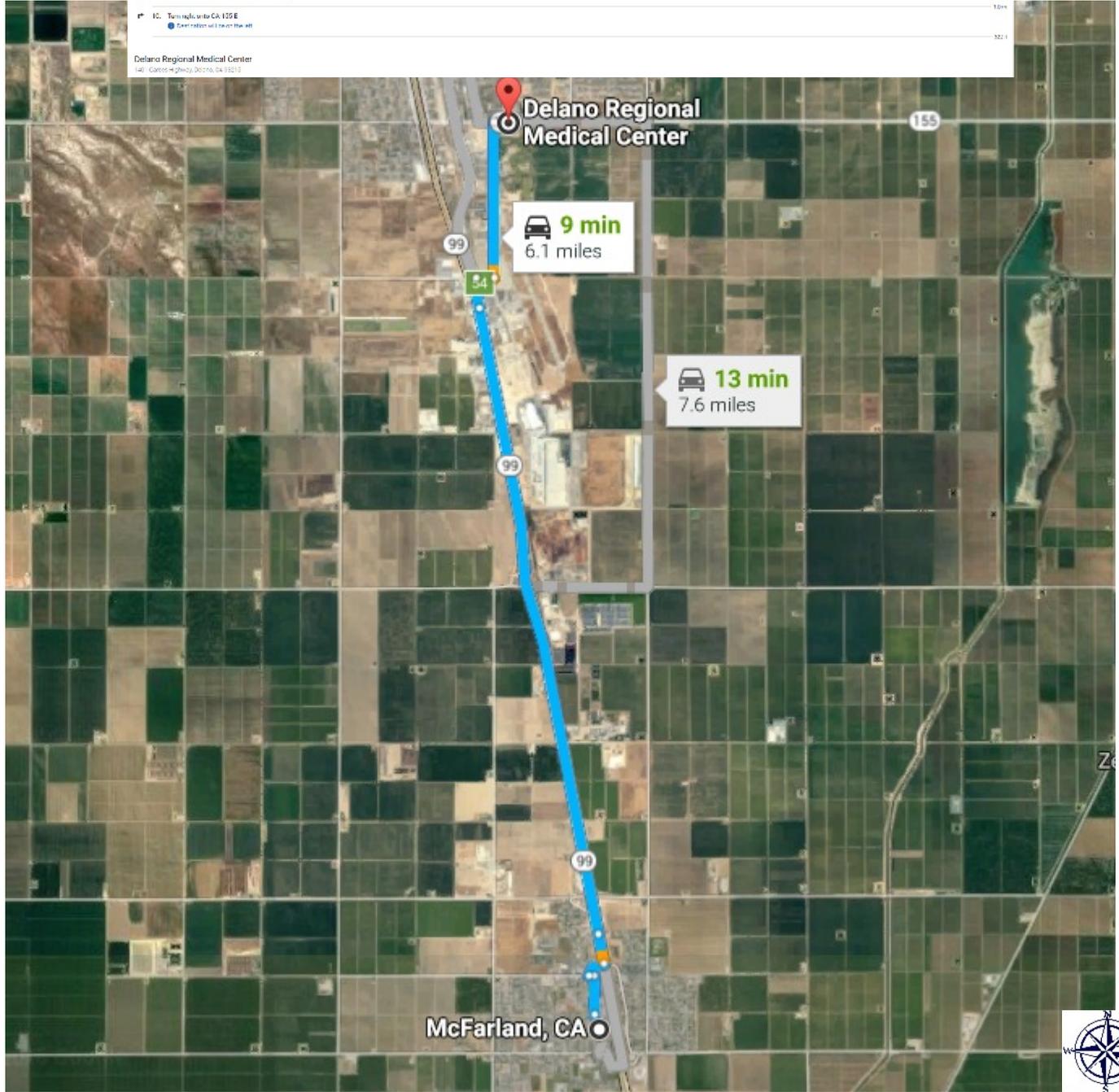
- 6 Merge onto CA-99 N 4.6 mi
- 7 Take exit 54 for Woodlawn Ave 4.1 mi

Take S Leavitt St to CA-135 E

- 8 Turn right onto Woodlawn Ave 1.1 mi
- 9 Turn left at the 1st cross street onto S Leavitt St 0.1 mi
- 10 Turn right onto CA-135 E 1.0 mi

Delano Regional Medical Center

1401 Gates Highway, Delano, CA 93315



AEC
 -ADVANCED ENVIRONMENTAL CONCEPTS INC -
 220 East Truxtun Avenue
 Bakersfield, California 93305
 (661) 395-1646

Hospital Route Map

**Cawelo Water District
 Various Locations
 McFarland, California**

FIGURE

2