RESOLUTION NO. 2649

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SHAFTER ADOPTING ADDENDUM NO. 1 TO THE NEGATIVE DECLARATION ADOPTED FOR THE GARLIC COMPANY AND GRIMMWAY ENTERPRISES INC. PROCESSING FACILITY LAND APPLICATION SYSTEMS PROJECT FOR A REVISED GARLIC COMPANY PROCESSING FACILITY LAND APPLICATION SYSTEM PROJECT IN COMPLIANCE WITH THE CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) AND STATE CEQA GUIDELINES

WHEREAS, on October 7, 2014, under Resolution No. 2310, the City of Shafter adopted a Negative Declaration for the Garlic Company and Grimmway Enterprises Inc. Processing Facility Land Application Systems Project to pipe wash waste water from their respective facilities down Zerker Road for discharge into two separate spreading fields south of the facilities; and

WHEREAS, the Garlic Company and Grimmway Enterprises Inc. were pursuing waste discharge permits from the California Regional Water Quality Control Board for their new waste water land application systems and proposed to utilize the right-of-way of Zerker Road to install parallel HDPE lines for waste discharge delivery to their respective land application sites with installation above and over the Friant-Kern Canal (Bureau of Reclamation Facility); and

WHEREAS, pursuant to CEQA, an Initial Study for the Garlic Company and Grimmway Enterprises Inc. Processing Facility Land Application Systems Project was circulated for a 30-day public review and comment period from September 4, 2014, to October 3, 2014; and

WHEREAS, no comments were submitted that identified potential significant impacts on the environment from the Garlic Company and Grimmway Enterprises Inc. Processing Facility Land Application Systems Project; and

WHEREAS, the Garlic Company has since revised and reduced the disturbance of its project and is requesting approval of an addendum for the minor change; and

WHEREAS, Grimmway Enterprises Inc. is no longer pursuing its Zerker Road pipeline and spreading grounds project; and

WHEREAS, an Addendum to the Negative Declaration that was adopted for the Garlic Company and Grimmway Enterprises Inc. Processing Facility Land Application Systems Project has been prepared for a revised Garlic Company Processing Facility Land Application System; and

WHEREAS, the laws and regulations relating to the preparation of an addendum to the Negative Declaration, as set forth in the California Environmental Quality Act, were adhered to and duly followed by City Staff and the City Council; and

WHEREAS, the proposed project would not result in a safety hazard or noise problem for persons using Minter Field or Meadows Field or for persons residing or working in the project area; and

WHEREAS, the City Council of the City of Shafter, at its meeting on May 7, 2019, studied and considered Addendum No. 1 to the Negative Declaration for the Garlic Company and Grimmway Enterprises Inc. Processing Facility Land Application Systems Project for a revised Garlic Company Processing Facility Land Application System Project; and

WHEREAS, none of the conditions described in Section 15162 of the State CEQA Guidelines can be attributed to the proposed addendum; the project analyzed under the adopted Negative Declaration for the Garlic Company and Grimmway Enterprises Inc. Processing Facility Land Application Systems has been reduced under the proposed addendum, and because the current proposal does not increase impacts beyond the levels considered in the adopted Negative Declaration, no new or additional impacts are present; and

WHEREAS, according to Section 15164(b) of the State CEQA Guidelines, the City of Shafter may prepare an addendum to a previously adopted Negative Declaration if only minor technical changes or additions are necessary or none of the conditions described in Section 15162 calling for the preparation of a subsequent Negative Declaration have occurred.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Shafter, in a regularly scheduled meeting assembled on the 7th day of May, 2019, hereby adopts Addendum No. 1 to the Negative Declaration for the Garlic Company and Grimmway Enterprises Inc. Processing Facility Land Application System Project for a revised Garlic Company Processing Facility Land Application System.

PASSED AND ADOPTED THIS 7th DAY OF MAY 2019.

Gilbert T Alvarado

Gilbert T. Alvarado, Mayor

ATTEST:

Rachel Zermeno, Deputy City Clerk

CERTIFICATE OF GOVERNING BODY'S ACTION

STATE OF CALIFORNIA)
) ss.
COUNTY OF KERN)

I, Rachel Zermeno, Deputy City Clerk of the City of Shafter, California, DO HEREBY CERTIFY that the above Resolution 2649, a Resolution of the City Council of the City of Shafter, was duly passed and adopted at a Regular Meeting held on the 7th day of May 2019, by the following vote:

AYES:	Alvarado, Garcia, Givens, Lopez, and Prout.
NOES:	None.
ABSENT:	None.
ABSTAINING:	None.

DATED: May 7, 2019

(SEAL)

Deputy City Clerk of the City of Shafter

ADDENDUM NO. 1

FOR

NEGATIVE DECLARATION

Date: March 29, 2019

Title: Addendum No. 1 to the Negative Declaration adopted for the Garlic Company and Grimmway Enterprises Inc. Processing Facility Land Application System Project herein referred to as "Garlic Company Processing Facility Land Application System Project".

Project Description: The original project plan under the approved final negative declaration included installation of a wastewater discharge line from The Garlic Company Facility to their 99-Acre land application site (99-Acre Site) via Zerker Road and installation of a 1.5 million-gallon wastewater reservoir (Balancing Reservoir) at the 99-Acre Site. This initial route and pipeline included a wastewater discharge line from Grimmway Farms' Premier Facility to the North Kern Spreading Grounds (Spreading Grounds). Grimmway Farms' plan to discharge to the Spreading Ground has changed, and as a result, will not require a discharge line along Zerker Road.

The Garlic Company has since secured an easement from Bidart Bros, Inc., that provides a more direct route between The Garlic Company Processing Facility on their 99-Acre Site (Attachment B, Figure 1).

Approximately 8,200 feet of 6-inch discharge piping will be installed from the new Balancing Reservoir, at the Garlic Company Processing Facility to a 50,000-gallon mixing tank connection at the 99-Acre Site. Approximately 8,200 feet of 6-inch dimeter freshwater piping will be installed to connect an existing well (Well 4), a 1,640 gallon per minute, 540-foot deep well, at the 99-Acre Site to an existing 240,670-gallon freshwater tank at the Garlic Processing Facility. Where the piping overlaps, the freshwater piping will be installed above the discharge piping in the same trench. The easement and subsequent pipelines will be located beneath existing farm roads, which reduces impacts to Prime Farmland soils (Attachment B, Figure 2).

The originally proposed 1.5-million-gallon wastewater Balancing Reservoir, that was to be built at the 99-Acre Site, will instead be built at an area within the current Garlic Company Processing Facility boundaries, will be reduced in size to 1.0-million gallons, and will be lined (Attachment B, Figure 2). A 50,000-gallon mixing tank will also be constructed at the 99-Acre Site, (Attachment B, Figure 1).

A freshwater connection will be installed on the mixing tank to connect freshwater from Well 4 via approximately 115-feet of 8-inch pipe. Freshwater and/or process wastewater from the mixing tank will be pumped to the land application areas utilizing two pumps connected to approximately 2,300-feet of 8-inch discharge pipe. Accessory structures such as fencing, lighting, and cameras may also be installed on the properties.

Well 4 will be utilized as a water supply for the Garlic Company Processing Facility and for irrigation purposes. Well 4 has been idle for several years and may require rehabilitation or replacement in the future. Consideration of Well 4 rehabilitation or replacement and subsequent abandonment is also included as part of the project. Should replacement of Well 4 occur, the new well would be installed at the 99-Acre site, within approximately 100 feet of existing Well 4. All required well/construction permits will be secured prior to installation and usage. Well rehabilitation/construction equipment and any associated cuttings will be controlled at the 99-Acre site. Upon completion of the new well, Well 4 will be decommissioned according to Kern County protocols. The replacement well, if installed, will be designed to extract a similar volume of water to Well 4. No additional volume of groundwater will be extracted as a result of Well 4 replacement. The proposed changes to the Garlic Company Processing Facility Land Application System Project result in a reduction in total project disturbance compared to the original project and will not result in additional groundwater extraction.

Reason for Addendum: According to Section 15164(b) of the State CEQA Guidelines, the City of Shafter may prepare an addendum to a previously adopted Negative Declaration if only minor technical changes or additions are necessary or none of the conditions described in Section 15162 calling for the preparation of a subsequent Negative Declaration have occurred. The relocation of the pipeline and reservoir and the addition of the mixing tank, freshwater piping, and possible well rehabilitation or replacement are minor technical changes being incorporated into the project description.

None of the conditions described in Section 15162 can be attributed to the proposed project. The addendum only involves the aforementioned changes to the Project Description. The City Council of the City of Shafter will consider the addendum with the adopted Negative Declaration. The subject Negative Declaration is attached to the addendum. In accordance with Section 15164(c) of the California State CEQA Guidelines, an addendum need not be circulated for public review and an additional round of public comments.

Wayne Clausen

Wayne Clausen, Planning Director
City of Shafter Community Development Department

Attachment A

Mandatory Determinations (Section 15162)

1. Are substantial changes proposed in the project which require major revisions of the previous Negative Declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects?

No, the proposed changes should have similar or less potential environmental impact than the previous Negative Declaration.

2. Have substantial changes occurred with respect to the circumstances under which the project is undertaken which will require major revisions of the previous Negative Declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects?

No, there will be six changes, all of which should reduce environmental impact than what was stated in the original Negative Declaration. These changes include:

- *Removing the proposed waste discharge pipeline from the Premier Facility to the Spreading Grounds.*
- *Rerouting the planned construction of the Garlic Company's process wastewater pipeline from the Zerker Road right of way to farm roads.*
- *Adding a freshwater supply pipeline to the Garlic Company within the same trench as the process wastewater pipeline.*
- *Relocating the planned construction of Balancing Reservoir from the 99-Acre Site to the Garlic Company facility and reducing its planned size from 1.5 MG to 1.0 MG.*
- *Installing a 50,000-gallon mixing tank at the 99-Acre Site in place of the Balancing Reservoir*
- *Rehabilitation or replacement of Well 4 at the 99-Acre Site.*

3. Has any new information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous Negative Declaration was adopted, shows any of the following:

> **(A) The project will have one or more significant effects not discussed in the negative declaration;**
>
> **(B) Significant effects previously examined will be substantially more severe than shown in the previous negative declaration;**
>
> **(C) Mitigation measures or alternatives previously found not to be feasible would in fact be feasible, and would substantially reduce one or more**

significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative

(D) Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment, but the project proponents decline to adopt the mitigation measure or alternative.

(A) The project will not have any significant effects not discussed in the Negative Declaration.

(B) There were no significant effects previously examined nor are there significant effects that result from the changes to the project.

(C) Mitigation Measures were not necessary in the previous Negative Declaration.

(D) Mitigation Measures were not necessary in the previous Negative Declaration.

Substantial Evidence

Attachment B

Project Map & Description Updates

Addendum 1 – Figure 1. Revised Pipeline Location Plan

(SOURCE: The Garlic Company Waste Water System Figure)

PROJECT NUMBER: 2016210030	CEQA Addendum 1
DATE: 9/20/2018	
DWG NO: 2016210030 ADD 1 F1-2.DWG	The Garlic Company Shafter, California
DWG BY: 6DJR / PROJECT MANAGER: 10MSS	
REVISED:	CES CASCADE EARTH SCIENCES

2016210030 Add 1 F1-2.dwg October 4, 2018 DR702784

Addendum 1 – Figure 2. Prime Farmland Map

0 1500'

1"=1500'

(SCALE AND LOCATIONS ARE APPROXIMATE)

(SOURCE: Google Earth Pro Image, 4-26-2018)

PROJECT NUMBER: 2016210030	CEQA Addendum 1
DATE: 9/20/2018	
DWG NO: 2016210030 ADD 1 F1-2.DWG	The Garlic Company Shafter, California
DWG BY: 6DJR / PROJECT MANAGER: 10MSS	
REVISED:	CES CASCADE EARTH SCIENCES

S:\[Working Drafting]\2016210030 Garlic Company\DWG\Addendum 1\2016210030 Add 1 F1-2.dwg October 4, 2018 DR702784

Attachment C

Initial Study Checklist-

Analysis of Updated Project with Changes

	Potentially Significant Impact	Less Than Significant with Mitigation Measures	Less Than Significant Impact	No Impact
I. AESTHETICS: Would the project:				
a) Have a substantial adverse effect on a scenic vista	☐	☐	☐	■
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway	☐	☐	☐	■
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	■
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	■
II. AGRICULTURE AND FOREST RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project; and the forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	■
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	■
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	■

	Potentially Significant Impact	Less Than Significant with Mitigation Measures	Less Than Significant Impact	No Impact
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	■
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	■
III. AIR QUALITY: Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	■
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	■
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non- attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	■
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	■
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	■
IV. BIOLOGICAL RESOURCES: Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	■
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☐	☐	■
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	■
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	■

	Potentially Significant Impact	Less Than Significant with Mitigation Measures	Less Than Significant Impact	No Impact
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	■
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	■
V. CULTURAL RESOURCES: Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	■
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☐	■
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	■
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	■
VI. GEOLOGY AND SOILS: Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	■
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42?	☐	☐	☐	■
ii) Strong seismic ground shaking?	☐	☐	☐	■
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	■
iv) Landslides?	☐	☐	☐	■
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	■

	Potentially Significant Impact	Less Than Significant with Mitigation Measures	Less Than Significant Impact	No Impact
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	■
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	■
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	■
VII. GREENHOUSE GAS EMISSIONS: Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☐	■
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	■
VIII. HAZARDS AND HAZARDOUS MATERIALS: Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	■
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	■
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	■
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	■
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	■

	Potentially Significant Impact	Less Than Significant with Mitigation Measures	Less Than Significant Impact	No Impact
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	■
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	■
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	■
IX. HYDROLOGY AND WATER QUALITY: Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	■
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	■
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	■
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site	☐	☐	☐	■
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	■
f) Otherwise substantially degrade water quality?	☐	☐	☐	■
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	■
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	■
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	■

	Potentially Significant Impact	Less Than Significant with Mitigation Measures	Less Than Significant Impact	No Impact
j) Inundation by seiche, tsunami, or mudflow	☐	☐	☐	■
X. LAND USE AND PLANNING: Would the project:				
a) Physically divide an established community?	☐	☐	☐	■
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	■
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	■
XI. MINERAL RESOURCES: Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	■
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	■
XII. NOISE: Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	■
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	■
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	■
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	■

	Potentially Significant Impact	Less Than Significant with Mitigation Measures	Less Than Significant Impact	No Impact
e) For a project located within an airport land use plan or, where such plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	■
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	■
XIII. POPULATION AND HOUSING: Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	■
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	■
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	■
XIV. PUBLIC SERVICES:				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	☐	☐	☐	■
Fire protection?	☐	☐	☐	■
Police protection?	☐	☐	☐	■
Schools?	☐	☐	☐	■
Parks?	☐	☐	☐	■
Other public facilities?	☐	☐	☐	■

	Potentially Significant Impact	Less Than Significant with Mitigation Measures	Less Than Significant Impact	No Impact
XV. RECREATION:				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	■
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	■
XVI. TRANSPORTATION/TRAFFIC: Would the project:				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☐	■
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	■
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	■
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	■
e) Result in inadequate emergency access?	☐	☐	☐	■
f) Conflict with adopted policies, plans or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☐	■
XVII. TRIBAL CULTURAL RESOURCES				
a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:	☐	☐	☐	■
i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	☐	■

	Potentially Significant Impact	Less Than Significant with Mitigation Measures	Less Than Significant Impact	No Impact
ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☐	☐	■
XVIII. UTILITIES AND SERVICE SYSTEMS: Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	■
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	■
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	■
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	■
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	■
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	■
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	■
XIX. MANDATORY FINDINGS OF SIGNIFICANCE				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☐	■
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☐	■

	Potentially Significant Impact	Less Than Significant with Mitigation Measures	Less Than Significant Impact	No Impact
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	■

2.0 Environmental Evaluation

The following evaluation provides responses to the questions in the Environmental Checklist. A brief explanation for each question in the Environmental Checklist is provided to support each impact determination. All responses consider the whole of the action involved including construction and operational impacts as well as direct and indirect impacts. Environmental factors potentially affected by the proposed Project are presented below and organized according to the format of the checklist.

I. Aesthetics

Would the project:

a) Have a substantial adverse effect on a scenic vista?

No Impact - *The project site is not on a scenic vista.*

b) Substantially damage scenic resources including, but not limited to trees, rock outcroppings, and historic buildings within a state scenic highway?

No Impact – *The project site is existing farm land and is not located near scenic resources.*

c) Substantially degrade the existing visual character or quality of the site and its surroundings?

No Impact - *The project site's visual character will be consistent will the surrounding area.*

d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

No Impact - *The project will not create substantial light or glare and will not affect day or nighttime views in the area.*

<u>Aesthetics Mitigation Measures – Summary</u>

No physical changes to the environment will occur as a result of the application of process wastewater from the Garlic Company's garlic processing facility (TGC Facility). The new pipeline route will be located under existing farm roads and the Balancing Reservoir will be constructed within the existing facility boundary. The rehabilitation of Well 4 or replacement of Well 4, which will occur within 100 feet of the existing well, will not degrade existing features. The project changes will neither create new nor degrade any existing features. No adverse impacts to area aesthetics will occur as result of this project.

II. Agricultural and Forest Resources

Would the Project:

a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

No Impact - *The soils mapped within the project site are designated as Prime Farmland, if irrigated. The proposed changes should not impact actual Prime Farmland acreage since the pipeline route reduces the pipeline distance and will be installed along existing farm roads. The mixing tank is substantially smaller than the original proposed reservoir and will require less land to construct. The Balancing Reservoir be reduced and will be placed inside the existing, non-irrigated, Processing Facility boundaries. The possible rehabilitation of Well 4 or replacement of Well 4, which will occur within 100 feet of the existing well, should not convert existing prime farmland to non-agricultural use.*

b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?

No Impact *– The proposed use is agricultural in nature and will not conflict with the existing zoning and the site is not under a Williamson Act contract.*

c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

No Impact *- The site is not zoned as forest land or timberland.*

d) Result in the loss of forest land or conversion of forest land to non-forest use?

No Impact *-The site is not zoned as forest land.*

e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?

No Impact *– The project will not convert farmland to non- agricultural use and there are no forest land at or near the project site.*

Agricultural and Forest Resources Mitigation Measures – Summary

The 99-Acre site used for process wastewater land application will continue to be an agricultural resource. The proposed changes reduce the amount of disturbance compared to the original pipeline route. There will be No Impact to agricultural or forest resources as a result of the project.

III. Air Quality

Would the project:

a) Conflict with or obstruct implementation of the San Joaquin Valley Air Pollution Control District Air Quality Attainment Plans?

No Impact *- The project will not conflict or obstruct implementation of the San Joaquin Valley Air Pollution Control District Air Quality Attainment Plans as per the findings of the adopted Negative Declaration.*

b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?

No Impact - *The project will not violate any air quality standard. The proposed changes reduce the pipeline length and Balancing Reservoir size. These changes subsequently reduces construction equipment usage, which results in the potential reduction in emissions for the project. The possible rehabilitation or replacement of Well 4 will allow the well pump to run more efficiently thus reducing run time and improve the water system's energy efficiency. The use of available process wastewater allows for continual cropping which reduces the potential periods of fallow or bear soil which should reduce the potential for wind erosion and dust emissions.*

c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under and applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?

No Impact*-The proposed changes reduce the pipeline length and Balancing Reservoir size. These changes subsequently reduce equipment usage and results in the potential reduction in emissions for the project. The possible rehabilitation or replacement of Well 4 will not result in a cumulatively considerable net increase of any criteria pollutant. Should Well 4 require replacement, the new well will be constructed and designed to extract groundwater at the same rate and volume as Well 4. Upon completion of the new well, Well 4 will be decommissioned in accordance with Kern County standards. The process wastewater being applied to field crops comes from washing and processing produce, contains no substantial pollutant concentrations (CES, 2013[1]).*

d) Expose sensitive receptors to substantial pollutant concentrations?

No Impact *- The project will not expose sensitive receptors to pollutants.*

e) Create objectionable odor affecting a substantial number of people?

No Impact - The process wastewater being applied to field crops comes from washing and processing produce. Its potential for creating objectionable odors is minimal when managed, as intended, with aeration, at the TGC facility and continuous use by land application, (CES, 2013). The possible rehabilitation or replacement of Well 4 will not create any objectionable odors.

Air Quality Mitigation Measures – Summary

The proposed changes to the project have the potential to reduce total emissions for the project. The shortened pipeline length and reduced Balancing Reservoir size will reduce construction equipment usage, which should result in less emissions for the project. No conflicts or violations of air quality standards are associated with the possible rehabilitation or replacement of Well 4. The possible rehabilitation or replacement of Well 4 will allow the well pump to run more efficiently thus reducing run time and improve the water system's overall efficiency. No conflicts or violations of air quality standards are associated with the application of process wastewater by means of irrigation. The use of available process wastewater allows for continual cropping schedule and reduces the potential for periods of fallow or bare soil which should reduce the potential for wind erosion and dust emissions.

The process wastewater being applied to field crops comes from washing and processing produce, contains no substantial criteria pollutants concentrations, and the intended management minimizes the potential for objectionable orders (CES, 2013).

No adverse impacts to air quality that will occur as a result of the project.

IV. Biological Resources

Would the project:

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

No Impact - There are no known suitable wildlife habitat or sensitive natural communities on the project site due to long-term agricultural use.

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?

No Impact *- There are no riparian areas or sensitive natural communities on the project site.*

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filing, hydrological interruption, or other means?

No Impact *- There are no wetlands on the project site.*

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

No Impact *- The project will not interfere with or impede current wildlife uses.*

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

No Impact *- There are no local policies or ordinances protecting biological resources on the project site.*

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

No Impact *- There are no conservation plans associated with the project site.*

Biological Resources Mitigation Measures – Summary

No known occurrences of wetlands, riparian areas, suitable wildlife habitat, or sensitive natural communities occur on the project site due to long-term agricultural land use and rural development (MBHCP, 1994).

No adverse effects to species or habitat should occur as a result of the project.

V. Cultural Resources

Would the project:

a) Cause a substantial adverse change in the significance of historical resources as defined in section 15064.5?

No Impact *- All proposed changes will occur on previously disturbed land and will not change any historical resources.*

b) Cause a substantial adverse change in the significance of an archaeological resources pursuant to section 15064.5?

No Impact *- All proposed changes will occur on previous disturbed land and will not change any historical resources.*

c) Directly or indirectly, destroy a unique paleontological resource on site or unique geologic feature?

No Impact *- There are no known unique or common paleontological resources on the site.*

d) Disturb any human remains, including those interred outside of formal cemeteries?

No Impact *- There are no known human remains on the project site.*

Cultural Resources Mitigation Measures – Summary

There are no changes that will affect cultural resources as a result of the project.

VI. Geology and Soils

Would the project:

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on Other substantial evidence of a known fault?

No Impact *- The project site is not located on a known fault.*

ii) Strong seismic ground shaking?

No Impact *- All proposed changes will occur on previously disturbed land and should not cause strong seismic ground shaking.*

iii) Seismic-related ground failure, including liquefaction?

No Impact *- The soils on the project site are stable and should not be susceptible to ground failure.*

iv) Landslides?

No Impact - *The project site is relatively flat (0-2 percent) and will be farmed continuously throughout the year, therefore, the likelihood of landslides is non-existent.*

b) Result in substantial soil erosion of the loss of topsoil?

No Impact *- The proposed changes reduce the amount of disturbance compared to the original project and the pipeline will be installed under existing farm roads and right-of- ways. The rehabilitation or replacement of Well 4 will not result in any substantial soil erosion or loss of topsoil. The area where the replacement well would be installed is relatively flat (0-2 percent) and is graded to keep water on-site to reduce the risk of runoff. The 99-Acre Site will be farmed and irrigated throughout the entire year significantly reducing soil erosion or loss of top soil.*

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on-or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

No Impact *- The soils on the project site are stable and relatively flat (0-2 percent), therefore, the proposed changes should have no impact.*

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

No Impact *- The soils on the project site are classified as sandy loam and are not considered expansive.*

e) Have soils incapable of adequately supporting the use of the septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

No Impact *– The soils have adequate capability of supporting septic tanks or alternative waste water disposal systems.*

<u>Geology and Soils Mitigation Measures – Summary</u>

No risk to people or structures is associated with seismic-related activity from the proposed project changes. The project encompasses 99 acres of stable and relatively flat (0-2 percent) farmland, existing farm roads, and the existing TGC Facility. Soils are well-suited to year-round crop rotations, which reduce erosion or loss of top soil and the pipeline will be installed under existing farm roads and right-of-ways. The area where the replacement well would be installed is relatively flat agricultural land (0-2 percent) and is graded to keep water on-site to reduce the risk of runoff.

No Impacts to soil or geologic features are expected to occur as a result of this project.

VII. Greenhouse Gas Emissions

Would the project:

a) Generate greenhouse gas (GHG) emissions, either directly or indirectly, that may have a significant impact on the environment?

   No Impact *– The proposed changes reduce the pipeline length and Balancing Reservoir size. These changes subsequently reduce construction equipment usage, which results in the potential reduction in GHG emissions for the project. The rehabilitation or replacement of the well will cause the well pump and water delivery system to run more efficiently thus potentially reducing greenhouse gas emissions.*

b) Conflict with any plan, policy, or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases?

   No Impact *– The proposed changes to the project do not result in conflict with any plans, policy, or regulations of any agency.*

Greenhouse Gas Emissions Mitigation Measures – Summary

The proposed changes to the project have the potential to reduce total GHG emissions for the project. The shortened pipeline length and reduced Balancing Reservoir size will reduce construction equipment usage, which should result in less GHG emissions for the project.

No Impacts to GHG emissions are expected to occur as a result of this project.

VIII. Hazards and Hazardous Materials

Would the project:

a) Create a significant hazard to the public or the environment through the routine transport, use or disposal of hazardous materials?

No Impact *- There are no hazardous materials or emissions that are associated with the installation of pipelines, a reservoir, and a long term, year-round application of process wastewater to the crops and farmland on this project site (CES, 2013). There are also no hazardous materials or emissions associated with the rehabilitation or replacement of the Well 4. Well rehabilitation or replacement will be conducted in accordance to industry standards*

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

No Impact *- There are no hazardous materials or emissions that are associated with this project (CES, 2013).*

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing proposed school?

No Impact *- The nearest school is approximately 3 miles away from the project site.*

d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment?

No Impact *– The site is not included on any hazardous materials lists.*

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

No Impact *- No public airport or public use airport exists or is planned to exist within a two-mile radius of the project site.*

f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?

No Impact *- No private airstrip exists or is planned to exist within the vicinity of the project site.*

g) Impair implementation of or interfere with an adopted emergency response plan or emergency evacuation plan?

No Impact *- The project will not impair or interfere with adopted emergency response or emergency evacuation plans.*

h) Expose people or structures to a significant risk of loss, injury, or death involving wild land fires, including where wild lands are adjacent to urbanized area or where residences are intermixed with wild lands?

No Impact *- The proposed changes would not expose people or structures to risk involving wildfires. There are also no wild lands near the project site and the year-round wastewater irrigation to the 99-Acre site reduces the likelihood of wildfires.*

Hazards and Hazardous Materials Mitigation Measures – Summary

There are no hazardous materials or emissions associated with this project, (CES, 2013). No public or private airport exists or is planned to exist within a two-mile radius of the project site. No Impacts from hazards or hazardous materials are expected from the project. There will be no impacts to the existing low risks from wildfire.

IX. Hydrology & Water Quality

Would the project:

a) Violate any water quality standards or waste discharge requirements?

No Impact*- The proposed project changes will not result in the violation of water quality standards or existing waste discharge requirements. A report of waste discharge (ROWD) was submitted to the Central Valley Regional Water Quality Control Board (Regional Board) to amend the TGC Facility's current waste discharge requirements to allow discharge to the 99-Acre Site and incorporate the proposed changes to the project as applicable. The Technical Report (Attachment D) provides detailed data to demonstrate that the process wastewater management and irrigation can be practiced year-round in a manner that is protective of groundwater quality and that there is a low probability of degrading groundwater.*

The Garlic Company has also submitted an application to the State Water Resources Control Board to amend their current domestic water supply permit to include Well 4 as a domestic water supply. The application contained information that included; a well design, components of water delivery system, an Environmental Information Form (EIF), a source water assessment and water quality analysis, all of which and more are required for permit amendment acquisition.

A permit or waiver for waste discharge will also be obtained from the Regional Board for any well rehabilitation, well installation, well flushing discharge or discharge for other operational purposes. Following the permit or waiver requirements will help ensure the discharge will not violate water quality standards or discharge requirements.

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume of a lowering of the local groundwater table level (e.g. the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

No Impact*- The addition of Well 4 to the water supply system will result in a reduction of usage from existing Processing Faculty water supply wells. The project should not result in a change in groundwater pumping or affect groundwater recharge such that there is a net deficit in aquifer volume or lowering of the local groundwater table level. The conversion of Well 4 to a domestic and agricultural use is projected to reduce the irrigated acreage from 90 acres to approximately 70 acres, which may result in a net reduction in groundwater usage. There are no known wells within 1,500 feet of Well 4 that would be substantially depleted by this project.*

Should Well 4 require replacement, the new well will be constructed and designed to extract groundwater at the same rate and volume as Well 4. Upon completion of the new well, Well 4 will be decommissioned in accordance with Kern County standards. Therefore, no additional groundwater extraction is projected to occur if Well 4 is replaced.

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on-or-off site?

No Impact*- The project will not alter any existing drainage patterns in a manner which would result in substantial erosion or siltation on-or-off site. No surface drainage, or intermittent streams or swales flow through the project irrigation fields or the TGC Facility. Stormwater from the TGC Facility is collected and comingled with the process wastewater for irrigation as permitted by the Regional Board. The 99-Acre Site is bisected by the Friant-Kern Canal. Existing pipeline crossings will be utilized with no alterations to the canal. The construction of the mixing tank, reservoir, and various components of the project will alter stormwater drainage in the short-term during construction and long-term due to component existence, however, stormwater management will remain consistent with current operations. The Garlic Company will obtain permits for the proposed project, as required. Permits will include an NPDES permit and any additional permits required by local, state, and federal agencies. A Stormwater Pollution Prevention Plan (SWPPP) will also be developed.*

d) Substantially alter the exiting drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

No impact- *The proposed changes will not substantially alter any existing drainage patterns or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-or-off site. Stormwater management will remain consistent with current operations. Land application fields are and will continue to be graded to retain stormwater and the facility will continue to capture stormwater in their existing 0.467 million-gallon stormwater basin. Stormwater in the basin is comingled with the process wastewater for irrigation, as permitted by the Regional Board. Existing pipeline crossings will be utilized with no alterations to the Friant-Kern canal. Implementation of* *the SWPPP will occur during construction operations.*

e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?

No impact*- The proposed changes will not create or contribute additional runoff that would exceed the capacity of existing systems. Stormwater management will remain consistent with current operations. Construction of the reservoir will now occur on existing improved land instead of active agricultural land, which reduces the runoff potential of the project. Land applications fields are and will continue to be graded to retain stormwater and the facility will continue to capture stormwater in their existing 0.467-million-gallon stormwater basin. Stormwater in the basin is comingled with the process wastewater for irrigation, as permitted by the Regional Board and the implementation of the SWPPP will occur during construction operation. The Garlic Company will obtain required permits for the proposed project, as applicable. Permits will include an NPDES permit and any additional permits required by locate, state, and federal agencies.*

f) Otherwise substantially degrade water quality?

No impact*- Water quality will not be adversely affected by implementation of this project. A report of waste discharge (ROWD) was submitted to the Central Valley Regional Water Quality Control Board (Regional Board) to amend their current waste discharge requirements to allow discharge to the 99-Acre Site and incorporate the proposed changes to the project, as applicable. The Technical Report (Attachment D) provided detailed data to demonstrate that the process wastewater management and irrigation can be practiced year-round in a manner that is protective of groundwater quality and that there is a low probability of degrading groundwater.*

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

No impact*- The project will not have any housing or buildings.*

h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?

No impact*- There will not be any structures built on the project site that will impede or redirect flood flows. The project is not within the 100-year flood plain*

i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

No impact*- The project will have no impact on flooding. The reduction in disturbed area, the reduction in size of the Balancing Reservoir and the maintenance of surrounding agricultural land will maintain the existing large infiltration area. The space population and lack of nearby dams also minimizes the potential risk of* *flooding and associated damages to people or structures.*

j) Inundation by seiche, tsunami, or mudflow?

No Impact- *Seiche, tsunamis, and mudflows do not occur in the project area and so the project will not expose people or structures to a significant risk of loss, injury, or death involving any seiche, tsunami, or mudflow.*

Hydrology and Water Quality Mitigation Measures –Summary

Water quality will not be adversely affected by implementation of this project. The project will not affect surface drainage and no surface drainage, or intermittent streams or swales flow through the project irrigation fields or the TGC Facility. The project will not create or contribute additional runoff that would exceed the capacity of existing systems. Stormwater management will remain consistent with current operations. Construction of the reservoir will now occur on existing improved land instead of active agricultural land which reduces the runoff potential of the project. Land application fields are and will continue to be graded to retain stormwater and the TGC Facility will continue to capture stormwater in their existing 0.467-million-gallon stormwater basin. Stormwater in the basin is commingled with the process wastewater for irrigation, as permitted by the Regional Board and implementation of the SWPPP will occur during construction operations.

The Garlic Company will obtain required permits for the project, as applicable. Permits will include an NPDES permit and any additional permits required by local, state, and federal agencies. A Report of Waste Discharge (ROWD) was submitted to the Central Valley Regional Water Quality Control Board (Regional Board) to amend the Garlic Company's current waste discharge requirements to allow discharge to the 99-acre Site and incorporate the proposed changes to the project, as applicable. The Technical Report (Attachment D) provides detailed data to demonstrate that the process wastewater management and irrigation can be practiced year-round in a manner that is protective of groundwater quality and that there is a low probability of degrading water. A permit or waiver for waste discharge will also be obtained from the Regional Board for any well discharge for flushing of any well or discharge for other operational purposes. The use of Well 4 as a domestic water supply and supplemental irrigation will not result in substantial depletion of groundwater supplies or interfere substantially with groundwater recharge. The rehabilitation or replacement of Well 4 will not result in an increase in the volume of groundwater that is extracted. The new well will be designed and constructed to extract groundwater at the same rate and volume as Well 4. Upon completion of the new well, Well 4 will be decommissioned and therefore, no additional groundwater extraction is projected to with the replacement of Well 4.

No impacts to hydrology or water quality are expected as a result of the project.

X. Land Use and Planning

Would the project:

a) Physically divide an established community?

No Impact *– The nearest established community is approximately 2 miles away and will not be impacted by the project.*

b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

No Impact *– The project will not conflict with any land use plan, policy, or regulation.*

c) Conflict with any applicable habitat conservation plan or natural community conservation plan?

No Impact *– The project site does not have any conservation plans associated with it.*

Land Use and Planning Mitigation Measures – Summary

No altered land uses are associated with the project. No impacts to land use or planning are expected as a result of the project.

XI. Mineral Resources

Would the project:

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

No Impact *– There are no known mineral resources that would be impacted by the project.*

b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?

No Impact *– The project would not affect any mineral resources.*

Mineral Resources Mitigation Measures – Summary

No Impacts to mineral resources are expected as a result of the project.

XII. Noise

Would the project result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

   No Impact *- The project changes should not generate or expose anyone to noise levels in excess of established standards.*

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

   No Impact *- The project changes should not generate any long-term groundborne vibration or noise. Short-term vibrations may occur during construction but will cease when construction is complete.*

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

   No Impact *- There should be no increase in ambient noise levels around the project site upon completion.*

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

   No Impact *– There will be short-term temporary increases in noise related to construction. There should be no substantial temporary or periodic increase in ambient noise levels associated with the finished project.*

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

   No Impact *- There are no airports within 2 miles of the project site.*

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

   No Impact - *There are no private airstrips located within 2 miles of the project site.*

Noise Mitigation Measures – Summary

No increases in ambient noise or levels of vibration are associated with the final completed project. No noise related impacts are expected as a result of the project.

XIII. Population and Housing

Would the project:

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example through the extension of roads or other infrastructure)?

   No Impact - *The proposed changes to the project will not induce substantial population growth.*

b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?

   No Impact - *The project will not displace any housing.*

c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

   No Impact - *The project will not displace any people.*

Population and Housing Mitigation Measures – Summary

No Impacts to existing population and housing are expected as a result of the project.

XIV. Public Services

Would the project:

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

   a) Fire Protection?
   b) Police protection?
   c) Schools?
   d) Parks?
   e) Other public facilities?

   No Impact - *The project will not require new government buildings or physical alteration of any existing government buildings. There will be no negative impact associated with the project.*

Public Services Mitigations Measures – Summary

No new or altered government facilities are associated with the project. No changes to the operational needs of the surrounding communities will occur as a result of this project.
No negative impacts to fire, police, education, parks, or other public services are expected as a result of the project.

XV. Recreation

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

   ***No Impact** - The project site is not located near any parks; therefore, the project should not affect any parks.*

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

   ***No Impact** - The project does not include or require any recreational facilities.*

Recreation Mitigation Measures – Summary

No changes to neighborhoods, parks, or recreational facilities are associated with the application of process wastewater by means of irrigation. No negative impacts to recreation facilities are expected as a result of the project.

XVI. Transportation/Traffic

Would the project:

a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.

   ***No Impact** - The project changes would not affect any applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system.*

b) Conflict with an applicable congestion management program including but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?

No Impact *- The project changes would not affect any congestion management programs.*

c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

No Impact *- The project changes will not affect air traffic patterns.*

d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

No Impact *- There will not be any increase in hazards due to this project. The relocation of the pipeline from Zerker Road to farm roads reduces transportation hazards during construction and operation. The installation of the mixing tank and the possible rehabilitation or replacement of Well 4 will not occur near any public roads. Their design features will not substantially increase traffic hazards.*

e) Result in inadequate emergency access?

No Impact *- Emergency access will not be negatively impacted by the project.*

f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

No Impact *- The project changes will not conflict with any adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities.*

Transportation/Traffic Mitigation Measures – Summary

No changes to local traffic patterns or needs for public transportation are associated with the proposed changes. The relocation of the pipeline from Zerker Road to farm roads reduces transportation hazards. The project will neither increase nor decrease the farm traffic related to farming on the existing agricultural fields (CES, 2013).

No negative impacts to transportation or traffic are expected as a result of the project.

XVII. Tribal Cultural Resources

a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

b) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or

c) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

No Impact *- The project will not affect or pose risks to any tribal cultural resources.*

XVIII. Utilities and Service Systems

Would the project:

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

No Impact *- The project will not require public wastewater treatment facilities and therefore, will not cause local utilities to exceed wastewater treatment requirements of the Regional Water Quality Control Board.*

b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

No Impact *- No additional city wastewater treatment will be required by implementation of this project.*

c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

No Impact *- The project will not result in changes to storm water management because it will not create additional runoff or negatively affect existing storm water management at the Processing Facility or the 99-Acre Site. All stormwater will be managed on-site, and construction will be governed by an NPDES construction stormwater permit and SWPPP.*

d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed.

No Impact *- The project will have sufficient water supplies available from existing wells. No new or expanded entitlements are needed.*

e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in additional to the provider's existing commitments?

No Impact *- The project will irrigate wastewater from the TGC Facility onto farm fields for reuse and not send wastewater to the city, thus will not affect any wastewater treatment provider.*

f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

No Impact *- The project will not affect any landfills in the area.*

g) Comply with federal, state, and local statutes and regulations related to solid waste?

No Impact *- Any solid waste that is generated by the project will be disposed of according to federal, state, and local guidelines and regulations.*

<u>Utilities and Service Systems Mitigation Measures – Summary</u>

No additional city wastewater treatment will be required by implementation of this project. No new or expanded stormwater discharge facilities will be required as the Facility maintains a separate stormwater pond and stormwater management on-site.

No negative impacts to utilities and service systems are expected as a result of the project.

XIX. Mandatory Findings of Significance

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

No Impact *- The proposed changes will not degrade the quality of the environment or damage fish or wildlife.*

b) Does the project have impacts that are individually limited, but cumulatively considerable?

No Impact *- The proposed changes will not have a negative impact either individually or cumulatively.*

c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

No Impact *- The project will not have substantial adverse direct or indirect effects on human beings.*

References:

CES, 2013. Technical Report for the Report of Waste Discharge – The Garlic Company, Shafter, California. Cascade Earth Sciences, Bakersfield, California. March 2013.

MBHCP, 1994. Metropolitan Bakersfield Habitat Conservation Plan. Metropolitan Bakersfield Habitat Conservation Plan Steering Committee. City of Bakersfield, California.

Attachment D

Technical Report for Waste Discharge

Synergy of Water and Science™

Technical Report for the Report of Waste Discharge

The Garlic Company
Shafter, CA
January 2019

2902 W Main St
Visalia, CA, 93291
Ph. (559) 732-3665
Fax (559) 732-3720
cascade-earth.com

Technical Report for the Report of Waste Discharge
The Garlic Company
Shafter, California

Prepared For:	Mr. Keith Price The Garlic Company 18602 Zerker Road Shafter, CA 93312
Prepared By:	Cascade Earth Sciences 2902 W Main St Visalia, CA 93291 (559) 732-3665
Author(s):	Michael S. Sowers, CPSS, CCA-WR, Managing Soil Scientist
Reviewed By:	Daniel J. Burgard, CPSS, Principal Soil Scientist Daniel J. Bruner PG, CHG, Managing Geologist
Report Date:	January 19, 2019
Project Number:	2016210030

Technical Report for the Report of Waste Discharge
The Garlic Company, Shafter, California

This report, sealed by a Professional Geologist and Certified Hydrogeologist registered in the State of California and a certified Professional Soil Scientist, contains information and data developed by a team of professionals including soil scientists, geologists, engineers, testing laboratories, and other professionals. This report does not contain design plans and specifications.

Submitted By:

PROFESSIONAL GEOLOGIST
DANIEL J.
BRUNER
No. CHG 991
STATE OF CALIFORNIA

Daniel J. Bruner PG, CHG,
Managing Geologist

CPSS
Certified Professional
Soil Scientist
MICHAEL SOWERS
25019 Exp.

Michael S. Sowers, CPSS, CCA-WR,
Managing Soil Scientist

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EXECUTIVE SUMMARY

The Garlic Company (TGC) is submitting this Amended Report of Waste Discharge (ROWD) consisting of State Form 200 and a Technical Report that thoroughly characterizes the process wastewater discharge to amend their current discharge permit to land from the California Regional Water Quality Control Board – Central Valley Region (Regional Board). TGC currently operates under Waste Discharge Requirements Order R5-2013-0150 adopted by the Regional Board on December 6, 2013

TGC washes, processes, and packages fresh garlic within a 13-acre processing facility, which currently includes office buildings, a processing facility, cold storage unit, Stormwater Pond, and a Main Pond (Facility). Processing of the garlic provides a method for the inspection and sorting of blemished or inferior (cull) garlic. It also processes peeled clove garlic into garlic puree, garlic juice, and pickled garlic. The current 14.8-acre land application area (Current Site), located to the west of the Facility, consists of a big gun sprinkler irrigation field. TGC is in the advanced planning stage of upgrading the Facility, which will include conveyance of the process wastewater to the 99-acre land application area (99-acre Site), the addition of a new water supply well (Well 4), the installation of a 50,000-gallon mixing tank and the construction of a 1 million gallon (MG) lined process wastewater reservoir. These upgrades are proposed to allow for an increase in permitted process wastewater This Technical Report will describe how the processes will function upon completion of the Facility upgrades.

TGC utilizes on-site water wells as the source water for seven processing lines. From the processing lines, the process wastewater is sent to a process wastewater pump pit. The process wastewater will then move through a trash press, and a series of filtration screens before delivery to a 1 MG gallon lined reservoir. From the reservoir, the process wastewater can either be irrigated on the Current Site or pumped to the 50,000-gallon mixing tank (mixing tank) located at the 99-acre Site. From the mixing tank, the process wastewater will be applied to the 99-acre Site. The 99-acre Site consists of approximately 98.95 acres, of which approximately 95.2 acres are available for process wastewater irrigation. The 99-acre Site has excess capacity to receive and effectively treat the proposed future maximum flow of 46.96 MG per year. Utilizing current flows, approximately 35 acres of land application area would be needed for effective treatment. The proposed maximum flow would require approximately 62 acres of land for effective treatment.

The anticipated biochemical oxygen demand loading rates are estimated to be 7.3 pounds per acre per day (lb/ac/day) at current flow rates, utilizing 35 acres and 6.1 lb/ac/day at the proposed maximum flow utilizing 62 acres. Total gross nitrogen load to the 99-acre Site is estimated to be 346 pounds per acre (lb/ac) per year at current flow, quality, and 35 acres and 296 lb/ac at the maximum flow rate utilizing 62 acres. Crop nitrogen uptake for a typical wheat – sudangrass rotation coupled with denitrification through gaseous loss results in a negative nitrogen balance of -28 and -63 lb/ac. If alfalfa is grown, the nitrogen deficit increases to -278 and -313 lb/ac. The fixed dissolved solids load is expected to range from 13,101 lb/ac at current flow and quality, utilizing 35 acres to 10,856 lb/ac at the maximum proposed flow.

The updated anti-degradation analysis submitted to the Regional Board on June 24, 2014 provided a limited perspective of the worst case potential to impact groundwater quality from one monitoring point and one irrigation management approach. The Addendum provided a review of historical groundwater quality data in the region and determined that the North Kern Water Storage District Spreading Grounds has influenced the water quality beneath the TGC 99-acre site. In the absence of active recharge at the Spreading Grounds, the EC will eventually increase back to prior levels or if recharge is resumed, it has potential to mitigate changes in groundwater EC. Deep percolation is associated with high precipitation months and is similar to the rainfall amount or is controlled through supplemental fresh water irrigation management. The 99-acre Site, with the proposed flows, is well-suited to provide sufficient acreage to control deep percolation and leaching losses to control the potential for negative impacts to groundwater quality. Monitoring and reporting has been proposed with few changes to the current program.

1.0 PROJECT DESCRIPTION

The Garlic Company (TGC) washes, processes, and packages predominately fresh garlic within a 13-acre processing facility near Shafter, California, which currently includes office buildings, a processing facility, cold storage unit, Stormwater Pond, and a Main Pond (Facility). Processing of the garlic provides a method for the inspection and sorting of blemished or inferior (cull) garlic. It also processes peeled clove garlic into garlic puree, garlic juice, and pickled garlic. Processing other of other vegetables occur on an as-needed basis. The Facility is operational year round and groundwater from a nearby wells supplies water for vegetable processing and evaporative cooling. After use, the process wastewater will be beneficially reused as an irrigation and nutrient source on nearby cropland.

As required for the proposed discharge to land, TGC is submitting a Report of Waste Discharge consisting of State Form 200 and this Technical Report to reflect the change in discharge quantity, quality, and location as an amendment to the current Waste Discharge Requirements (WDR R5-2013-0150). This Technical Report thoroughly characterizes the wash water discharge and potential effects on groundwater quality to provide a complete permit amendment application in support of the State Form 200.

1.1 Introduction

The Garlic Company (TGC) is submitting this Amended Report of Waste Discharge (ROWD) consisting of State Form 200 and a Technical Report that thoroughly characterizes the process wastewater discharge to amend their Current Waste Discharge Requirements (permit) for discharge to land for treatment. The permit is issued and administered by the California Regional Water Quality Control Board – Central Valley Region (Regional Board).

1.2 Facility Location

TGC is located 11 miles northwest of Bakersfield, 8 miles east of downtown Shafter, California on the western side of U.S. Highway 99, south and east of Zerker Road. It is in the southwest quarter of the northeast quarter of the northwest quarter of Section 23, Township 28 south, and Range 6 east of the Mt. Diablo Meridian (Figure 1). Land surrounding TGC consists of agricultural land in all directions interrupted only by public roadways and railroad tracks. Immediately to the east, TGC borders the Union Pacific Railroad right-of-way and U.S. Highway 99. No residential properties are currently located within ½ mile of TGC's facility (Facility).

1.3 Facility Description

TGC washes, processes, and packages fresh garlic. They produce fresh-packed whole bulb and peeled clove garlic year-round. They also process peeled clove garlic into garlic puree, garlic juice, and pickled garlic from June through December. TGC may process peppers and ginger anytime during the year, when available and demand exists but typically between May and July. The Facility consists of office buildings, a processing facility, cold storage, Stormwater Pond, and a Main Pond on approximately 13 acres. Process wastewater produced by the Facility is discharged to the Main pond prior to discharge to the Current Site (Figure 2). TGC is in the advanced stages of upgrading the Facility's processing operations and improve process wastewater management and land treatment operations. The major changes affecting the process wastewater will be the elimination of the Main Pond, enhanced filtration, and improved cull material removal. The Main Pond will be abandoned and replaced by a 1,000,000-gallon lined balancing reservoir located at the southern end of the Current

Site. A 50,000-gallon mixing tank will be constructed at the 99-acre Site, which is located approximately one mile south of the Facility (Figure 3). The mixing tank will receive process wastewater from the reservoir and will be used primarily for equalization with some storage capacity to provide a stable water supply for irrigation. In addition, enhanced filtration has been added to improve process wastewater quality and cull material removal will be improved to remove a majority of the solids before the process wastewater enters the reservoir. The Current Site will be utilized for process wastewater irrigation on an as-needed basis.

1.4 Processing Schedule

The processing season runs from June through December during which time, TGC operates five to six days per week, twelve hours per day to produce garlic puree, fresh packed whole bulb garlic, and peeled clove garlic. In the off-season (January through June), TGC continues to operate five days per week, but the shifts are reduced to eight to ten hours per day. The processing of peppers and ginger occurs for a period of six weeks per year, typically between May and July. In 2017, the Facility operated for 252 days, averaging 21 days of processing per month.

1.5 Non-Contact and Process Wastewater Sources

The Facility consists of three non-contact and seven-contact process wastewater streams that contribute to the overall Facility's process wastewater sources. Non-contact process wastewater streams include:

- **Cold Storage -** used throughout the season to preserve raw garlic, cool processed products and store products prior to shipping. It is also used intermittently during the processing season to cool processed garlic before shipping. Process wastewater generated by this equipment is condensation from the air, as a result of the refrigeration process.
- **Boiler Blowdown -** the concentrated water remaining after water is converted to steam and used within the Facility. Small amounts of chemicals are added to prevent scaling and maintain proper boiler operation.
- **Boiler Regenerate -** brine from the regeneration of the water softener attached to the boiler.

The seven contact process wastewater streams include:

- Whole Bulb Packing
- Seed Cracking
- Peel Plant Cracking
- Peel Plant Packing
- Diced / Puree Plant
- Pepper Process
- Cold Storage

An on-site septic system is located on the western side of the property. All domestic wastewater is managed separately from the process wastewater and delivered to the on-site septic system. A septic tank service pumps the septage from the tank on a semi-annual basis.

1.6 Current Process Wastewater Flow

Source water currently utilized for processing comes from two of the three on-site wells. The primary wells (Well 2 and Well 3) are located on the southern end of the property (Figure 2). The third well (Well 1) is available as a backup to the primary wells. The source water is piped to a 240,000-gallon water tank (water tank) located on the southeast side of the property. Valving, which includes a backflow prevention device, at the water tank allows source water to be delivered to the Current Site for supplemental fresh water irrigation or for blending of fresh water with process wastewater. When needed, a 15-horsepower booster pump is available to inject fresh water into the pressurized process wastewater discharged to the irrigation system. Water in the tank is pumped into two holding tanks located on the east side of the property near the backup source well (Well 1). From the holding tanks, source water is pumped to one of the seven process lines, which are illustrated on Figure 4. After the source water has been utilized within the seven processing lines, the process wastewater will be collected into a 2,700-gallon process wastewater pump pit before being pumped through a primary filter. After the primary filter, process wastewater can be sent either to the mud separation pit or a trash press. Process wastewater sent to the mud separation pit is either sent to the Main Pond for irrigation or to a secondary screen. Process wastewater exiting the secondary filtration system will be utilized in the Cyclone Cleaning System. Process wastewater pumped to the trash press has the solids dewatered, which are then loaded onto a cull truck and shipped off for dairy feed. Water from the trash press, cull fill trucks, and Cyclone Cleaning System are collected in a pit where it is sent back through the primary filter for reuse.

1.7 Future Process Wastewater Flow

In the near future, source water from an existing well (Well 4), which is located at the 99-acre Site, will be connected to the source water system network at the water tank (Figure 5). Water flow through the Facility will remain consistent with current operations. Process wastewater that previously would have been sent to the Main Pond for irrigation will be redirected to a new 1,000,000 gallon lined balancing reservoir (reservoir). From the reservoir, process wastewater can be discharged to the Current Site and/or be pumped to the new 25,000-gallon mixing tank located at the 99-acre Site. Once in the mixing tank, process wastewater can either be directly irrigated on the 99-acre Site or be mixed with source water from Well 4 prior to irrigation.

1.8 Reservoir Design

The new reservoir will be located in the southwest of the existing Facility boundaries (Figure 2). The reservoir will be approximately 170 feet by 115 feet and lined with a 60-millimeter-thick polypropylene liner. The Reservoir Design and Leak Detection Plan are provided in Appendices A and B, respectively. Once the new reservoir is operational, the Main Pond will be abandoned and subsequently backfilled to allow for future Facility expansion. An abandonment plan, describing the proposed sampling and testing procedures that will be utilized to assess potential impacts associated with the Main Pond usage will be submitted to the Regional Board for approval.

2.0 SOURCE AND PROCESS WASTEWATER CHARACTERISTICS

Two different types and characteristics of water are present at the Facility. Source water wells are used as the source water for the processing of the various garlic products. The second type of water is process wastewater generated by the processing of the garlic and pepper products. The following is a description of the current and projected quality and quantity of each type of water at the Facility.

Water data from 2016 (Current) was utilized in this reports as typical source water and process wastewater quantities and qualities. The projected source water quality was estimated by using the anticipated flow-weighted average constituent concentrations from Wells 2, 3, and 4. The projected process wastewater quality was calculated by estimating the changes to the projected source water quality resulting from processing operations.

2.1 Current Source Water Quality

The Facility has the ability to obtain source water for processing garlic from the three water supply wells (Wells 1, 2, and 3) located at the Facility. Currently, only Wells 2 and 3 are utilized. This source water is defined as the source water for compliance with the Tulare Lake Basin Plan water quality objectives for salinity. Samples of source water are collected quarterly and tested for the following parameters: total dissolved solids (TDS), electrical conductivity (EC), nitrate-nitrogen, total hardness as calcium carbonate, total alkalinity, carbonate, bicarbonate, calcium, magnesium, sodium, potassium, chloride, sulfate, and boron. The EC and nitrate-nitrogen quality of the source water was determined based on the analyses of twelve water samples collected during 2016. Additional water quality parameters were tested from a single annual sample, as required, in September 2016. A summary of the 2016 source water analyze results are summarized in Table 1. Key parameters of the Current flow-weighted average (65% Well 2 and 35% Well 3) source water quality are summarized below:

- pH = 7.2 standard units (s.u.)
- EC = 2,357 micromhos per centimeter (µmhos/cm)
- Nitrate-nitrogen = 4.5 milligrams per liter (mg/L)
- TDS = 1,649 mg/L
- Calcium = 184 mg/L
- Chloride = 359 mg/L
- Sodium = 352 mg/L
- Total Alkalinity = 14 mg/L

These results show the Current source water is not suited to unrestricted cropping for irrigated agriculture or municipal water supply beneficial uses because of salinity.

2.2 Projected Source Water Quality

Facility upgrades include the addition of a source water supply, Well 4, which produces water of better quality, with respect to salinity, sodium, sulfate, and chloride, as compared to Wells 2 and 3. Laboratory analysis results from samples collected from Well 4 in January 2014, April 2014, January 2015, April 2015, and August 2016 are summarized in Table 1. Well 4 is projected to be the main source of water for the Facility and for supplemental irrigation at the 99-acre Site. The projected water usage from the wells are, 98% from Well 4 and 1% from Wells 2 and 3 each. The projected source water quality was calculated utilizing the anticipated flow-weighted average of Wells 2, 3, and 4. Key parameters of the projected flow-weighted average source water quality from the wells are summarized below:

- pH = 7.8 s.u.

- EC = 1,492 µmhos/cm
- Nitrate-nitrogen = 5.0 mg/L
- TDS = 983 mg/L
- Calcium = 117 mg/L
- Chloride = 168 mg/L
- Sodium = 211 mg/L
- Total Alkalinity = 53 mg/L

2.3 Current Source Water Quantity

Source water flows on a monthly and average daily basis are summarized in Table 2. Flow rates are measured using a flow meter on the source water well on a daily (Monday through Friday) basis. Flow rates vary based on production demands and the day of the week. When production operations occur on Saturday and Sunday, source water is measured on the next day of business. Typically, weekend operations are limited to cleaning the processing equipment. The result is a daily flow meter reading for the business day following weekends that shows an artificially higher than average daily flow.

During 2016, source water flow on a total monthly basis ranged from 1.552 to 2.958 million gallons (MG), and averaged approximately 2.190 MG per month. The daily maximum flow for the year was 0.099 MG during November, and the average daily flow rate (total monthly flow volume ÷ number of calendar days per month) ranged from a low of 0.052 to 0.099 MG per day (MGD) for an overall average daily flow rate of approximately 0.0722 MGD (Table 2).

2.4 Projected Source Water Quantity

To accommodate for future growth at the Facility, an increase to 173,913 gallons per day (4 MG per month), was used as the projected maximum source water usage. The total projected annual usage is approximately 46.96 MG.

2.5 Current Process Wastewater Quality

Table 3a summarizes the 2016 monthly and annual average concentration of constituents contained within the process wastewater prior to discharge to the Current Site. The process wastewater quality represents the concentration of constituents present in the process wastewater after it has passed through the Main Pond. The data contained in Table 3 represents process wastewater quality applied to the land application system in 2016. Key parameters of the current process wastewater quality from the Facility are summarized below:

- pH = 7.1 s.u.
- EC = 2,952 µmhos/cm
- Nitrate = <1.7 mg/L
- TDS = 1,983 mg/L
- Biochemical Oxygen Demand (BOD)= 351 mg/L

- Calcium = 190 mg/L
- Chloride = 420 mg/L
- Sodium = 520 mg/L

2.6 Projected Process Wastewater Quality

Using the higher quality water from Well 4 as the primary source water, the projected process wastewater quality will improve as compared to the current quality. Table 3b shows the projected process wastewater quality based on the source water flow weighted average and the average constituent additions contributed from Facility operations. Key parameters of the projected process wastewater quality are summarized below:

- pH = 7.6 s.u.
- EC = 2,087 µmhos/cm
- Nitrate = 1.0 mg/L
- TDS = 1,318 mg/L
- BOD_5 = 351 mg/L
- Calcium = 123 mg/L
- Chloride = 228 mg/L
- Sodium = 379 mg/L

2.7 Current Process Wastewater Quantity

Process wastewater flows are summarized on a monthly and daily basis in Table 4. Flow rates are measured daily (Monday through Friday) using a flow meter on the pipeline that delivers process wastewater to the Current Site from the Main Pond. Flow rates, on any given day, can vary based on production levels, Main Pond level, and the day of the week. Processing operations are not conducted on Saturday and Sunday; therefore, the land application of process wastewater often operates on a five-day and not seven-day per week schedule.

During 2016, process wastewater irrigation flows ranged from 1.321 to 3.691 MG per month and averaged approximately 2.656 MG per month. The daily maximum flow ranged from 0.157 to 0.607 MGD. The average daily flow ranged from 0.0574 to 0.1605 MGD for an overall average daily flow of approximately 0.1182 MGD (Table 4). These daily average flows are based on the actual number of days that process wastewater is pumped from the Main Pond to the Current Site and not the number of calendar days per month. Therefore, these flow values represent operational flow rates on a daily and monthly basis, and represent realistic process wastewater production flow rates to land application areas.

2.8 Projected Process Wastewater Quantity

To accommodate the proposed Facility upgrades and future expansion, a maximum flow of 46.96 MG per year (MG/yr) was anticipated. The proposed maximum flow of 46.96 MG is equivalent to 270 operating days at 173,913 gallons per day (gpd) (Table 5). This maximum yearly flow does not take into account stormwater addition. The hydraulic capacity of the land application area, which takes into account process wastewater and stormwater loads, is described in subsequent sections of this report.

2.9 Differences Between Source Water and Process Wastewater Flow

In the current flow data, there is approximately a 5.6 MG per year difference between source water pumped and process wastewater applied to the Current Site. The differences are attributed to pond evaporation of approximately 0.30 MG per year, dust control estimated to be 1.0 MG per year, and cold storage/evaporative cooling use estimated at 5.5 MG per year. There is also pre-process use such as bin washing and plant clean up estimated at 1.0 MG per year, which evaporates and an estimated 5.2 MG per year used to sustain the moisture in the culled products to prevent wind dispersion on the Facility grounds and during transportation to the dairy as feed. These outputs will continue, following the Facility expansion.

2.10 Stormwater

Stormwater quantity is not actually metered at a specific discharge point in the Facility. TGC currently utilizes their Main Pond and a smaller stormwater pond to contain runoff from the Facility buildings and parking areas. Since there is no stormwater discharge from the Facility and the stormwater is allowed to infiltrate into the ground or is combined with the process wastewater, there are no separate stormwater quality data. The stormwater will continue to be generated from the gravel parking area and processing plant rooftops. The existing Stormwater Pond has an approximate capacity of 0.467 MG (Figure 2). Currently, the excess stormwater is pumped to the Main Pond, where it is mixed process wastewater prior to irrigation. In the future, the reservoir will receive the stormwater from the Facility via the Stormwater Pond. Stormwater received in the reservoir will be mixed with process wastewater prior to irrigation.

An additional estimated 1.0 MG of stormwater storage is available for emergency discharge to the retired percolation ponds located along the southeast edge of the Facility for infiltration. Since these ponds are retired, they will only be used for as a backup stormwater flow, when runoff exceeds the capacity of existing Stormwater Pond.

The 99-acre Site is bordered by the Friant-Kern and Calloway Canals whose berms are raised to prevent surface runoff from entering the canal. The Current Site and the 99-acre Site are graded and bermed to retain stormwater on-site.

2.11 Chemical Usage

Hazardous wastes are not generated or used by the Facility. Small quantities of conditioning chemicals are added to the boiler to prevent scaling and maintain proper boiler operation. Sodium hydroxide is added to the process wastewater at the Main Pond to adjust the pH to approximately 8. Laboratory chemicals and cooking oil byproducts that are utilized as part of standard operating procedures are disposed of off-site. Cooking oil byproducts are collected in two oil and grease traps, a gutter system, and a three-tank separation system. A list of chemicals added to process wastewater include (material safety data sheets are included in Appendix C):

- Quat DS: quaternary sanitizer
- Sodium Hydroxide 50% Gluconate: used as a cleaner

- Foaming Red Acid: acid cleaner
- Foaming Acid: acid cleaner
- General Cleaner: quaternary sanitizer
- NC Foam Cleaner: Inorganic solution used for cleaning
- Conclean: acid cleaner

3.0 LAND APPLICATION SITE CHARACTERISTICS

The Facility and the Current Site are surrounded by agriculture, specifically grape vineyards. Commercial/industrial and agricultural properties are located near the property, but no residential properties are located within one half mile of the Facility and the Current Site (Figure 1 and 2).

3.1 Available Acreage

The 99-acre Site is approximately one mile to the south - southwest of the Facility. The 99-acre Site parcel area totals 98.95 acres, which is bisected by the Friant-Kern canal on its northern half, and is bordered by the Callaway canal on its southwestern edge. The 99-acre Site is surrounded by agriculture on all sides, and there are no residences within one half mile (Figure 1 and 3). The net acreage available for land application is calculated to be 110.0 acres with 14.8 acres at the Current Site, 15.2 acres located on the north side of the Friant-Kern Canal (North Field) and 80 acres located on the south side of the Friant Kern Canal (South Field, Table 6).

3.1.1 High Speed Rail Considerations

The current projected path of the High Speed Rail (HSR) runs through the 99-acre Site. If the construction of the HSR occurs according to current plans, it is estimated that the HSR will remove approximately 12.0 acres from the South Field’s irrigation availability (Appendix D). The available acreage for land application would be reduced to approximately 98 acres. Subsequent sections in this report will show that there will be adequate acreage to effectively manage the process wastewater and stormwater even if the HSR construction, as currently planned, occurs through the 99-acre Site.

3.2 Climate

The Facility is located in Kern County, California with a surface elevation of approximately 405 feet above mean sea level, based on the USGS topographical maps (Figure 1). Climate is described as semi-arid with cool somewhat moist winters and hot, dry summers. The average maximum air temperature in July and August is 95 and 94 degrees Fahrenheit (^{o}F), respectively, cooling to average maximums of 57^{o}F in December and January, respectively (Table 7).

Soil temperatures affect plant growth, nutrient uptake, and biological activity. Soil temperatures, measured at four-inch depth, range from a high of 78 ^{o}F in July and August to a low of 50 ^{o}F in January (CIMIS, 2018).

Annual precipitation in this region can fluctuate greatly from year to year. The approximate 100-year annual precipitation occurred in 1998 and totaled 13.6 inches of precipitation. The 30-year average annual precipitation is 6.3 inches (CIMIS, 2018,).

3.3 Topography and Surface Drainage

Surface topography within the local vicinity consists of basin and stream flood plains formed in mixed alluvium with slopes of 0 to 5 percent. The topography is flat with a general slope of less than 2 percent. Regionally, the topography slopes generally to the south-southwest toward the Friant-Kern Canal. Surface drainage from the paved and gravel surfaces are designed to flow to the southeast corner of the property and captured by a Stormwater Pond (Figure 2).

Surface drainage from the 99-acre Site based on topography is to the southwest. A raised dirt road runs along the south, west, and north sides of the site effectively blocking drainage from the field (Figure 3). If in the unlikely event surface water were to flow beyond the elevated roadbed, it would flow to the southwest toward the Calloway Canal. The canal is constructed such that the sides of the canal are raised above the surrounding ground surface level to prevent the interception of surface water runoff.

3.4 Groundwater

A Department of Water Resources (DWR) search for wells within the township, range, and section, which the Facility lays, returned only one result. The well, based on DWR longitude and latitude coordinates is located directly west of the Facility approximately a quarter of a mile. The DWR records ranged from 1969 to 1975. The depth to groundwater ranges from a high of 147.0 feet below ground surface (ft bgs) in 1973, and a low of 219.8 ft bgs in 1971.

The DWR search for groundwater levels at the 99-acre Site yielded two records from the DWR database. One record was for the well onsite, and the only depth to groundwater was a single point taken in 1971, which was 210.3 ft bgs. The second record pulled from the DWR database, was for a well directly west, approximately one half mile from the 99-acre Site. There were only three data points for this well, two showed groundwater depths of 236.0 ft bgs in 1974, and the third was 250 ft bgs taken in 1975 (Appendix E).

Groundwater quality surrounding the Facility and 99-acre Site was evaluated based on data obtained from the Kern County Water Agency (KCWA). The KCWA retains a database of groundwater quality provided by well owners on a voluntary basis. Water quality data provided by the KCWA is contained in Appendix E. The KCWA database contained water quality from approximately 36 wells with records from 1936 through 1988.

Regional water quality based on the information obtained from the KCWA consists of the following characteristics (Appendix F):

- pH 6.8 to 9.0, average 8.0;
- EC 170 to 5,170 µmhos/cm, average 1,558 µmhos/cm;
- TDS 172 to 3,136 mg/L, average 919 mg/L; and
- Nitrate-nitrogen 0.2 to 507 mg/L, average 47 mg/L.

3.5 Soil Characterization

The purpose of this section is to summarize the characteristics of the soils to provide an adequate summary of the information important to managing the process wastewater land treatment. This section will, therefore, briefly describe the soils found at the 99-acre Site and identify the properties important to management of the wash water. The information presented in this section is based upon a review of data published in the Web Soil Survey for Kern County, California, Northwestern Part (NRCS, 2018a; Appendix G). The Official Series Descriptions (OSD's) are included in Appendix H.

3.5.1 Soil Classification

The Natural Resource Conservation Service mapping of the 99-acre Site soils as Wasco sandy loam on the northeast half, and Driver coarse sandy loam on the southwest half (Table 8, Appendix G). The soils at the Current Site are mapped as Wasco sandy loam.

The Wasco soil consists of a coarse-loamy, very deep, well-drained soil formed in mixed alluvium from igneous and/or sedimentary rock sources. The Driver soil consists of fine-loamy, very deep, well-drained soil formed in mixed alluvium, derived from igneous and/or sedimentary rock sources (NRCS, 2018a). A summary description of the Driver and Wasco soil series is contained in Appendix H. All soils at the 99-acre Site and the Current Site are well suited for process wastewater land treatment with proper crop and irrigation management.

3.5.2 Soil Chemical Properties

Soil samples were collected by CES in 2003 for detailed chemical analysis across two transects at the Current Site. The transects were angled from the southwest to the northeast, and from the southeast to the northwest. Transects were split into four samples, one sample for each quadrant of the Current Site. Each quadrant was sampled to make a composite sample for submittal to the laboratory for analysis. Samples were collected at 0 to 12 inches, 12 to 24 inches, 24 to 36 inches, and 36 to 60 inches. The 2003 soil sampling was a more complete set of analysis than what is conducted for required monitoring so is relevant for illustrating soil characteristics. The 2003 set of four samples has been condensed into an average of the sites for this report (Table 9). Laboratory reports are contained in Appendix I.

The analysis of constituents included: nitrate-nitrogen, ammonium-nitrogen, available phosphorus, exchangeable calcium, magnesium, sodium, potassium, hydrogen, cation exchange capacity, chloride, sulfate-sulfur, boron, copper, iron, manganese, zinc, saturation-paste extract EC, sodium adsorption ratio, calcium, sodium, and magnesium.

Nitrate-nitrogen was highest at the 0-12 inch depths (surface depth) in all transects and the average ranges from 30.5 parts per million (ppm) at surface depth, reducing to 3.0 ppm, at the average of the 60 inch depths. The results suggest both treatment and plant uptake of nitrate-nitrogen is occurring at the surface depth. Ammonium-nitrogen was minimally variable with depth, ranging from 11 to 10 ppm. Available phosphorus was highest in the surface depth with an average of 29 ppm, decreasing with depth to an average of 12 ppm at the 60 inch depth.

Soil salinity is typically characterized by measurement of sodium adsorption ratio and EC. However, soil salinity can be managed by the use of appropriate seasonal leaching and sodium can be managed with soil amendments such as gypsum. The average sodium adsorption ratio at the Current Site was low at all depths with the maximum value of 0.9 at the surface depth to a high of 1.3 at the 60 inch depth.

There was additional data collected in 2016 according to the Monitoring and Reporting Program (MRP) No. 5-01-802 issued in June 2008. The results in 2016 include pH, ECe, sodium adsorption ratio, nitrate-nitrogen total Kjeldahl nitrogen, and total nitrogen. The pH values were higher than the

2003 study, with a range of 7.7 to 8.9. The ECe ranged from 3.90 to 1.87 millimhos per centimeter (mmhos/cm) from the 0-6 inch depth to the 48-60 inch depth, respectively. The nitrate-nitrogen decreased with depth from 29.3 mg/L in the 0-6 inch depth to 9.2 mg/L in the 48-60 inches depth.

In summary, the Current Site soil chemistry was within expected values for good agricultural production. Analytical results collected thirteen years apart and at different times of the year showed similar nitrogen and salinity profiles. The distribution of nutrients and salinity parameters through the profile suggests the soil has effectively retained the nutrients applied under managed irrigation for treatment and crop uptake. Similar treatment would be expected from the soils at the 99-acre Site.

4.0 WASTE MANAGEMENT PLAN

This section will describe and demonstrate the management of the land application areas to reuse the process wastewater from the Facility. The Waste Management Plan includes a description of the projected amount of wash water that will be applied to the proposed land application areas (Figures 2 and 3) with a steady daily flow rate while maintaining crop viability, controlling soil salinity, and applying wash water and nutrients at agronomic rates.

4.1 Process Wastewater Application

Process wastewater is applied to the Current Site by a big gun sprinkler irrigation system (Figure 2). Sprinklers positioned on riser pipes are spaced in a 115-foot-by-115-foot square grid pattern. The distribution systems are managed to produce as uniform a distribution of water as possible across the Current Site. Management activities include:

- Rotating irrigation events between the application zones to allow rest for treatment and soil re-aeration.
- Regular evaluation of irrigation events to check for sprinkler nozzle plugging.
- Checking system pressure for optimum sprinkler pattern and minimization of nozzle plugging.

The frequency and rate of water application are conducted to meet evapotranspiration demands. Irrigation from November through February that exceeds crop evapotranspiration provides water to leach salts to maintain a productive soil profile. An equivalent irrigation system will be installed at the 99-acre Site. The primary irrigation water supply to the 99-acre Site will be process wastewater discharged from the Facility, via the reservoir and mixing tank. Well 4 will be the primary water supply to the Facility and will also be utilized for supplemental irrigation. It is anticipated that Well 4 has sufficient capacity to supply the source water needs of the Facility and the supplemental irrigation demand of the crops. The groundwater quality at Well 4 is anticipated to be better than the current water supply to the Facility with an EC of approximately 1,475 μmhos/cm and a nitrate-nitrogen concentration of 5.0 mg/L.

The 99-acre Site will have an irrigation system installed to irrigate all available acres, and will have the ability to accept the process wastewater from the Facility. The actual acreage available consists of 15.2 acres located on the north side of the Friant-Kern Canal and 80 acres located on the south side of the Friant Kern Canal for a net total of 95.2 acres (Figure 3). It is anticipated that the process wastewater will primarily be irrigated on approximately 65 of the 80 acres located on the south side of the Friant Kern Canal. The current flow of 31.87 MG per year and future increases in flow will be distributed as uniformly as possible for effective treatment and crop production. The irrigation system will be designed so the management of the process wastewater will be through sprinkler irrigation to allow utilization in an agronomic manner. The exact design has not been finalized at this time but will be prepared by a qualified professional.

4.2 Effluent Constituent Mass Loading

This section will describe the capabilities of the 99-acre Site to accept the process wastewater discharge from the Facility. A description of the proposed maximum process wastewater flow will be given. It is unlikely TGC will generate the projected maximum flow in the foreseeable future, but some expansion of the process wastewater discharge in the future is likely. The purpose of this section is to allow flow expansion without the resubmission of an Amended Report of Waste Discharge when the capability to handle an increase in process wastewater discharge exists. Two separate acreage scenarios were utilized to show land application area capacity with respect to mass loading. Using current and projected flow rates, 35 and 62 acres, respectively were utilized to demonstrate capacity.

The projected process wastewater water quality concentrations (Table 3b), the current flow rate of 31.87 MG (Table 4) and the projected maximum flow rate of 46.96 MG (Table 5) were used to estimate the mass load of the following constituents on the 99-acre Site: nitrogen, BOD, and fixed dissolved solids (FDS). The 99-acre Site has been computed to be capable of managing the proposed maximum annual process wastewater flow of 46.96 MG based on projected process wastewater quality (Table 3b).

4.2.1 Nitrogen Load

Total gross nitrogen (total Kjeldahl nitrogen (TKN) + nitrate-nitrogen) mass loading is estimated at 9,724 pounds per year (lb/yr) with an average of 278 pounds per acre per year (lb/ac/yr) at the current flow rate of 31.87 MG per year and 35 acres. Gross nitrogen loading, adjusted to account for 30 percent gaseous nitrogen losses, including volatilization of ammonia and denitrification (Brown and Caldwell and Kennedy/Jenks, 2007), produces an adjusted net nitrogen mass loading of 194 lb/ac/yr (Table 10).

Table 10 also shows the potential nitrogen loading if 62 acres were utilized for the projected maximum annual flow rate of 46.96 MG. Total gross nitrogen (TKN+ nitrate-nitrogen) mass loading is estimated at 14,326 lb/yr for an average of 231 lb/ac/yr. Gross nitrogen loading was adjusted to account for gaseous nitrogen losses, including volatilization of ammonia and denitrification of 30 percent produces an adjusted net nitrogen mass loading of 162 lb/ac/yr.

Given the projected nitrogen loads, the application of commercial fertilizers may be required to maintain the productivity of most potential crop rotations containing annual crops, such as winter wheat followed by sudangrass. Additionally, the application of phosphorus would need to be evaluated but potassium fertilizer will not likely be necessary. The application of fertilizer will be determined by soil analysis data or crop quality.

4.2.2 Nitrogen Balance

A nitrogen balance provides an example of how the process wastewater nitrogen load will be managed. Nitrogen can be removed from a site by gaseous losses where volatilization and denitrification of nitrogen constituents are lost to the atmosphere, or through crop removal (Brown and Caldwell and

Kennedy/Jenks, 2007). Gaseous losses of nitrogen are regulated by many factors, but primarily by environmental conditions such as temperature and soil moisture. Crop selection and management primarily regulate the removal of nitrogen by a crop. The nitrogen balance calculated for the 99-acre Site has been evaluated for using the following criteria:

- design process wastewater flow
- acreage used
- projected nitrogen concentration of the process wastewater
- nitrogen concentration of the supplemental irrigation
- projected supplemental irrigation quantity
- estimating gaseous losses of nitrogen constituents
- estimating crop nitrogen uptake for two scenarios; an alfalfa crop and a wheat and sudangrass forage crop

At the 99-acre Site, the estimated total nitrogen load rate was calculated based on process wastewater and supplemental irrigation flow and the projected process wastewater and supplemental irrigation water quality. The total gross nitrogen loads for the current and projected maximum flows for wheat - sudangrass were estimated at 336 and 287 lb/ac/yr, respectively (Table 11). The estimated gaseous losses of nitrogen are 101 lb/ac/yr for the current flow rate and 86 lb/ac/yr for the projected maximum flow. Nitrogen losses due to crop uptake, for both scenarios, are estimated at 270 lb/ac/yr for the wheat - sudangrass and 520 lb/ac/yr for alfalfa. Crop nitrogen uptake was estimated assuming conservatively low 70 pounds nitrogen per crop per acre for a wheat crop, 270 pounds nitrogen per crop per acre for sudangrass hay, and 520 pounds nitrogen per crop per acre for alfalfa hay (NRCS, 2018b). At the current flow rates of 31.87 MG the net nitrogen balance for the wheat - sudangrass is -35 lb/ac/yr (Table 11) indicating that the applied process wastewater and supplemental irrigation nitrogen will be fully consumed and will not be sufficient to provide for crop needs. At the proposed maximum flow rate of 46.96 MG, the estimated nitrogen balance for the wheat - sudangrass of -69 lb/ac/yr indicates that the applied nitrogen will also be fully consumed.

An alfalfa crop under the same flows and water quality conditions has an even greater nitrogen consumption rate and a larger negative balance than a wheat/sudangrass rotation. At the current flow of 31.87 MG, the nitrogen balance is estimated to be -285 lb/ac. At the projected maximum flow rate of 46.96 MG per year, the nitrogen balance is estimated to be -319 lb/ac. Alfalfa is a nitrogen-fixing crop, and as such will need little to no nitrogen to fulfill the projected nitrogen deficit.

4.2.3 Biochemical Oxygen Demand Load

The BOD loading has typically been minimal at the Current Site of 14.8 acres, and is expected to remain minimal at the 99-acre Site under the current annual flow of 31.87 MG and the projected maximum flow of 46.96 MG (Table 12). The projected concentration of the process wastewater is estimated to be 351 mg/L (Table 3b). Using the projected BOD concentration, the annual BOD loading to the 99-acre Site would be 93,257 pounds (lb) at the current annual flow of 31.87 MG and 137,394 lb at the maximum annual flow of 46.96 MG. The average daily BOD load would be 7.3 pounds per acre per day for the current flow rate using 35 acres and 6.1 pounds per acre per day at the future maximum flow rate using 62 acres (Tables 10 and 12). This low BOD loading rate, in addition to the dose and rest application using sprinkler irrigation, and well-drained soils reduce nearly all potential risks associated with organic loadings.

4.2.4 Fixed Dissolved Solids Load

Fixed dissolved solids represent the mineral salts fraction of the process wastewater. The 2016 load on the Current Site was approximately 27,294 pounds per acre (lb/ac). At the 99-acre Site, the additional acreage reduces that load to approximately 13,101 lb/ac/yr at the current flow rate using 35 acres (Table 10). At the proposed maximum flow rate of 46.96 MG and use of 62 acres, the annual FDS load would be 10,896 lb/ac.

4.3 Water Balance Considerations

Design parameters, including crop, crop evapotranspiration rate, precipitation rate, water availability, and soil water holding capacity were used to calculate the water balance. Precipitation, evapotranspiration, and evaporation values utilized in the water balance calculation are summarized in Tables 13a, 13b, 14a, and 14b. The following sections briefly discuss the water balances using each of these parameters.

4.3.1 Precipitation

Precipitation influences percolate losses by adding to the quantity of water already in the soil. For calculation purposes, the approximate 100-year return and 30-year average annual precipitations were used (Table 7). The 100-year return provides a margin of safety for designing water management to reliably achieve groundwater quality protection goals. In determining the rainfall return period for the 100-year return period the precipitation records for the Shafter and Famoso-USDA California Irrigation Management Information Systems (CIMIS) stations for the years 1987 through 2016 were reviewed. Without 100 years of precipitation information, best professional judgment was used to approximate the 100-year return high annual precipitation year. At the Arvin weather station, about 30 miles southeast of Shafter, there is more than 100 years of precipitation weather data and the 1998 year was the greatest rainfall year at that station. Therefore, the approximate annual precipitation with a 100-year return frequency is the 13.6 inches of rainfall measured in 1998. The 30-year average is 6.3 inches.

4.3.2 Evapotranspiration

Monthly evapotranspiration data were obtained from actual monthly values derived from the Shafter - USDA CIMIS station located at the USDA Research Facility in Shafter, California. When data was not available for the Shafter station, the Famoso CIMIS station data was used. The estimated evapotranspiration for a wheat/sudangrass rotation crop is approximately 56.7 inches per year. These data are summarized in Table 7 and utilized in the water balances (CIMIS, 2018).

Monthly pan evaporation data were obtained from actual monthly values derived from California Department of Water Resources (California Department of Water Resources San Joaquin District, March 1993). The estimated pan evaporation is approximately 64 inches per year. This data are summarized in Table 7.

4.3.3 Land Application Site Water Balance

The 99-acre Site water balances are based on irrigation to control deep percolation of water below the root zone while maintaining the potential for excellent crop yields and efficient nutrient removal from the soil profile (Tables 13a, 13b, 14a and 14b). Review of the water balances indicates the potential for percolate losses to occur during winter high precipitation months, when using the 100-year return and 30-year average annual precipitation years. The leaching requirement was calculated to maintain soil ECe near 3.0 mmhos/cm, slightly greater than the process wastewater EC. A leaching fraction exceeding the leaching requirement will not likely result in significant nitrate-nitrogen leaching because of the continuous cropping at the land application areas and crop and soil nitrogen capacity that will keep nitrate-nitrogen concentrations low. To confirm this assumption, a review of the soil nitrate-nitrogen concentrations show the greatest nitrate concentration in the surface 0 to 12 inches, decreasing significantly with depth. Therefore, in the event of a 100-year return annual precipitation year the risk to leaching significant nitrate-nitrogen through the root zone is low.

Based on the 2016 flow and 100-year return annual precipitation, the process wastewater application ranges from 1.6 to 3.0 MG per month with an additional 0.0 to 1.6 MG of stormwater per month (Table 13a). The combined total discharge to land is 30.6 MG of process wastewater and stormwater in a 100-year precipitation year. The water balance also considers an estimate of the fresh irrigation water needed to fully support the crop to meet projected evapotranspiration demands. Accounting for irrigation efficiencies of 85% from September through April and 75% from May through August, the 99-acre Site will receive a net process wastewater load of 22.6 inches (21.4 MG) and an approximate total combined net irrigation plus precipitation load of 61.4 inches in a 100-year return annual precipitation year. The leaching fraction of 8.8% was less that the leaching requirement of 10.9% through supplemental irrigation management. In an average precipitation year, additional supplemental irrigation will be required to project a leaching fraction of 6.2 % to the 12.5% leaching requirement (Table 13b).

In the proposed maximum flow scenario, the process wastewater application could range from 3.7 to 4.0 MG per month. An additional 0.0 to 1.6 MG of stormwater per month captured from the Facility would also be applied with the process wastewater. Accounting for the same irrigation efficiencies, the resulting net process wastewater application rate would be 24.9 inches and the total combined irrigation plus precipitation rate would be 61.6 inches (Table 14a). The projected leaching fraction is 11.4% compared to the leaching requirement of 11.3%. In an average precipitation year, the leaching fraction through fresh water irrigation management would be 6.5% compared to a leaching requirement of 12.8% (Table 14b).

Water balances were also prepared utilizing fresh water only to determine the minimal effect to groundwater from irrigation at the 99-acre Site. Irrigation rates were set to avoid a soil water deficit greater than 15% but not enough to meet the leaching requirement for salinity control (Tables 15a and 15b). This would not be sustainable practice due to salinity buildup in the soil profile but could be used on a short-term basis. The projected leaching fraction during a year with 100-year precipitation would be 4.9% compared to a leaching requirement of 11.4%. During a year with average precipitation, the leaching fraction would be 2.0% compared to a leaching requirement of 12.9%.

A summary of the water balances is provided in Table 16. The water balances provide an indication that the proposed process wastewater irrigation is within the capacity of the 99-acre Site. Deep percolation is associated with high precipitation months and is similar to the rainfall amount or is controlled through supplemental fresh water irrigation management. The 99-acre Site, with the proposed flows, is well-suited to provide sufficient acreage to control deep percolation and leaching losses to control the potential for negative impacts to groundwater quality.

4.4 Pond System Stormwater Management

The existing stormwater pond and Main Pond at the Facility are designed to contain total annual precipitation using a rainfall return period of 100 years without exceeding two-feet of freeboard. Process wastewater and non-contact water generated in the Facility are discharged to the 0.94 MG Main Pond (Figure 2). The Main Pond is a triangular-shaped structure with the approximate dimensions of 162 feet by 192 feet by 255 feet an approximate surface area of 0.36 acres (Figure 2). A Stormwater Pond is located in the southeast corner of the Facility. The estimated Stormwater Pond capacity is 0.47 MG, for a total combined water storage capacity of 1.40 MG. As part of the upgrades at the Facility, the Main Pond will be decommissioned and removed. The Stormwater Pond will remain to collect stormwater. Stormwater will be pumped from the Stormwater Pond to the sump for discharge to the 1 MG reservoir, then to the 99-acre Site, as needed to maintain capacity. In the event of a rainfall greater than the capacity of the Stormwater Pond and pumping system, the emergency stormwater area is the railroad right-of-way adjacent to the Facility. TGC has an easement with the Railroad for this type of use.

4.5 Solids Management

Solids produced by the Facility consist of garlic residues and scraps. Although the solids are typically characterized as a waste, TGC considers the solids a valuable resource and they are treated as such. The solids are collected from the stationary and rotary process wastewater screens and used as cattle feed or a soil amendment. The solids are currently sold to Resources Buyers, which in turn sells the product to various dairies. Handling of the solid waste stream will remain consistent with current operations.

4.6 Antidegradation Analysis

In support of a ROWD submitted by TGC on September 20, 2013, Cascade Earth Sciences (CES) prepared an Updated Anti-Degradation Analysis (Analysis) and submitted it to the Regional Board on June 21, 2014 (CES, 2014).

Initial comments from the Regional Board regarding the June 2014 analysis, indicated concern that the simple Cmix model used predicted that the groundwater EC would exceed the upper limit 1,600 µmhos/cm for the municipal and domestic water supply supply (MUN) beneficial use. The Regional Board implied that process water use at the 99-acre site may not be approvable under the requirements of the Tulare Lake Basin Plan.

In response to these concerns, an Addendum to the Updated Anti-Degradation Analysis was submitted to the Regional Board on November 4, 2014 (Appendix J). The addendum addresses the following items (described in detail in the subsequent sections):

1. A review of historical groundwater quality data in the region and determined that the North Kern Water Storage District (NKWSD) Spreading Grounds has influenced the water quality beneath the TGC 99-acre site.

2. A review and recalculation of the water balances to determine if deep percolation of salts and the potential effect on groundwater quality could be controlled by water irrigation management.

This section summarizes the Addendum to the Updated Anti-Degradation Analysis and updates the water balance calculations.

4.6.1 Historical Groundwater Quality Review

CES completed a detailed review of the historical background groundwater quality data as it pertains to the EC in the vicinity of the new 99-acre Site (Appendix J). The Analysis stated that the EC at the Site is affected by aquifer recharge by seepage from the Calloway and Friant-Kern Canals and operation of the NKWSD Rosedale Spreading Grounds (Spreading Grounds). Surface water from these sources has a lower salinity than ambient groundwater. Comparison of EC data from the NKWSD with EC data from an irrigation well located 800 feet west of the Site (Well 99-0-12) indicate that EC in groundwater beneath the Site is lowered by recharge from the Spreading Grounds. As such, the recharge will tend to mitigate salinity contributions from land application of process water at the Site.

4.6.2 Predictions of Groundwater Salinity Affects from Land Treatment

CES updated our analysis from November 2014 to predict changes in groundwater salinity resulting from the revised land treatment proposal described in Section 4.3.3. The first scenario is land application of process water at the current flow rate on 35 acres of the Site with average precipitation (Table 13a) and 100-year maximum annual precipitation (Table 13b). The second scenario is land application of the maximum future potential process water flow on 62 acres of the Site with average and 100-year annual precipitation (Tables 14a and 14b). The third scenario is irrigation of 35 acres of the Site with only fresh water during years with average precipitation (Table 15a) and 100-year maximum annual precipitation (Table 15b).

Salt balances are exhibited in Table 17 for all six irrigation scenarios (Tables 13a, 13b, 14a, 14b, 15a, and 15b) described in Section 4.3.3 (current process water, maximum future process water and fresh water only,; each with average precipitation and 100-year maximum precipitation). Salt loads ranged from 11,930 lb/ac for source water alone to 21,680lb/ac for the maximum process water flow, which would leave 87-94% of the salt in the soil after crop harvest.

A groundwater mixing model, Cmix, was used to predict changes in the EC of the groundwater in response to the irrigation management scenarios (Table 18). Predictions were computed as ranges to show the range of uncertainties in aquifer parameter inputs for gradient and transmissivity. The ambient groundwater EC level used in the model is 1,492 umhos/cm. The model predicted that the EC could increase by approximately <10 to 50 μmhos/cm under fresh water alone. Process water application on 35 acres at the current (2016) flow could cause the EC to increase by 30 to 150 μmhos/cm. Application of future maximum process water flows on 62 acres could cause the EC to increase by 60 to 300 umhos/cm.

If we average the results for the high and low estimates of groundwater flow, all of the scenarios predict that the EC will remain under 1,600 umhos/cm except the maximum future process water flow with 100-year precipitation.

4.6.3 Summary of Anti-Degradation Analysis

The Updated Anti-Degradation Analysis submitted to the Regional Board on June 24, 2014 (Appendix J) provided a limited perspective of the worst case potential to impact groundwater quality from one monitoring point and one irrigation management approach. The Addendum provided a review of historical groundwater quality data in the region and determined that the NKWSD Spreading Grounds has influenced the water quality beneath the TGC 99-acre site. In the absence of active recharge at the Spreading Grounds, the EC will eventually increase back to prior levels or if recharge is resumed, it has potential to mitigate changes in groundwater EC. In addition, if the irrigation scheduling is managed to control the salts leaching to a moderate level, the effect on groundwater is substantially less than if the full leaching requirement is met on an annual basis.

5.0 FARM MANAGEMENT AND MONITORING

The purpose of this section is to provide the basis under which the Current Site and future 99-acre Site will be managed to appropriately re-use the process wastewater and nutrients in a manner protective of groundwater. TGC capacities discussed above have been compared to the process wastewater flows and mass loadings. The land application area sizing provides sufficient capacity for water and nutrients at the new 99-acre Site at the current flow and at the proposed maximum flow of 46.96 MG per year.

5.1 Farming Objectives

TGC will manage irrigation to distribute process wastewater as a water and nutrient resource within agronomic needs for agricultural crop production. Irrigation systems, irrigation rates, hydraulic loadings, nutrient loadings, and salts management will be based on known agricultural best management practices to grow high quality, high yield crops. The available acreage is sufficient to plan hydraulic loading and nutrient loading goals based on crop requirements. The objective of the operations will be to efficiently and beneficially use the nitrogen and water that is available from all sources.

5.2 Monitoring

Currently, TGC is operating under a MRP 5-01-802 issued by the Regional Board in June 2008. The MRP requires source water and process wastewater monitoring, loading calculations, soil monitoring, and monthly reporting. The following sections describe the existing monitoring program with minor modifications appropriate to land treatment system monitoring.

5.2.1 Source Water Quality and Quantity

Three groundwater wells (Wells 2, 3, and 4) will be the source for processing operations. Well 4 is projected to provide supplemental irrigation water to the 99-acre Site. The source water supplies will be monitored on a quarterly basis for:

- EC
- nitrate + nitrite as nitrogen

On an annual basis the source water will be analyzed for:

- general minerals[1]

Source water flow meter readings will be recorded on a daily basis to document the volume of source water utilized by the Facility and for supplemental irrigation.

5.2.2 Process Wastewater Quality and Quantity

TGC will monitor process wastewater quality on a weekly, monthly, and annual basis by the collection and analysis of representative samples of the process wastewater distributed for land treatment. The monitoring location will be near the outlet of the Main Pond, prior to discharge to the LAA. Upon decommissioning of the Main Pond, the sampling location will be relocated the reservoir where the sample will be collected prior to discharge to the mixing tank.

Process wastewater quality samples will be collected and analyzed for the following parameters on a weekly basis using field instruments:

- EC
- dissolved oxygen measured
- pH

On a monthly basis, the process wastewater will be analyzed for:

- BOD
- TKN
- ammonia as nitrogen
- nitrate + nitrite as nitrogen
- total nitrogen
- TDS
- total suspended solids
- FDS

On an annual basis, the process wastewater will be tested for:

- general minerals[1]

The volume of water delivered to the land application area will be recorded on a daily basis by recording flow meter readings and/or pump and irrigation run times and design capacity. On a weekly basis, the reservoir and/or Main Pond freeboard will be recorded. TGC will check for odor during irrigation events. The daily, weekly, and monthly monitoring data will be reported monthly.
Based on the concentration of constituents present in the process wastewater and the volume of water applied, monthly loading rates will be calculated to monitor nutrient and hydraulic loading to the land application area. Average daily loading rates in lb/ac/dy will be calculated for BOD and total nitrogen,

[1] General minerals consists of alkalinity, bicarbonate, calcium, carbonate, chloride, conductivity, copper, hardness, hydroxide, iron, magnesium, manganese, nitrate, pH, potassium, sodium, sulfate, total dissolved solids, and zinc accompanied with an anion-cation balance.

to the land application area and reported on a quarterly basis. Monthly average hydraulic loading will be reported in inches applied in the monthly report each quarter.

5.2.3 Soil Sampling

TGC will collect soil samples on an annual basis each fall (October) to document soil conditions near the end of the growing season. Soil samples will be collected from depths of 0-6, 6-24, 24-48, and 48-72 inches. A single soil sampling transect will be established across the land application area. Soil sampling along the transect will consist of a composite of six sub-samples at approximately equal distance between sub-samples for each individual sampling depth. The transects at the 99-acre Site will be proportionately defined to represent the irrigation system zones within the land application area, as needed.

Soil samples will be tested for the following list of parameters:

- nitrate-nitrogen
- ammonium-nitrogen
- organic matter
- saturation paste extract EC
- sodium adsorption ratio
- pH

The collection of soil samples to a depth of six feet (72 inches) will provide documentation of treatment of nutrients loaded to the land treatment area within the crop root zone to control the potential for degradation of groundwater.

5.2.4 Crop Sampling

The crops established at the land application area should be monitored as an evaluation tool for management of the site(s). Crop samples should be collected at harvest to provide an estimate of crop quality and nutrients harvested from the site. Weights will be estimated by counting bales or by summing weight tickets of truckloads of biomass removed. Samples should be collected from the crop prior its removal from the land application area. If the crop is green chopped, samples can be collected from windrows after cutting, prior to chopping and hauling. Crop samples should be analyzed for:

- moisture
- percent ash
- total nitrogen
- nitrate-nitrogen

Crop yield and nitrogen removal will be reported in the annual report.

5.2.5 Groundwater Sampling

Groundwater sampling will not be conducted at the 99-acre Site or the Current Site. The negative nitrogen balance, low BOD loading, lined Balancing Reservoir, and favorable hydraulic balances suggest the irrigation of the process wastewater poses a minimal threat to groundwater and does not warrant the necessity for groundwater sampling.

5.2.6 Reservoir Liner Monitoring

The reservoir liner will be monitored as per the monitoring plan provided in Appendix B.

5.3 Reporting

Quarterly, and annual reports will be prepared to document the quality and quantity of process wastewater applied to the land treatment area. Nutrient and hydraulic loading rates will also be prepared to document that loading rates are within crop uptake and treatment capacity and that water application rates are appropriate.

5.4 Contact Information

The primary contact for both emergency and routine information regarding the land application program at The Garlic Company is:

Nicolas Ligonde – QA Manager
In the event that Mr. Ligonde is not available, contact: John Layous, and Joe Lane - Partner
18602 Zerker Road
Shafter, CA 93314
(661) 393-4212

6.0 SUMMARY

TGC washes, processes, and packages fresh garlic. The processing plant facility consists of office buildings, a processing facility, cold storage unit, Stormwater Pond, and an unlined Main Pond. Currently the process wastewater passes through a series of screens prior to being pumped to the Main Pond for stabilization then it is irrigated to grow forage crops. The current 16.8 irrigated acre land application site (Current Site) consists of a big gun irrigation system and wheat/sudangrass crop rotation.
The Facility is in a planning phase to upgrade the process water management and land treatment systems. The Main Pond will be abandoned. Process wastewater will pass through a more intensive filtering process before being pumped to a 1,000,000 gallon lined reservoir then pumped to a 50,000 gallon mixing tank at the 99-acre Site located one mile south of the Facility. The proposed maximum process wastewater flow is 46.96 MG per year. The 2016 process wastewater and stormwater combined flow was 24.3 MG. The 99-acre Site provides capability to support future growth of the processing operations. The soil physical and chemical characteristics present no inhibitions for the treatment of applied process wastewater and groundwater is deep.

Based on the current and projected process wastewater quality and quantity, the 99-acre Site provides sufficient acreage to maintain nitrogen loads at a nitrogen deficit compared to crop uptake potential and BOD load of 7.3lb/ac/day. It substantially reduces the FDS load compared to the Current Site even at the proposed maximum flow. The hydraulic balance demonstrates the ability to limit the potential for deep percolation and leaching losses to high rainfall periods.

Daily, weekly, monthly, quarterly, and annual monitoring of the process wastewater quality and quantity applied to the land application areas, annual soil sampling, and crop sampling will be conducted to document the performance of the land application operations. Regular monitoring will provide feedback on system performance to correct short-term problems before they can become a threat to groundwater quality. Therefore, the discharge of process wastewater to the 99-acre Site has a low probability of degrading groundwater at the site and groundwater monitoring should not be necessary.

REFERENCES

Brown and Caldwell and Kennedy/Jenks. 2007. Manual of Good Practice for Land Application of Food Processing/Rinse Water. California League of Food Processors, Sacramento, CA. February 27, 2007.

California Department of Water Resources San Joaquin District, March 1993. Agroclimate Monitoring in the San Joaquin Valley, 1958 – 1991

CES, 2014. Updated Anti-Degradation Analysis, The Garlic Company, Shafter, Cascade Earth Sciences, June 6, 2014

CIMIS. 2018. California Irrigation Management Information Systems (CIMIS). Calif. Dept of Water Resources, Office of Water Use Efficiency. http://wwwcimis.water.ca.gov/cimis/

NRCS, 2018a. Web Soil Survey Custom Soil Resource Report, Kern County, California, Northwestern Part. United States Department of Agriculture, Natural Resource Conservation Service. Web Soil Survey Report. Accessed on November 13, 2018.

NRCS, 2018b. The PLANTS Database (https://plants.sc.egov.usda.gov/npk). Natural Resource Conservation Service. Accessed on November 13, 2018.

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Table 1. Source Water Quality

Constituent	Units	Well #4 (99-Acre Well)						Well #2					Well #3					Current Flow Weighted Average[1]	Projected Flow Weighted Average[2]
		January 2014	April 2014	January 2015	April 2015	August 2016	Average	January 2016	April 2016	July 2016	October 2016	Average	January 2016	April 2016	July 2016	October 2016	Average		
pH	standard units	7.8	7.8	7.7	7.7	7.8	7.8	7.1	7.0	6.6	7.6	7.1	7.5	7.2	7.1	8.2	7.5	7.2	7.8
Electrical Conductivity	µmhos/cm	1,400	1,500	1,500	--	1,500	1,475	2,446	2,498	2,318	2,383	2,411	2,322	2,319	2,118	2,264	2,256	2,357	1,492
Ammonia as Nitrogen	mg/L	--	< 0.10	--	< 0.13	--	< 0.12	--	--	--	--	--	--	--	--	--	--	--	--
Nitrate as Nitrogen	mg/L	3.2	2.5	12	6.6	0.7	5.0	1	0.46	2	<1	1.2	13.0	4.0	8.5	17.0	10.6	4.5	5.0
Total Nitrogen	mg/L	3.2	2.5	12	6.6	--	6.1	--	--	--	--	--	--	--	--	--	--	--	6
Total Dissolved Solids	mg/L	--	980	--	960	970	970	1,800	1,700	1,700	1,500	1,675	1,700	1,700	1,500	1,500	1,600	1,649	983
Fixed Dissolved Solids	mg/L	--	900	--	--	--	900	--	--	--	--	--	--	--	--	--	--	--	900
Total Hardness	mg/L CaCO3	280	330	--	--	300	303	500	480	490	450	480	480	480	380	410	438	465	306
Calcium	mg/L	110	130	110	110	120	116	200	190	190	180	190	190	190	150	160	173	184	117
Magnesium	mg/L	0.7	0.8	0.6	0.7	0.1	0.6	0.97	0.98	1.00	1.00	0.99	0.75	0.97	0.68	1.00	0.85	0.9	0.6
Sodium	mg/L	200	210	200	220	210	208	400	380	380	250	353		360	340	350	350	352	211
Potassium	mg/L	2.2	2.1	2.1	1.9	2.3	2.1	2.3	2.3	3.0	2.7	2.6	2.9	2.9	3.0	3.7	3.1	3	2
Chloride	mg/L	160	170	160	170	160	164	450	410	340	360	390	320	320	270	300	303	359	168
Sulfate	mg/L	400	460	380	440	460	428	720	710	690	660	695	800	770	660	650	720	704	434
Bicarbonate	mg/L CaCO3	65	48	69	42	32	51	9.1	10.0	12.0	8.3	9.9	15	30	15	27	22	14	50
Carbonate	mg/L CaCO3	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Total Alkalinity	mg/L CaCO3	65	48	69	--	32	54	9.1	10.0	12.0	8.3	9.9	15	30	15	27	22	14	53
Boron	mg/L	0.4	0.3	0.4	0.2		0.3	--	--	--	--	--	--	--	--	--	--	--	--
Sodium Adsorption Ratio	unitless	5	5	5	6	5	5	8	8	8	5	7	0	7	8	8	6	7	5

NOTES:
Abbreviations: "--" = no data collected, $CaCO_3$ = calcium carbonate, mg/L = milligrams per liter, < = less than reporting limit, µmhos/cm = micromhos per centimeter.
Samples collected by The Garlic Company technicians and analysis completed by BSK Laboratories in Fresno, California.
1 Current source water flow weighted average assumes 65% water flow from Well 2 and 35% water flow from Well 3.
2 Projected source water flow weighted average assumes 98% water flow from Well 4 and 1% water flow from Well 2 and 1% water flow from Well 3.

Table 2. 2016 Source Water Supply Flow

Month	Operational Days per Month [1]	Total Monthly Flow [2]	Average Daily Flow [3]
		millon gallons	
January	20	1.704	0.055
February	20	2.466	0.088
March	22	2.134	0.069
April	22	2.210	0.074
May	20	1.861	0.060
June	21	2.159	0.072
July	23	2.186	0.071
August	20	2.643	0.085
September	20	1.552	0.052
October	22	2.511	0.081
November	20	2.958	0.099
December	22	1.890	0.061
Minimum	**20**	**1.552**	**0.052**
Maximum	**23**	**2.958**	**0.099**
Average	**21**	**2.190**	**0.072**
Total	**252**	**26.275**	

NOTES:

1 Operational days per month are typical and obtained from 2016 data.

2 Source water flows monitored by The Garlic Company for Well 2 and Well 3.
2016 source water flow is representative of current flow.

3 Average daily flow per calendar day calculated from Total Monthly Flow / Days per Month.

Table 3a. 2016 Process Wastewater Quality

Constituent	Units	Jan 2016 [1]	Feb 2016 [1]	Mar 2016 [1]	Apr 2016 [1]	May 2016 [1]	Jun 2016 [1]	Jul 2016 [1]	Aug 2016 [1]	Sep 2016 [1]	9/7/2016 [2]	Oct 2016 [1]	Nov 2016 [1]	Dec 2016 [1]	2016 Average
Biochemical Oxygen Demand	mg/L	240	220	150	223	127	160	390	540	440	420	750	510	460	351
pH	s.u.	6.9	6.9	7.2	7.1	7.2	7.2	7.1	7.5	7.2	7.5	6.6	6.9	7.2	7.1
Fixed Dissolved Solids	mg/L	1,800	1,700	1,800	1,700	1,800	1,700	1,800	1,600	1,700	NT	1,700	1,800	1,600	1,725
Total Suspended Solids	mg/L	670	640	510	760	590	670	460	490	930	880	700	710	780	659
Electrical Conductivity	μmhos/cm	2,963	2,957	2,958	2,963	2,962	2,960	2,956	2,955	2,945	3,200	2,945	2,941	2,914	2,952
Total Dissolved Solids	mg/L	2,000	1,800	1,900	1,900	1,900	1,900	2,100	2,000	1,900	1,900	2,200	2,300	1,900	1,983
Calcium	mg/L	--	--	--	--	--	--	--	--	--	190	--	--	--	190
Magnesium	mg/L	--	--	--	--	--	--	--	--	--	10	--	--	--	9.9
Sodium	mg/L	--	--	--	--	--	--	--	--	--	520	--	--	--	520
Potassium	mg/L	--	--	--	--	--	--	--	--	--	130	--	--	--	130
Nitrate	mg/L	< 1.0	< 1.8	< 2.0	< 1.2	< 1.0	< 1.2	< 5.1	< 2.0	< 1.3	< 0.5	< 1.0	< 1.2	< 1.2	< 1.7
Total Kjeldahl Nitrogen	mg/L	16	11	20	22	20	19	50	42	50	NT	61	65	51	36
Total Nitrogen	mg/L	39	10	21	22	20	19	51	42	50	NT	62	65	51	38
Bicarbonate	mg/L $CaCO_3$	--	--	--	--	--	--	--	--	--	500	--	--	--	500
Carbonate	mg/L $CaCO_3$	--	--	--	--	--	--	--	--	--	<3	--	--	--	<3
Hydroxide	mg/L CaCO3	--	--	--	--	--	--	--	--	--	<3	--	--	--	<3
Chloride	mg/L	--	--	--	--	--	--	--	--	--	420	--	--	--	420
Sulfate	mg/L	--	--	--	--	--	--	--	--	--	560	--	--	--	560
Color	CU	--	--	--	--	--	--	--	--	--	150	--	--	--	150
Alkalinity, Total	mg/L $CaCO_3$	--	--	--	--	--	--	--	--	--	500	--	--	--	500
Sodium Adsorption Ratio	unitless	--	--	--	--	--	--	--	--	--	10	--	--	--	10

NOTES:

Effluent monitoring represents process wastewater samples collected prior to discharge to the land application system.

Samples collected by The Garlic Company technicians and analysis completed by BSK Laboratories in Fresno, California.

Abbreviations: "--" = not tested, $CaCO_3$ = calcium carbonate, CU = color units, mg/L = milligrams per liter, NT = not tested, s.u. = standard units, μmhos/cm = micromhos per centimeter.

1 Monthy average constituent concentrations

2 The results of the analysis performed on the sample collected on September 7, 2016 was used to represent concentrations of constituents not analyzed throughout 2016.

Table 3b. Projected Wastewater Quality

Constituent	Units	Source Water Quality		Process Wastewater Quality[3]	Processing Addition[4]	Projected Wastewater Quality[5]
		Current Weighted Average[1]	Projected Weighted Average[2]			
Biochemical Oxygen Demand	mg/L	--	--	351	351	351
pH	s.u.	7.2	7.8	7.1	-0.2	7.6
Fixed Dissolved Solids	mg/L	--	900	1,725	--	1,725
Total Suspended Solids	mg/L	--	--	659	880	880
Electrical Conductivity	µmhos/cm	2,357	1,492	2,952	595	2,087
Total Dissolved Solids	mg/L	1,649	983	1,983	335	1,318
Calcium	mg/L	184	117	190	6	123
Magnesium	mg/L	1	1	10	9	10
Sodium	mg/L	352	211	520	168	379
Potassium	mg/L	3	2	130	127	129
Nitrate	mg/L	4	5	0.46	-4.0	1.0
Total Kjeldahl Nitrogen	mg/L	--	--	36	36	36
Total Nitrogen	mg/L	4	6	38	34	40
Bicarbonate	mg/L $CaCO_3$	14	50	500	486	536
Carbonate	mg/L $CaCO_3$	3	3	<3	<3	<3
Hydroxide	mg/L CaCO3	--	--	<3	<3	<3
Chloride	mg/L	359	168	420	61	228
Sulfate	mg/L	704	434	560	-144	290
Total Hardness as $CaCO_3$	mg/L	465	306	--	--	--
Color	CU	--	--	150	150	150
Alkalinity, Total	mg/L $CaCO_3$	--	--	500	500	500
Sodium Adsorption Ratio	unitless	7	5	10	10	9

NOTES:

Effluent monitoring represents process wastewater samples collected prior to discharge to the land application system.

Samples collected by The Garlic Company technicians and analysis completed by BSK Laboratories in Fresno, California.

Abbreviations: "--" = not tested, $CaCO_3$ = calcium carbonate, CU = color units, mg/L = milligrams per liter, NT = not tested, s.u. = standard units, µmhos/cm = micromhos per centimeter.

1 Current source water quality is a flow weighted average which assumes 65% water flow from Well #2 and 35% water flow from Well #3.

2 Projected source water quality is a flow weighted average which assumes 98% water flow from Well #4 and 1% water flow from Well #2 and Well #3

3 Process wastewater quality is an average of 2016 constituent concentrations. The results of the analysis performed on the sample collected on September 7, 2016 was used to represent concentrations of constituents not analyzed throughout 2016.

4 Data represents the change in source water quality from processing operations (process wastewater quality - current source water quality = processing addition).

5 Data represents projected process water quality (processing additions + projected source water quality = projected wastewater quality).

Table 4. 2016 Process Wastewater Discharge Flow

Month	Process Water[1]	Maximum Daily Flow [2]	Average Daily Flow [3]
	MG		
January	2.587	0.218	0.112
February	2.677	0.315	0.127
March	1.652	0.157	0.072
April	2.239	0.380	0.102
May	2.408	0.238	0.105
June	2.704	0.182	0.123
July	1.321	0.351	0.057
August	3.397	0.607	0.148
September	2.948	0.387	0.134
October	3.691	0.449	0.160
November	3.020	0.537	0.137
December	3.228	0.301	0.140
Total	**31.872**		
Minimum	**1.321**	**0.157**	**0.057**
Maximum	**3.691**	**0.607**	**0.160**
Average	**2.656**	**0.344**	**0.118**

NOTES:

Abbreviations: MG = million gallons

1 Process wastewater flows includes both process wastewater and stormwater contained onsite and discharged to the stormwater and main pond.

2 Maximum daily flow is the maximum flow measured in one day of each month.

3 Average daily flow calculated from Total Monthly Flow / Days per Month of operation.

Table 5. Projected Process Wastewater Discharge Maximum Flow

Month	Projected Maximum Daily Flow[1]	Total Monthly Discharge [2]	Average Operating Days[3]
	gallons		
January	173,913	4,000,000	23
February	173,913	3,652,174	21
March	173,913	4,000,000	23
April	173,913	3,826,087	22
May	173,913	4,000,000	23
June	173,913	3,826,087	22
July	173,913	4,000,000	23
August	173,913	4,000,000	23
September	173,913	3,826,087	22
October	173,913	4,000,000	23
November	173,913	3,826,087	22
December	173,913	4,000,000	23
Total		**46,957,000**	**270**
Minimum		**3,652,174**	
Maximum		**4,000,000**	
Daily Average		**173,900**	

NOTE:

1 Projected maximum daily flow calculated from a maximum 4 million gallon per month flow with 23 operating days (4,000,000 ÷ 23).

2 Total monthly discharge = projected maximum daily flow x average operating days.

3 Average days per month of facility operation.

Table 6. Land Application Area Fields

Field	Acres
Existing Land Application Area (Current Site)	14.8
North Field	15.2
South Field	80.0
CA HSR ROW[1]	12.0
Total Land Application Area	**110.0**
Total Land Application Area with CA HSR ROW	**98.0**

NOTES
1 Estimated acreage of California High Speed Rail right-of-way (CA HSR ROW).

Table 7. Climate - Temperature, Precipitation, and Pan Evaporation

Month	Precipitation [1] 100-Year Return [2] 1998	10-Year Return [3] 1987-2016	30-Year Average [4] 1987-2016	Monthly Distribution	Reference ETo [5]	Pan [6]	Temperatures [7] Air Average Max	Air Average Min	Soil Minimum 4" Depth
	inches			%	inches		degrees Fahrenheit		
Nov	0.55	2.20	0.54	8.6%	2.0	2.2	66	39	59
Dec	0.67	1.90	1.09	17.4%	1.3	1.2	57	34	52
Jan	1.13	0.57	1.18	18.8%	1.3	1.4	57	36	50
Feb	5.09	0.71	1.25	20.0%	2.2	2.2	64	39	52
Mar	2.81	0.16	1.04	16.6%	4.0	4.0	70	43	56
Apr	0.58	0.00	0.49	7.8%	5.6	5.8	76	46	61
May	1.59	0.01	0.22	3.5%	7.4	8.3	84	52	67
Jun	0.67	0.00	0.06	1.0%	8.0	9.5	90	58	73
Jul	0.00	0.00	0.01	0.2%	8.1	9.7	95	63	78
Aug	0.00	0.49	0.01	0.2%	7.2	8.6	94	61	78
Sep	0.12	1.04	0.05	0.8%	5.7	6.4	91	56	74
Oct	0.42	5.97	0.32	5.1%	3.9	4.4	81	48	67
Annual	**13.6**	**13.1**	**6.3**	**100%**	**56.7**	**63.7**			

NOTES:

Abbreviations: % = percent, ETo = evapotranspiration, Max = maximum, Min = minimum.

1 Precipitation data based on data obtained from the California Irrigation Management Information Systems (CIMIS) (http://www.cimis.ca.gov). Data was obtained for January 1983 to December 2016 fro Shafter station and for June 2012 to August 2013 from the Famoso Station #138.

2 1998 was the greatest precipitation year in 30 years (1987 to 2016). This year was selected to represent the 100 year-return period. This estimation is supported by data from the Arvin weather station 30 miles southeast of Shafter where 1998 had the greatest annual rainfall from 100 years of data.

3 The 10-year return is the 2nd greatest annual precipitation in the past 30 years (2010). The 10-year data are distributed monthly in accordance with historical (long-term average) rainfall patterns.

4 Average precipitation data was obtained from the CIMIS (http://www.cimis.ca.gov) for January 1983 to December 2016 from the Shafter station and for June 2012 to August 2013 from the Famoso Static

5 The Reference Evapotranspiration (ETo) was provided by CIMIS (http://www.cimis.ca.gov) for January 1987 to December 2016 from the Shafter station and for June 2012 to August 2013 from the Famc

6 Monthly Class 'A' pan evaporation data obtained from Agroclimate Monitoring near Bakersfield, California, 1958 - 1991, California Department of Water Resources San Joaquin District, March 1993 (http://www.sjd.water.ca.gov/landwateruse/publications/index.cfm).

7 Soil temperature data collected from CIMS (http://www.cimis.ca.gov) for January 1987 to December 2016 from the Shafter station and for June 2012 to August 2013 from the Famoso Station #138.

Table 8. Soil Physical Characteristics of the 99-Acre Site

Series [1]	Map Unit [2]	Depth [3] inches	USDA [4] Texture	Clay [5] %	Ksat [6] in/hr	AWHC [7] in/in	AWHC [7] in/60"	Slope %
Driver, coarse sandy loam	145	0-16	Coarse sandy loam	8-20	2.0-6.0	0.09-0.12	5.8	0 to 2%
		16-27	Loam, clay loam	20-35	0.6-2.0	0.15-0.18		
		27-37	Sandy loam, coarse sandy loam	8-15	0.2-0.6	0.09-0.11		
		37-65	Stratified loam to loamy coarse sand	5-20	0.6-2.0	0.08-0.15		
Wasco, sandy loam	243	0 - 15	Sandy loam	8 - 18	2.0 to 6.0	0.08 - 0.11	4.8	0 to 5%
		15 - 60	Sandy loam, fine sandy loam	8 - 18	2.0 to 6.0	0.08 - 0.13		

NOTES:

Based on information from a Custom Soil Survey Resource Report for Kern County, California Northwestern Part. USDA NRCS Web Soil Survey. Report generated on November 13, 2018.

Abbreviations: % = percent, AWHC = available water holding capacity, in = inches, in/hr = inches per hour, in/in = inches per inch, in/60" = inches per 60 inches.

1 Soil series are differentiated by variability in texture, all soils within a series have similar horizonation.

2 Map unit numbers correspond to the descriptions and map symbols contained in the Kern County Soil Survey.

3 Typical depth below ground surface of each horizon (distinct layer of soil) in each soil series.

4 Texture based on USDA soil series.

5 Clay given as a percentage of the soil mineral constituents, Sand - Silt - Clay.

6 Ksat is the abbreviation for saturated hydraulic conductivity. Ksat provides measurement of the ease of vertical water movement in soil.
Rapid: 6.0 to 20 in/hr; Moderately Rapid: 2.0 to 6.0 in/hr; Moderate: 0.6 to 2.0 in/hr; Mod. slow: 0.2 to 0.6 in/hr; Slow: 0.06 to 0.2 in/hr.

7 AWHC is the amount of water available for use by plants in inches of water per inch of soil (field capacity minus permanent wilting point). AWHC calculated to a depth of 60".

Table 9. Current Site Soil Chemistry Sample Analyses

Constituent	Units	2003 Average[1]				2016 Average [2]			
Depth (inches)		12"	24"	36"	60"	0-6"	6-24"	24-48"	48-60"
Saturation Percentage	%	25.7	25.6	27.2	27.2				
pH	units	6.8	7.7	8.0	8.1	7.7	8.2	8.6	8.9
Electrical Conductivity	mmhos/cm	1.90	0.65	0.58	0.48	3.90	2.90	4.50	1.87
Sodium Adsorption Ratio	unit less	0.9	0.8	0.8	1.3	--	--	--	--
Calcium, Soluble	meq/L	28.90	8.10	4.48	3.48	--	--	--	--
Magnesium, Soluble	meq/L	3.7	1.0	0.6	0.5	--	--	--	--
Sodium, Soluble	meq/L	3.38	1.60	1.35	1.95	--	--	--	--
Nitrate-Nitrogen	ppm	30.5	11.0	4.3	3.0	29.3	15.9	11.7	9.2
Ammonia-Nitrogen	ppm	11	11	11	10	--	--	--	--
Total Kjeldahl Nitrogen	mg/kg	--	--	--	--	640	350	330	1080
Total Nitrogen	mg/kg	--	--	--	--	670	370	340	1090
Available Phosphorus	ppm	29	18	12	12	--	--	--	--
Sulfate-Sulfur	ppm	171.3	32.0	19.3	19.3	--	--	--	--
Chloride	meq/L	1.20	0.75	0.63	0.60	--	--	--	--
Boron	ppm	0.40	0.20	0.18	0.20	--	--	--	--
Zinc	ppm	2.4	0.4	0.2	0.1	--	--	--	--
Manganese	ppm	1.4	0.8	0.8	1.0	--	--	--	--
Iron	ppm	2.8	1.0	1.0	1.0	--	--	--	--
Copper	ppm	0.8	0.3	0.2	0.2	--	--	--	--
Calcium, Exchangeable	meq/100g	12.5	11.1	11.8	11.3	--	--	--	--
Magnesium, Exchangeable	meq/100g	1.0	0.7	0.6	0.6	--	--	--	--
Potassium, Exchangeable	meq/100g	0.68	0.48	0.50	0.43	--	--	--	--
Sodium, Exchangeable	meq/100g	0.23	0.18	0.20	0.25	--	--	--	--
Hydrogen, Exchangeable	meq/100g	0.55	ND	ND	ND	--	--	--	--
Cation Exchange Capacity	meq/100g	14.9	16.28	17.15	17.97	--	--	--	--

NOTES:
Soil sampling and analysis results for the existing 16.8 acre land application site adjacent to The Garlic Company processing plant.
Abbreviations: "--" = not analyzed or required, % = percent, mmhos/cm = millimhos per centimeter, meq/L = milliequivalents per liter, meq/100g = milliequivalents per 100 grams of soil, ppm = parts per million, ND = not detected above reporting limit.
1 Sampled by Cascade Earth Sciences in January 2003 and analyzed by A&L Western Agricultural Laboratories, Modesto, California. An average of the four sites tested: Northwest, Southwest, Southeast, Northeast.
2 Sampled by Cascade Earth Sciences in August 2016 and analyzed by Kuo Testing Labs in Othello, Washington. An average of the three sites tested: North Pivot, Pivot Point, and South Pivot.

Table 10. Process Wastewater Constituent Mass Loads

Period	Flow	TKN	NO_3-N	Gross Total N	Net Total N [1]	BOD	FDS	Na	K	Ca	Mg	Cl	SO_4-S
2016 Flow and 35 Acres													
	MG	**lb**											
2016	31.87	9,459	265	9,724	6,807	93,257	458,531	100,808	34,388	32,810	2,539	60,678	77,044
	Acres [2]	**lb/ac/yr**											
	35.0	270	8	278	194	2,664	13,101	2,880	983	937	73	1,734	2,201
Maximum Future Flow and 62 Acres													
	MG	**lb**											
Future	46.96	13,935	391	14,326	10,028	137,394	675,547	148,518	50,663	48,338	3,740	89,395	113,508
	Acres [2]	**lb/ac/yr**											
	62.0	225	6	231	162	2,216	10,896	2,395	817	780	60	1,442	1,831

NOTES:

Constituent mass loads calculated from average process wastewater constituent concentrations, measured total annual flow. Mass Loads calculated by the following:
milligrams per liter x (1 gram / 1,000 milligrams) x (1 pound / 453.6 grams) x (1 liter / 0.265 gallons) x (1,000,000 gallons).

Abbreviations: BOD = biochemical oxygen demand, Ca = calcium, Cl = chloride, FDS = fixed dissolved solids, K = potassium, lb = pounds, lb/ac/yr = pounds per acre per year,
MG = million gallons, Na = sodium, NH_3-N = ammonia-nitrogen, NO_3-N = nitrate-nitrogen, Mg = magnesium, SO_4-S = sulfate-sulfur, Total N = TKN + NO_3-N, and TKN = total Kjeldahl nitrogen.

1 Net Total N assumes a 30 percent loss of the gross Total N to account for volatilization and denitrification in the soil/plant system. Net Total N represents the amount of nitrogen available for crop uptake. based on nitrogen loss factors from Brown and Caldwell and Kennedy/Jenks (2007).

2 Acres based on projected cropping

Table 11. Design Nitrogen Balance

Crop	Acres [2]	Gross Nitrogen Additions [1]					Total Gross Nitrogen Load	Nitrogen Losses			Agronomic Nitrogen Balance [6]
		Process Wastewater Irrigation			Supplemental Fresh Water Irrigation [3]	Commercial Fertilizer		Uptake [4]	Gaseous Losses [5]	Total Losses	
		TKN	NO_3-N	Total N							
		lb N/ac						lb N/ac			
2016 Flow and 35-Acre Site											
Wheat -Sudangrass	35	270	8	278	58	0	336	270	101	371	-35
Maximum Future Flow and 62-Acre Site											
Wheat -Sudangrass	62	225	6	231	56	0	287	270	86	356	-69
2016 Flow and 35-Acre Site											
Alfalfa	35	270	8	278	58	0	336	520	101	621	-285
Maximum Future Flow and 62-Acre Site											
Alfalfa	62	225	6	231	56	0	287	520	86	606	-319

NOTES:

Abbreviations: lb N/ac = pounds nitrogen per acre, NO_3-N = nitrate-nitrogen, NH_3-N = ammonia-nitrogen, Total N = TKN + NO_3-N, and TKN = total Kjeldahl nitrogen, N = nitrogen.

1 Estimated based on the average process wastewater quality from 2016.

2 Acres based off of projected cropping and crop nitrogen uptake.

3 Estimated based on the average source water quality from Well #4 and projected supplemental fresh water quantities from water balances (Tables 14b and 15b).

4 Estimates of crop uptake for a wheat - Sudangrass rotation, with 4 cuttings per year, estimating 8.5 tons per acre of dry matter yield. Alfalfa assumes up to 6 cuttings per year and a yield of 8 tons per acre. Estimated nitrogen removal is an average of wheat, Sudangrass, and alfalfa provided by NRCS-Plants Crop Nutrient Removal database: https://plants.sc.egov.usda.gov/npk

5 Assumes gaseous loss of 30 percent of applied nitrogen through denitrification and ammonia volatilization.

6 Total gross nitrogen additions minus total nitrogen losses. Positive values indicate additional nitrogen available. Negative values indicate nitrogen demand in excess of application rates.

Table 12. Design Biochemical Oxygen Demand Loading

Total Land Available	Process Wastewater	BOD Load [1]	Daily BOD Load [2]
acres	MG	lb	lb/ac/day
2016 Flow and 35-Acre Site			
35.0	31.87	93,257	7.3
Maximum Future Flow and 62-Acre Site			
62.0	46.96	137,394	6.1

NOTES:

Abbreviations: BOD = biochemical oxygen demand, lb = pounds, lb/ac/day = pounds per acre per day, MG = million gallons.

1 BOD calculated from process wastewater quality using the average BOD from 2016.

2 A typically accepted design treatment capacity for Chemical Oxygen Demand (COD) is 100 lb/ac/day annual average (EPA, 1977. Pollution abatement in the fruit and vegetable industry).

Table 13a. 2016 Flow Water Balance - 100-Year Precipitation

Soil Unit: Wasco

Field: Land Application Site | **Acres:** 35 | **Avail. Water Cap. (in.):** 4.8

Crop: Wheat-Sudangrass/Alfalfa | **Min. Soil Depth (in):** 60 | **Initial Avail. Water (in.):** 3.0

Month	ppt [1]	Process Water	Storm Water	Gross Water Applied [2]			Net Water Applied [3]			ET [4]			Avail. Water [5]	Surplus [6]
				Process	Stormwater	Fresh	PW+SW	Fresh	Total	Pond Evap.	Potential	Estimate		
	in/ac	MG		in/ac			in/ac			in/ac			in/ac	
Nov	0.6	3.0	0.2	3.1	0.2	0.0	2.6	0.0	3.1	2.2	2.0	1.6	4.5	0.0
Dec	0.7	1.9	0.2	2.0	0.2	0.0	1.7	0.0	2.3	1.2	1.3	1.3	4.8	0.8
Jan	1.1	1.7	0.4	1.8	0.4	0.0	1.5	0.0	2.5	1.4	1.3	1.3	4.8	1.2
Feb	5.1	2.5	1.6	2.6	1.7	0.0	2.2	0.0	6.8	2.2	2.2	2.2	4.8	4.6
Mar	2.8	2.1	0.9	2.2	0.9	0.0	1.9	0.0	4.4	4.0	4.0	4.0	4.8	0.5
Apr	0.6	2.2	0.2	2.3	0.2	3.5	2.0	3.0	5.5	5.8	5.6	5.6	4.7	0.0
May	1.6	1.9	0.5	2.0	0.5	5.0	1.5	3.7	6.6	8.3	7.4	7.3	4.0	0.0
Jun	0.7	2.2	0.2	2.3	0.2	6.5	1.7	4.9	7.2	9.5	8.0	7.3	3.9	0.0
Jul	0.0	2.2	0.0	2.3	0.0	7.4	1.7	5.6	7.3	9.7	8.1	7.3	3.9	0.0
Aug	0.0	2.6	0.0	2.8	0.0	6.0	2.1	4.5	6.6	8.6	7.2	6.5	4.0	0.0
Sep	0.1	1.6	0.0	1.6	0.0	4.3	1.4	3.6	5.1	6.4	5.7	5.2	3.9	0.0
Oct	0.4	2.5	0.1	2.6	0.1	1.6	2.2	1.4	4.0	4.4	3.9	3.5	4.4	0.0
Total	**13.6**	**26.3**	**4.3**	**27.6**	**4.6**	**34.2**	**22.6**	**26.6**	**61.4**	**63.7**	**56.7**	**53.0**		**7.0**

Leaching Fraction [7]	8.8%
Leaching Requirement [8]	10.9%

NOTES:

Abbreviations: Avail. = available, ET = evapotranspiration, Evap. = evaporation, in/ac = inches per acre, MG = million gallons, ppt = precipitation, PW = process water, SW = storm water.

1 1998 was the greatest precipitation (ppt) year in 29 years (1983 to 2011). This year was selected to represent the 100 year-return period. This estimation is supported by data from the Arvin weather station 30 miles southeast of Shafter where 1998 had the greatest annual rainfall from 100 years of data.

2 Gross water applied is the total volume of process wastewater, stormwater, and fresh water discharge to the land application site from facility storage or source wells.

3 Net water applied are based on measured process (process wastewater + stormwater) and supplemental fresh water irrigation. Total includes net precipitation. Irrigation efficiency of 75% assumed for May to August and 85% for September to April has been applied to all irrigation and rainfall.

4 The potential evapotranspiration (ET) for wheat-sudangrass/alfalfa crop is reference ET data collected at the Shafter-USDA CIMIS station, Shafter, California.

5 Plant available water in soil profile at month end. Initial available water is assumed to be at field capacity. Available water holding capacity calculated based on particle size analysis from Soil Survey of Kern County, Northwest Part (NRCS-SCS, 1988).

6 Estimated soil water balance. Surplus is water in excess of soil water holding capacity.

7 Leaching Fraction = % of gross water input estimated to percolate beyond root zone = Surplus / Precipitation + Gross Irrigation.

8 Leaching Requirement = Quantity of Surplus required to drain through the soil to leach sufficient soluble salts to maintain soil salinity (ECe) at the existing level of 3.0 mmhos/cm. LR = ECiw / ECdw - ECiw. LR = leaching requirement, Eciw = weighted average EC of ppt, process, storm, and fresh water sources, ECdw = EC of drainage water = 5 x target soil Ece.

Table 13b. 2016 Flow Water Balance - 30-Year Average Precipitation

Soil Unit: Wasco

Field: Land Application Site **Acres:** 35 **Avail. Water Cap. (in.):** 4.8

Crop: Wheat-Sudangrass/Alfalfa **Min. Soil Depth (in):** 60 **Initial Avail. Water (in.):** 3.0

Month	ppt [1]	Process Water	Storm Water	Gross Water Applied [2]			Net Water Applied [3]			ET [4]			Avail. Water [5]	Surplus [6]
				Process	Stormwater	Fresh	PW+SW	Fresh	Total	Pond Evap	Potential	Estimate		
	in/ac	MG		in/ac			in/ac			in/ac			in/ac	
Nov	0.5	3.0	0.2	3.1	0.2	0.1	2.8	0.1	3.4	2.2	2.0	1.6	4.8	0.0
Dec	1.1	1.9	0.3	2.0	0.4	0.0	2.0	0.0	3.0	1.2	1.3	1.3	4.8	1.7
Jan	1.2	1.7	0.4	1.8	0.4	0.0	1.9	0.0	2.9	1.4	1.3	1.3	4.8	1.6
Feb	1.3	2.5	0.4	2.6	0.4	0.0	2.6	0.0	3.7	2.2	2.2	2.2	4.8	1.5
Mar	1.0	2.1	0.3	2.2	0.3	1.0	2.2	0.9	4.0	4.0	4.0	4.0	4.8	0.0
Apr	0.5	2.2	0.2	2.3	0.2	3.5	2.1	3.0	5.5	5.8	5.6	5.6	4.8	0.0
May	0.2	0.0	0.1	0.0	0.1	7.5	0.1	5.6	5.9	8.3	7.4	7.4	3.3	0.0
Jun	0.1	2.2	0.0	2.3	0.0	8.3	1.7	6.2	8.0	9.5	8.0	6.6	4.7	0.0
Jul	0.0	2.2	0.0	2.3	0.0	8.5	1.7	6.4	8.1	9.7	8.1	8.0	4.8	0.0
Aug	0.0	2.6	0.0	2.8	0.0	6.8	2.1	5.1	7.2	8.6	7.2	7.2	4.8	0.0
Sep	0.1	1.6	0.0	1.6	0.0	5.0	1.4	4.3	5.7	6.4	5.7	5.7	4.8	0.0
Oct	0.3	2.5	0.1	2.6	0.1	1.5	2.3	1.3	3.9	4.4	3.9	3.9	4.8	0.0
Total	**6.3**	**24.4**	**2.0**	**25.7**	**2.1**	**42.2**	**22.9**	**32.8**	**61.3**	**63.7**	**56.7**	**54.7**		**4.8**

Leaching Fraction [7]	6.2%
Leaching Requirement [8]	12.5%

NOTES:

Abbreviations: Avail. = available, ET = evapotranspiration, Evap. = evaporation, in/ac = inches per acre, MG = million gallons, ppt = precipitation, PW = process water, SW = storm water.

1 Average precipitation (ppt) data was obtained from the CIMIS (http://www.cimis.ca.gov) for January 1983 to May 2012 from the Shafter station and for June 2012 to July 2013 from the Famoso Station #138.

2 Gross water applied is the total volume of process wastewater, stormwater, and fresh water discharge to the land application site from facility storage or source wells.

3 Net water applied are based on measured process (process wastewater + stormwater) and supplemental fresh water irrigation. Total includes net precipitation. Irrigation efficiency of 75% assumed for May to August and 85% for September to April has been applied to all irrigation and rainfall.

4 The potential evapotranspiration (ET) for wheat-sudangrass/alfalfa crop is reference ET data collected at the Shafter-USDA CIMIS station, Shafter, California.

5 Plant available water in soil profile at month end. Initial available water is assumed to be at field capacity. Available water holding capacity calculated based on particle size analysis from Soil Survey of Kern County, Northwest Part (NRCS-SCS, 1988).

6 Estimated soil water balance. Surplus is water in excess of soil water holding capacity.

7 Leaching Fraction = % of gross water input estimated to percolate beyond root zone = Surplus / Precipitation + Gross Irrigation.

8 Leaching Requirement = Quantity of Surplus required to drain through the soil to leach sufficient soluble salts to maintain soil salinity (ECe) at the existing level of 3.0 mmhos/cm. LR = ECiw / ECdw - ECiw. LR = leaching requirement, Eciw = weighted average EC of ppt, process, storm, and fresh water sources, ECdw = EC of drainage water = 5 x target soil Ece.

Table 14a. Maximum Flow Water Balance - 100-Year Precipitation

Soil Unit: Wasco

Field: Land Application Site **Acres:** 62 **Avail. Water Cap. (in.):** 4.8

Crop: Wheat-Sudangrass/Alfalfa **Min. Soil Depth (in):** 60 **Initial Avail. Water (in.):** 3.0

Month	ppt [1]	Process Water	Storm Water	Gross Water Applied [2]			Net Water Applied [3]			ET [4]			Avail. Water [5]	Surplus [6]
				Process	Stormwater	Fresh	PW+SW	Fresh	Total	Pond Evap	Potential	Estimate		
	in/ac	MG		in/ac			in/ac			in/ac			in/ac	
Nov	0.6	3.8	0.2	2.3	0.1	0.0	2.0	0.0	2.5	2.2	2.0	1.6	3.9	0.0
Dec	0.7	4.0	0.2	2.4	0.1	0.0	2.1	0.0	2.7	1.2	1.3	1.2	4.8	0.7
Jan	1.1	4.0	0.4	2.4	0.2	0.0	2.2	0.0	3.2	1.4	1.3	1.3	4.8	1.9
Feb	5.1	3.7	1.6	2.2	1.0	0.0	2.7	0.0	7.2	2.2	2.2	2.2	4.8	5.0
Mar	2.8	4.0	0.9	2.4	0.5	0.0	2.5	0.0	5.0	4.0	4.0	4.0	4.8	1.0
Apr	0.6	3.8	0.2	2.3	0.1	2.5	2.0	2.1	4.7	5.8	5.6	5.6	3.9	0.0
May	1.6	4.0	0.5	2.4	0.3	4.3	2.0	3.2	6.7	8.3	7.4	6.7	3.9	0.0
Jun	0.7	3.8	0.2	2.3	0.1	6.4	1.8	4.8	7.2	9.5	8.0	7.2	3.9	0.0
Jul	0.0	4.0	0.0	2.4	0.0	7.3	1.8	5.5	7.3	9.7	8.1	7.3	3.9	0.0
Aug	0.0	4.0	0.0	2.4	0.0	6.3	1.8	4.7	6.5	8.6	7.2	6.5	3.9	0.0
Sep	0.1	3.8	0.0	2.3	0.0	3.6	2.0	3.1	5.1	6.4	5.7	5.1	3.9	0.0
Oct	0.4	4.0	0.1	2.4	0.1	1.2	2.1	1.0	3.5	4.4	3.9	3.5	3.9	0.0
Total	**13.6**	**47.0**	**4.3**	**27.9**	**2.6**	**31.6**	**24.9**	**24.4**	**61.6**	**63.7**	**56.7**	**52.1**		**8.6**

Leaching Fraction [7]	11.4%
Leaching Requirement [8]	11.3%

NOTES:

Abbreviations: Avail. = available, ET = evapotranspiration, Evap. = evaporation, in/ac = inches per acre, MG = million gallons, ppt = precipitation, PW = process water, SW = storm water.

1 1998 was the greatest precipitation (ppt) year in 29 years (1983 to 2011). This year was selected to represent the 100 year-return period. This estimation is supported by data from the Arvin weather station 30 miles southeast of Shafter where 1998 had the greatest annual rainfall from 100 years of data.

2 Gross water applied is the total volume of process wastewater, stormwater, and fresh water discharge to the land application site from facility storage or source wells.

3 Net water applied are based on measured process (process wastewater + stormwater) and supplemental fresh water irrigation. Total includes net precipitation. Irrigation efficiency of 75% assumed for May to August and 85% for September to April has been applied to all irrigation and rainfall.

4 The potential evapotranspiration (ET) for wheat-sudangrass/alfalfa crop is reference ET data collected at the Shafter-USDA CIMIS station, Shafter, California.

5 Plant available water in soil profile at month end. Initial available water is assumed to be at field capacity. Available water holding capacity calculated based on particle size analysis from Soil Survey of Kern County, Northwest Part (NRCS-SCS, 1988).

6 Estimated soil water balance. Surplus is water in excess of soil water holding capacity.

7 Leaching Fraction = % of gross water input estimated to percolate beyond root zone = Surplus / Precipitation + Gross Irrigation.

8 Leaching Requirement = Quantity of Surplus required to drain through the soil to leach sufficient soluble salts to maintain soil salinity (ECe) at the existing level of 3.0 mmhos/cm. LR = ECiw / ECdw - ECiw. LR = leaching requirement, Eciw = weighted average EC of ppt, process, storm, and fresh water sources, ECdw = EC of drainage water = 5 x target soil Ece.

Table 14b. Maximum Flow Water Balance - 30-year Average Precipitation

Soil Unit: Wasco

Field: Land Application Site **Acres:** 62 **Avail. Water Cap. (in.):** 4.8

Crop: Wheat-Sudangrass/Alfalfa **Min. Soil Depth (in):** 60 **Initial Avail. Water (in.):** 3.0

Month	ppt [1]	Process Water	Storm Water	Gross Water Applied [2]			Net Water Applied [3]			ET [4]			Avail. Water [5]	Surplus [6]
				Process	Stormwater	Fresh	PW+SW	Fresh	Total	Pond Evap	Potential	Estimate		
	in/ac	MG		in/ac			in/ac			in/ac			in/ac	
Nov	0.5	3.8	0.2	2.3	0.1	1.1	2.0	0.9	3.4	2.2	2.0	1.6	4.8	0.0
Dec	1.1	4.0	0.3	2.4	0.2	0.0	2.2	0.0	3.2	1.2	1.3	1.3	4.8	1.9
Jan	1.2	4.0	0.4	2.4	0.2	0.0	2.2	0.0	3.3	1.4	1.3	1.3	4.8	1.9
Feb	1.3	3.7	0.4	2.2	0.2	0.0	2.0	0.0	3.2	2.2	2.2	2.2	4.8	1.0
Mar	1.0	4.0	0.3	2.4	0.2	1.0	2.2	0.9	4.0	4.0	4.0	4.0	4.8	0.0
Apr	0.5	3.8	0.2	2.3	0.1	3.7	2.0	3.1	5.6	5.8	5.6	5.6	4.8	0.0
May	0.2	4.0	0.1	2.4	0.0	7.2	1.8	5.4	7.4	8.3	7.4	7.4	4.8	0.0
Jun	0.1	3.8	0.0	2.3	0.0	7.2	1.7	5.4	7.2	9.5	8.0	8.0	4.0	0.0
Jul	0.0	4.0	0.0	2.4	0.0	7.5	1.8	5.6	7.4	9.7	8.1	7.4	4.0	0.0
Aug	0.0	4.0	0.0	2.4	0.0	6.3	1.8	4.7	6.5	8.6	7.2	6.6	3.9	0.0
Sep	0.1	3.8	0.0	2.3	0.0	4.8	1.9	4.1	6.1	6.4	5.7	5.1	4.8	0.0
Oct	0.3	4.0	0.1	2.4	0.1	1.8	2.1	1.5	3.9	4.4	3.9	3.9	4.8	0.0
Total	**6.3**	**47.0**	**2.0**	**27.9**	**1.2**	**40.6**	**23.8**	**31.7**	**61.1**	**63.7**	**56.7**	**54.4**		**4.9**

Leaching Fraction [7]	6.5%
Leaching Requirement [8]	12.8%

NOTES:

Abbreviations: Avail. = available, ET = evapotranspiration, Evap. = evaporation, in/ac = inches per acre, MG = million gallons, ppt = precipitation, PW = process water, SW = storm water.

1 Average precipitation (ppt) data was obtained from the CIMIS (http://www.cimis.ca.gov) for January 1983 to May 2012 from the Shafter station and for June 2012 to July 2013 from the Famoso Station #138.

2 Gross water applied is the total volume of process wastewater, stormwater, and fresh water discharge to the land application site from facility storage or source wells.

3 Net water applied are based on measured process (process wastewater + stormwater) and supplemental fresh water irrigation. Total includes net precipitation. Irrigation efficiency of 75% assumed for May to August and 85% for September to April has been applied to all irrigation and rainfall.

4 The potential evapotranspiration (ET) for wheat-sudangrass/alfalfa crop is reference ET data collected at the Shafter-USDA CIMIS station, Shafter, California.

5 Plant available water in soil profile at month end. Initial available water is assumed to be at field capacity. Available water holding capacity calculated based on particle size analysis from Soil Survey of Kern County, Northwest Part (NRCS-SCS, 1988).

6 Estimated soil water balance. Surplus is water in excess of soil water holding capacity.

7 Leaching Fraction = % of gross water input estimated to percolate beyond root zone = Surplus / Precipitation + Gross Irrigation.

8 Leaching Requirement = Quantity of Surplus required to drain through the soil to leach sufficient soluble salts to maintain soil salinity (ECe) at the existing level of 3.0 mmhos/cm. LR = ECiw / ECdw - ECiw. LR = leaching requirement, Eciw = weighted average EC of ppt, process, storm, and fresh water sources, ECdw = EC of drainage water = 5 x target soil Ece.

Table 15a. Fresh Water Only Water Balance - 100 Year Precipitation

Soil Unit: Wasco
Field: Land Application Site | **Acres:** 35 | **Avail. Water Cap. (in.):** 4.8
Crop: Wheat-Sudangrass/Alfalfa | **Min. Soil Depth (in):** 60 | **Initial Avail. Water (in.):** 4.1

Month	ppt [1]	Process Water	Storm Water	Gross Water Applied [2]			Net Water Applied [3]			ET [4]		Avail. Water [5]	Surplus [6]
				Process	Stormwater	Fresh	PW+SW	Fresh	Total	Potential	Estimate		
	in/ac	MG		in/ac			in/ac						
Nov	0.6	0.0	0.0	0.0	0.0	2.8	0.0	2.4	2.9	2.1	1.9	4.8	0.3
Dec	0.7	0.0	0.0	0.0	0.0	1.2	0.0	1.0	1.6	1.3	1.3	4.8	0.4
Jan	1.1	0.0	0.0	0.0	0.0	1.0	0.0	0.9	1.9	1.3	1.3	4.8	0.6
Feb	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	2.2	2.2	4.8	2.4
Mar	2.8	0.0	0.0	0.0	0.0	0.8	0.0	0.7	3.2	3.9	3.9	4.1	0.0
Apr	0.6	0.0	0.0	0.0	0.0	6.3	0.0	5.4	5.9	5.6	5.1	4.8	0.0
May	1.6	0.0	0.0	0.0	0.0	7.0	0.0	5.3	6.7	7.4	7.4	4.0	0.0
Jun	0.7	0.0	0.0	0.0	0.0	10.0	0.0	7.5	8.1	8.1	7.4	4.7	0.0
Jul	0.0	0.0	0.0	0.0	0.0	10.0	0.0	7.5	7.5	8.2	8.2	4.1	0.0
Aug	0.0	0.0	0.0	0.0	0.0	9.8	0.0	7.4	7.4	7.3	6.7	4.7	0.0
Sep	0.1	0.0	0.0	0.0	0.0	6.0	0.0	5.1	5.2	5.8	5.7	4.2	0.0
Oct	0.4	0.0	0.0	0.0	0.0	3.8	0.0	3.2	3.6	4.0	3.7	4.1	0.0
Total	**13.6**	**0.0**	**0.0**	**0.0**	**0.0**	**58.7**	**0.0**	**46.2**	**58.5**	**57.1**	**54.9**		**3.6**

Leaching Fraction [7]	4.9%
Leaching Requirement [8]	11.4%

NOTES:

Abbreviations: Avail. = available, ET = evapotranspiration, Evap. = evaporation, in/ac = inches per acre, MG = million gallons, ppt = precipitation, PW = process water, SW = storm water.

1 1998 was the greatest precipitation (ppt) year in 29 years (1983 to 2011). This year was selected to represent the 100 year-return period. This estimation is supported by data from the Arvin weather station 30 miles southeast of Shafter where 1998 had the greatest annual rainfall from 100 years of data.

2 Gross water applied is the total volume of process wastewater, stormwater, and fresh water discharge to the land application site from facility storage or source wells.

3 Net water applied are based on measured process (process wastewater + stormwater) and supplemental fresh water irrigation. Total includes net precipitation. Irrigation efficiency of 75% assumed for May to August and 85% for September to April has been applied to all irrigation and rainfall.

4 The potential evapotranspiration (ET) for wheat-sudangrass/alfalfa crop is reference ET data collected at the Shafter-USDA CIMIS station, Shafter, California. Estimated ET is estimated actual ET based on soil water content = Potential ET x square root(avail. water ÷ soil avail water capacity)

5 Plant available water in soil profile at month end. Initial available water is assumed to be at field capacity. Available water holding capacity calculated data in from Soil Survey of Kern County, Northwest Part (NRCS-SCS, 1988).

6 Estimated soil water balance. Surplus is water in excess of soil water holding capacity (deep percolation).

7 Leaching Fraction = % of gross water input estimated to percolate beyond root zone = Surplus / Precipitation + Gross Irrigation.

8 Leaching Requirement = Quantity of Surplus required to drain through the soil to leach sufficient soluble salts to maintain soil salinity (ECe) at 3.0 mmhos/cm. LR = ECiw / ECdw - ECiw. LR = leaching requirement, Eciw = weighted average EC of ppt, process, storm, and fresh water sources, ECdw = EC of drainage water = 5 x target soil Ece.

Table 15b. Fresh Water Only Water Balance - Average Year Precipitation

Soil Unit: Wasco

Field: Land Application Site | **Acres:** 35 | **Avail. Water Cap. (in.):** 4.8

Crop: Wheat-Sudangrass/Alfalfa | **Min. Soil Depth (in):** 60 | **Initial Avail. Water (in.):** 4.1

Month	ppt [1]	Process Water	Storm Water	Gross Water Applied [2]			Net Water Applied [3]			ET [4]		Avail. Water [5]	Surplus [6]
				Process	Stormwater	Fresh	PW+SW	Fresh	Total	Potential	Estimate		
	in/ac	MG		in/ac			in/ac						
Nov	0.6	0.0	0.0	0.0	0.0	1.7	0.0	1.4	2.0	2.1	1.9	4.1	0.0
Dec	1.1	0.0	0.0	0.0	0.0	1.5	0.0	1.3	2.2	1.3	1.2	4.8	0.4
Jan	1.3	0.0	0.0	0.0	0.0	1.3	0.0	1.1	2.2	1.3	1.3	4.8	0.9
Feb	1.1	0.0	0.0	0.0	0.0	1.7	0.0	1.4	2.4	2.2	2.2	4.8	0.2
Mar	1.1	0.0	0.0	0.0	0.0	2.7	0.0	2.3	3.2	3.9	3.9	4.1	0.0
Apr	0.5	0.0	0.0	0.0	0.0	6.0	0.0	5.1	5.5	5.6	5.2	4.5	0.0
May	0.2	0.0	0.0	0.0	0.0	9.1	0.0	6.8	7.0	7.4	7.2	4.2	0.0
Jun	0.1	0.0	0.0	0.0	0.0	10.0	0.0	7.5	7.6	8.1	7.6	4.2	0.0
Jul	0.0	0.0	0.0	0.0	0.0	10.0	0.0	7.5	7.5	8.2	7.7	4.0	0.0
Aug	0.0	0.0	0.0	0.0	0.0	9.8	0.0	7.4	7.4	7.3	6.7	4.8	0.0
Sep	0.1	0.0	0.0	0.0	0.0	6.0	0.0	5.1	5.2	5.8	5.8	4.2	0.0
Oct	0.3	0.0	0.0	0.0	0.0	4.0	0.0	3.4	3.6	4.0	3.7	4.1	0.0
Total	**6.3**	**0.0**	**0.0**	**0.0**	**0.0**	**63.8**	**0.0**	**50.3**	**55.7**	**57.1**	**54.3**		**1.4**

Leaching Fraction [7]	2.0%
Leaching Requirement [8]	12.9%

NOTES:

Abbreviations: Avail. = available, ET = evapotranspiration, Evap. = evaporation, in/ac = inches per acre, MG = million gallons, ppt = precipitation, PW = process water, SW = storm water.

1 Average precipitation (ppt) data was obtained from the CIMIS (http://www.cimis.ca.gov) for January 1983 to May 2012 from the Shafter station and for June 2012 to July 2013 from the Famoso Station #138.

2 Gross water applied is the total volume of process wastewater, stormwater, and fresh water discharge to the land application site from facility storage or source wells.

3 Net water applied are based on measured process (process wastewater + stormwater) and supplemental fresh water irrigation. Total includes net precipitation. Irrigation efficiency of 75% assumed for May to August and 85% for September to April has been applied to all irrigation and rainfall.

4 The potential evapotranspiration (ET) for wheat-sudangrass/alfalfa crop is reference ET data collected at the Shafter-USDA CIMIS station, Shafter, California. Estimated ET is estimated actual ET based on soil water content = Potential ET x square root(avail. water ÷ soil avail water capacity)

5 Plant available water in soil profile at month end. Initial available water is assumed to be at field capacity. Available water holding capacity calculated data in from Soil Survey of Kern County, Northwest Part (NRCS-SCS, 1988).

6 Estimated soil water balance. Surplus is water in excess of soil water holding capacity (deep percolation).

7 Leaching Fraction = % of gross water input estimated to percolate beyond root zone = Surplus / Precipitation + Gross Irrigation.

8 Leaching Requirement = Quantity of Surplus required to drain through the soil to leach sufficient soluble salts to maintain soil salinity (ECe) at 3.0 mmhos/cm. LR = ECiw / ECdw - ECiw. LR = leaching requirement, Eciw = weighted average EC of ppt, process, storm, and fresh water sources, ECdw = EC of drainage water = 5 x target soil Ece.

Table 16. Water Balance Summary

Crop	Acres	Process Water	Stormwater	Total Process Water Flow		Supplemental Fresh Water		Leaching Fraction
		MG		MG	ac-ft.	MG	ac-ft.	%
Fresh Water Only - 100 Year Precipitation								
Wheat-Sudangrass/Alfalfa	35	0.0	0.0	0.0	0.0	55.8	171.3	4.9%
Fresh Water Only - Average Year Precipitation								
Wheat-Sudangrass/Alfalfa	35	0.0	0.0	0.0	0.0	60.6	186.1	2.0%
2016 Flow - 100 Year Precipitation								
Wheat-Sudangrass/Alfalfa	35	26.3	4.3	30.6	94.0	32.5	99.8	8.8%
2016 Flow - Average Year Precipitation								
Wheat-Sudangrass/Alfalfa	35	24.4	2.0	26.4	81.1	40.1	123.1	6.2%
Maximum Flow - 100 Year Precipitation								
Wheat-Sudangrass/Alfalfa	62	47.0	4.3	51.3	157.5	53.2	163.3	11.4%
Maximum Flow - Average Year Precipitation								
Wheat-Sudangrass/Alfalfa	62	47.0	2.0	48.9	150.3	68.3	209.6	6.5%

NOTES:

Abbreviations: % = percent, ac-ft = acre feet, MG = million gallons.

Table 17. Example Salts Balances - Average Year Precipitation

Crop		Acres	Salts Load [1]			Salts Removal			Net Salts Load [3]	
			Process Wastewater	Fresh Water	Total Salts	Crop Ash	Crop Yield [2]	Total Removal		
			lb/ac			%	tons per acre	lb/ac	lb/ac	%
Fresh Water Only ---Tables 15a, 15b										
Avg Precip	Wheat-Sudangrass	35	0	12,971	12,970	8%	8.5	1,360	11,610	90%
	Alfalfa	35	0	12,971	12,970	10%	8.0	1,600	11,370	88%
100-yr Precip	Wheat-Sudangrass	35	0	11,934	11,930	8%	8.5	1,360	10,570	89%
	Alfalfa	35	0	11,934	11,930	10%	8.0	1,600	10,330	87%
2016 Flow (31.87 MG) ---Tables 13a, 13b										
Avg Precip	Wheat-Sudangrass	35	13,101	8,580	21,680	8%	8.5	1,360	20,320	94%
	Alfalfa	35	13,101	8,580	21,680	10%	8.0	1,600	20,080	93%
100-yr Precip	Wheat-Sudangrass	35	13,101	6,953	20,050	8%	8.5	1,360	18,690	93%
	Alfalfa	35	13,101	6,953	20,050	10%	8.0	1,600	18,450	92%
Maximum Future Flow (46.96 MG) ---Tables 14a, 14b										
Avg Precip	Wheat-Sudangrass	62	10,896	8,244	19,140	8%	8.5	1,360	17,780	93%
	Alfalfa	62	10,896	8,244	19,140	10%	8.0	1,600	17,540	92%
100-yr Precip	Wheat-Sudangrass	62	10,896	6,425	17,320	8%	8.5	1,360	15,960	92%
	Alfalfa	62	10,896	6,425	17,320	10%	8.0	1,600	15,720	91%

NOTES:

Worst case salts balance comparison with greatest process wastewater salts load and lowest fresh water salts load because of the high rainfall.

Abbreviations: % = percent, Avg = average, tons = US tons (2,000 pounds), lb/ac = pounds per acre, precip = precipitation, yr = year.

1 Estimated based on the average process wastewater fixed dissolved solids from 2012 and fresh water fixed dissolved solids from 2014.

2 Estimates of crop uptake for a wheat-sudangrass rotation, with 4 cuttings per year, estimating 8.5 tons per acre of dry matter yield. Alfalfa assumes up to 6 cuttings per year and a yield of 8 tons per acre. Estimated salts removal is based on the approximate ash content of the wheat, sudangrass, and alfalfa hay based on professional experience.

3 Total salts load minus total salts removal. This is the amount of salts that would be expected to remain in the soil.

Table 18. Projected Future Groundwater (Cmix) Electrical Conductivity and Fixed Dissolved Solids Concentrations

Acres	Scenario	Total Percolate [1]	Cp		Qp	Cgw		Qgw		Cmix $_{low\ flow}$ [2]		Cmix $_{high\ flow}$ [2]	
			EC	FDS	Average Percolate Flow	EC	FDS	Groundwater Flow		EC	FDS	EC	FDS
		MG	µmhos/cm	mg/L	MGD	µmhos/cm	mg/L	MGD		µmhos/cm	mg/L	µmhos/cm	mg/L
Fresh Water Only ---Tables 15a, 15b													
35	Average Rainfall	1.3	9,727	6,209	0.0037	1,492	900	1.4	4.0	1,510	910	1,500	900
35	100 Year Rainfall	3.4	9,337	6,147	0.0093	1,492	900	1.4	4.0	1,540	930	1,510	910
2016 Flow (31.87 MG) ---Tables 13a, 13b													
35	Average Rainfall	4.5	12,028	9,625	0.0124	1,492	900	1.4	4.0	1,580	980	1,520	930
35	100 Year Rainfall	6.7	12,790	10,062	0.0183	1,492	900	1.4	4.0	1,640	1,020	1,540	940
Maximum Future Flow (46.96 MG) ---Tables 14a, 14b													
62	Average Rainfall	8.3	11,655	8,626	0.0227	1,492	900	1.4	4.0	1,650	1,020	1,550	940
62	100 Year Rainfall	14.5	12,202	8,828	0.0397	1,492	900	1.4	4.0	1,790	1,120	1,600	980

NOTES:

Calculated future groundwater concentrations using the Cmix method that computes the results of mixing of percolate with groundwater.

Cmix = [(Cp x Qp) +(Cgw x Qgw)] / (Qp + Qgw),

Where:

Cmix = concentration in groundwater following mixing of percolate (future groundwater)

Cp = average concentration in deep percolation; average combined (precipitation, process water, and fresh water) ÷ leaching fraction

Qp = flow rate of percolate = total annual deep percolation at leaching requirement averaged across 365 days

Cgw = concentration in groundwater from irrigation well; average of two samples in 2014

Qgw = flow rate of groundwater (Transmissivity (T) x site width x groundwater gradient); 1.4 to 4.0 MGD

T = 160,000 to 460,000 gpd/ft, site width = 2,700 ft, gradient = 0.00322

Abbreviations: EC = electrical conductivity, FDS = fixed dissolved solids, mg/L = milligrams per liter, MG = million gallons, MGD = million gallons per day, µmhos/cm = micromhos per centimeter.

1 Total Percolate is the annual total deep percolation from irrigation leaching fraction.

2 Cmix low flow and Cmix high flow represent potential future long term groundwater concentrations at the potential range of groundwater flow beneath the 99-acre Site.

FIGURES

Figure 1. Site Location Map
Figure 2 Facility Map
Figure 3. Available Land Application Area – 99-Acre Site
Figure 4. Current Process Wastewater Flow Diagram
Figure 5. Future Process Wastewater Flow Diagram

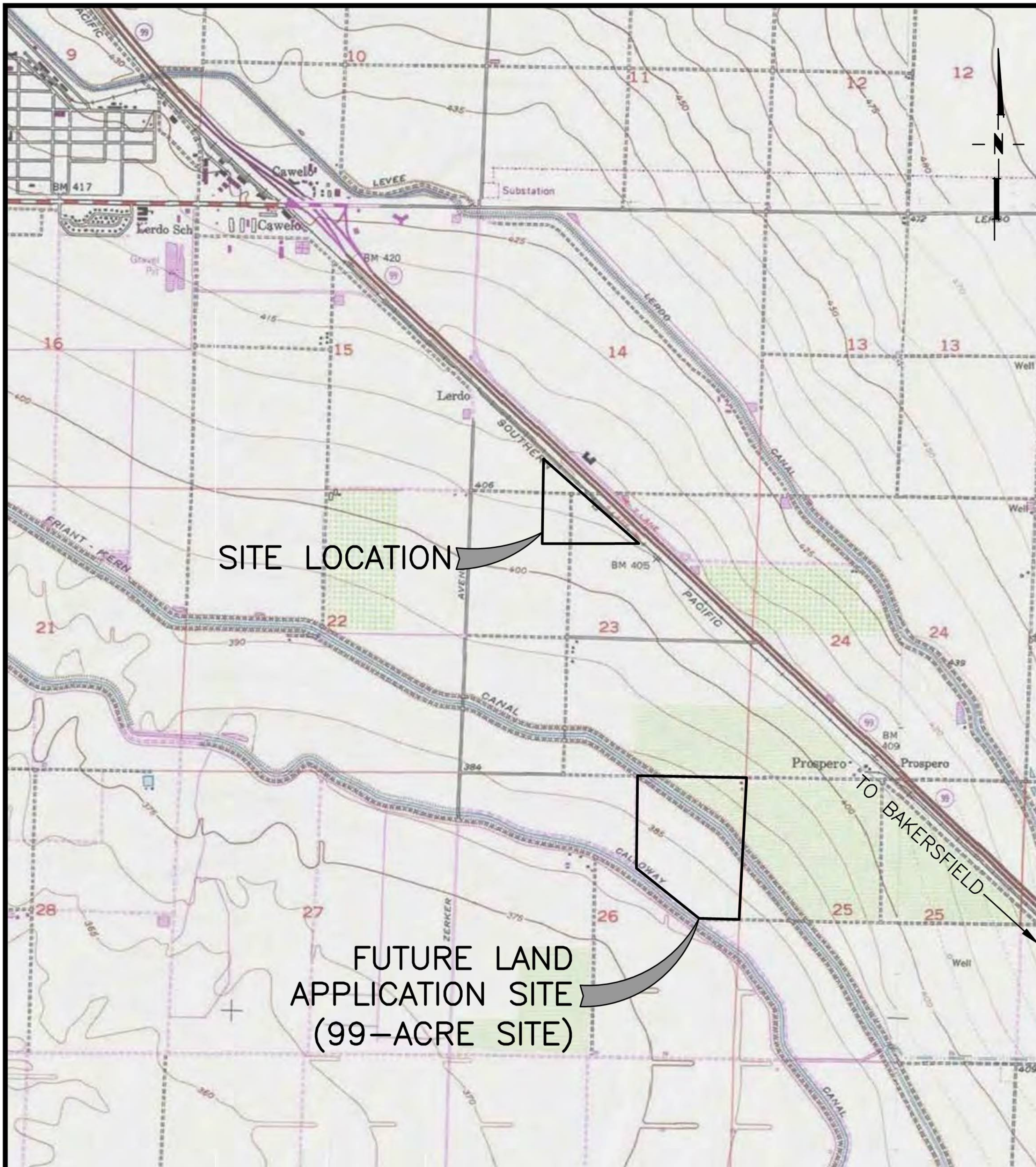
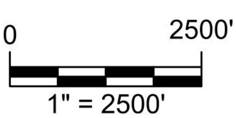


Figure 1. Site Location Map



(SCALE AND LOCATIONS ARE APPROXIMATE)

(SOURCE: USGS Topographic map from ArcGIS ©ESRI 2013)

PROJECT NUMBER: 2016210030	Technical Report of Waste Discharge
DATE: 11/9/2018	
DWG NO: 2016210030 F1.dwg	The Garlic Company 18602 Zerker Road Bakersfield, CA 93314
DWG BY: 1DJR / PROJECT MANAGER: 10MSS	
REVISED:	CES CASCADE EARTH SCIENCES

S:\[Working Drafting]\2016210030 Garlic Company\DWG\Technical Report Of Wastewater Discharge\Drawings\Tech Rpt Of Waste Discharge\2016210030 F1.dwg November 12, 2018 DR702784

SOURCE: GOOGLE EARTH PRO IMAGE, OCTOBER 2016

Figure 2. Facility Map

PROJECT NUMBER: 2016210030	Technical Report of Waste Discharge
DATE: 11/9/2018	
DWG NO: 2016210030 F2-3.dwg	The Garlic Company 18602 Zerker Road Bakersfield, CA 93314
DWG BY: 6DJR / PROJECT MANAGER: 10MSS	
REVISED:	CES CASCADE EARTH SCIENCES

SOURCE: GOOGLE EARTH PRO IMAGE, OCTOBER 2016

Figure 3. Available Land Application Area – 99-Acre Site

PROJECT NUMBER: 2016210030	Technical Report of Waste Discharge
DATE: 11/9/2018	
DWG NO: 2016210030 F2-3.dwg	The Garlic Company 18602 Zerker Road Bakersfield, CA 93314
DWG BY: 6DJR; PROJECT MANAGER: 10MSS	
REVISED:	CES CASCADE EARTH SCIENCES

S:\[Working Drafting]\2016210030 Garlic Company\DWG\Technical Report Of Wastewater Discharge\Drawings\Tech Rpt Of Waste Discharge\2016210030 F2-3.dwg November 14, 2018 DR702784

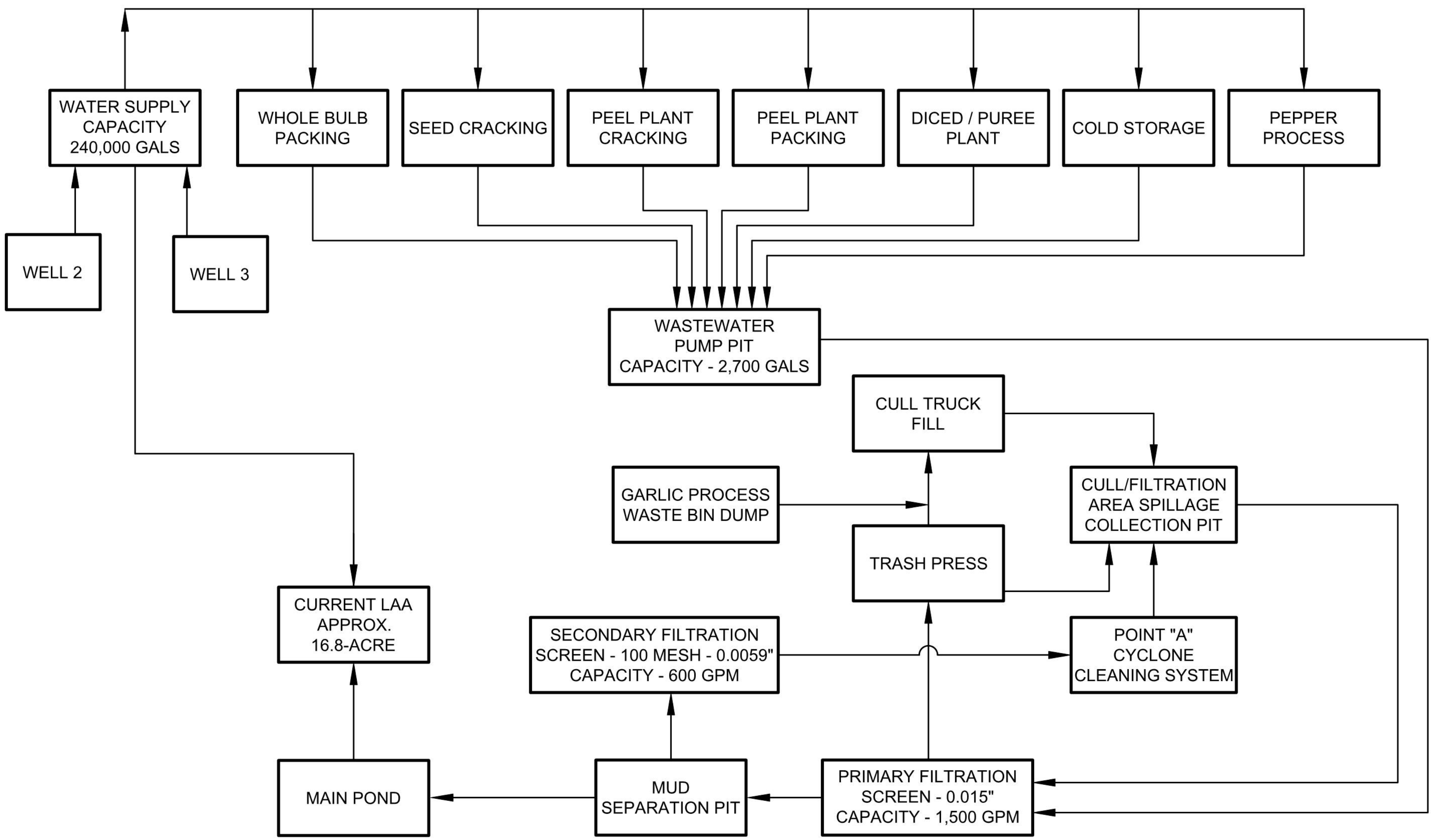


Figure 4. Current Process Wastewater Flow Diagram

PROJECT NUMBER: 2016210030	Technical Report of Waste Discharge
DATE: 11/9/2018	
DWG NO: 2016210030 F4.DWG	The Garlic Company 18602 Zerker Road Bakersfield, CA 93314
DWG BY: 6DJR / PROJECT MANAGER: 10MSS	
REVISED:	CES CASCADE EARTH SCIENCES

2016210030 F4.dwg November 12, 2018 DR702784

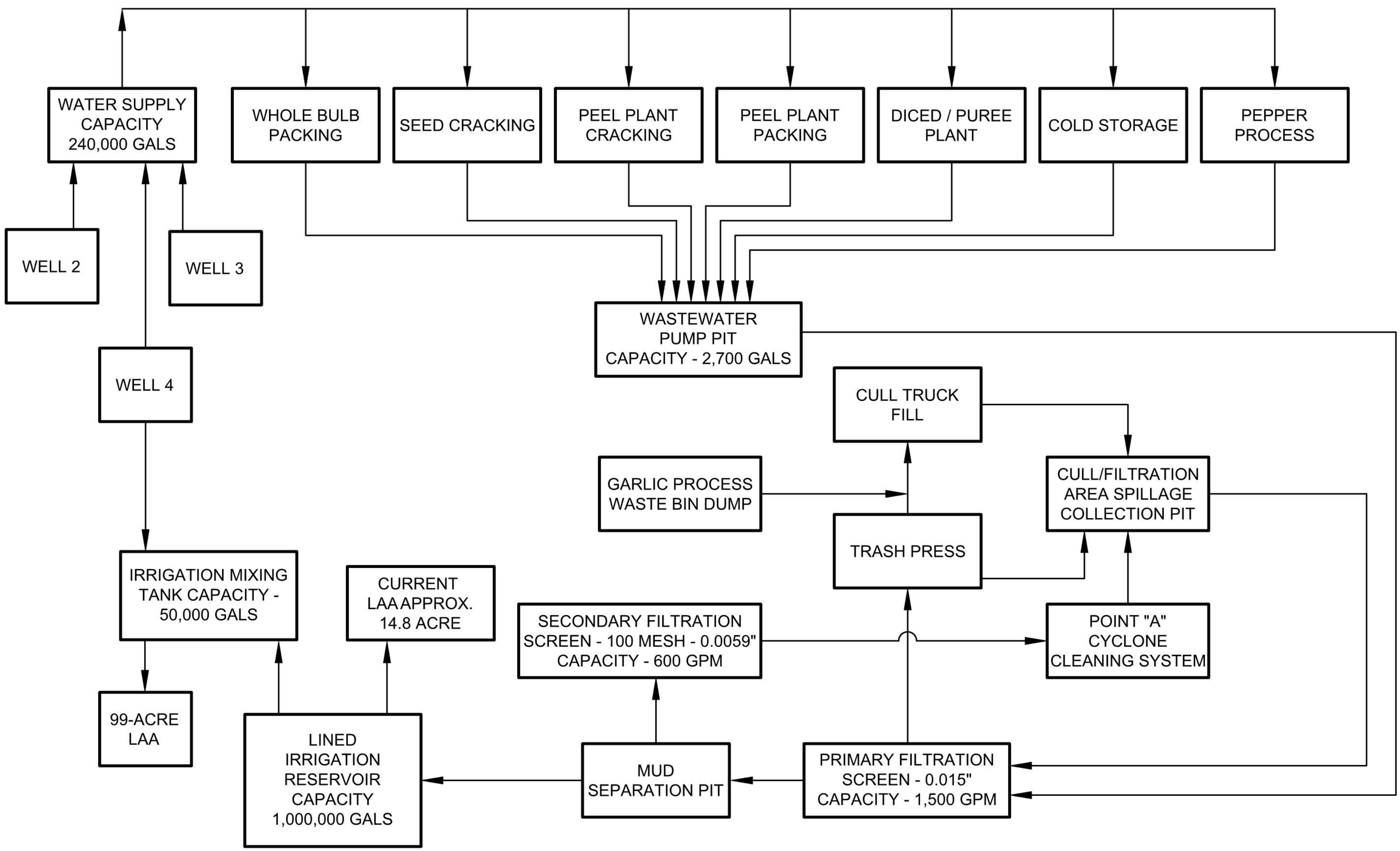


Figure 5. Future Process Wastewater Flow Diagram

PROJECT NUMBER: 2016210030	Technical Report of Waste Discharge
DATE: 11/9/2018	
DWG NO: 2016210030 F5.DWG	The Garlic Company 18602 Zerker Road Bakersfield, CA 93314
DWG BY: 6DJR / PROJECT MANAGER: 10MSS	
REVISED:	CES CASCADE EARTH SCIENCES

APPENDICES

Appendix A. **Reservoir Design Plan**
Appendix B. **Leak Detection Plan**
Appendix C. **Safety Data Sheets for Chemical Processing**
Appendix D. **High Speed Rail Easement**
Appendix E. **California Water Resources Groundwater Level Data Records**
Appendix F. **Kern County Water Agency Groundwater Quality Data Records**
Appendix G. **Custom Soil Report**
Appendix H. **Official Soil Series Descriptions**
Appendix I. **Soil Analysis Data**
Appendix J. **Addendum to the Updated Anti-Degradation Analysis**

Appendix A.

Reservoir Design Plan

THE GARLIC COMPANY

GRADING PLAN

PROPOSED WASTE WATER RESEVOIR

CITY OF SHAFTER, STATE OF CALIFORNIA

EARTHWORK QUANTITIES

THE QUANTITIES SHOWN BELOW ARE FOR GRADING PERMIT PURPOSES ONLY, AND SHALL NOT BE USED FOR BIDDING PURPOSES. THE CONTRACTOR SHALL MAKE HIS OWN ESTIMATE OF QUANTITIES FOR BIDDING THIS PROJECT.

ALL QUANTITIES WERE CALCULATED BASED ON A 0.1 FT LOSS DUE TO CLEARING AND GRUBBING OF THE SITE. THE ENGINEER MAKES NO WARRANTY AS TO THE ANTICIPATED SHRINKAGE FACTOR.

EARTHWORK CALCULATION

CUT	5,700 C.Y.
FILL	0 C.Y.
EARTHWORK TOTAL =	5,700 C.Y. (EXPORT)

EXPORT MATERIAL TO BE STOKPILED ONSITE FOR FUTURE GRADING PROJECTS.

SHEET NO. INDEX

C1	TITLE SHEET
C2	GENERAL NOTES
C3	GRADING PLAN
C3A	GRADING PLAN (AERIAL)
C4	CROSS SECTIONS AND DETAILS
C5	EROSION CONTROL
C6	BMPS

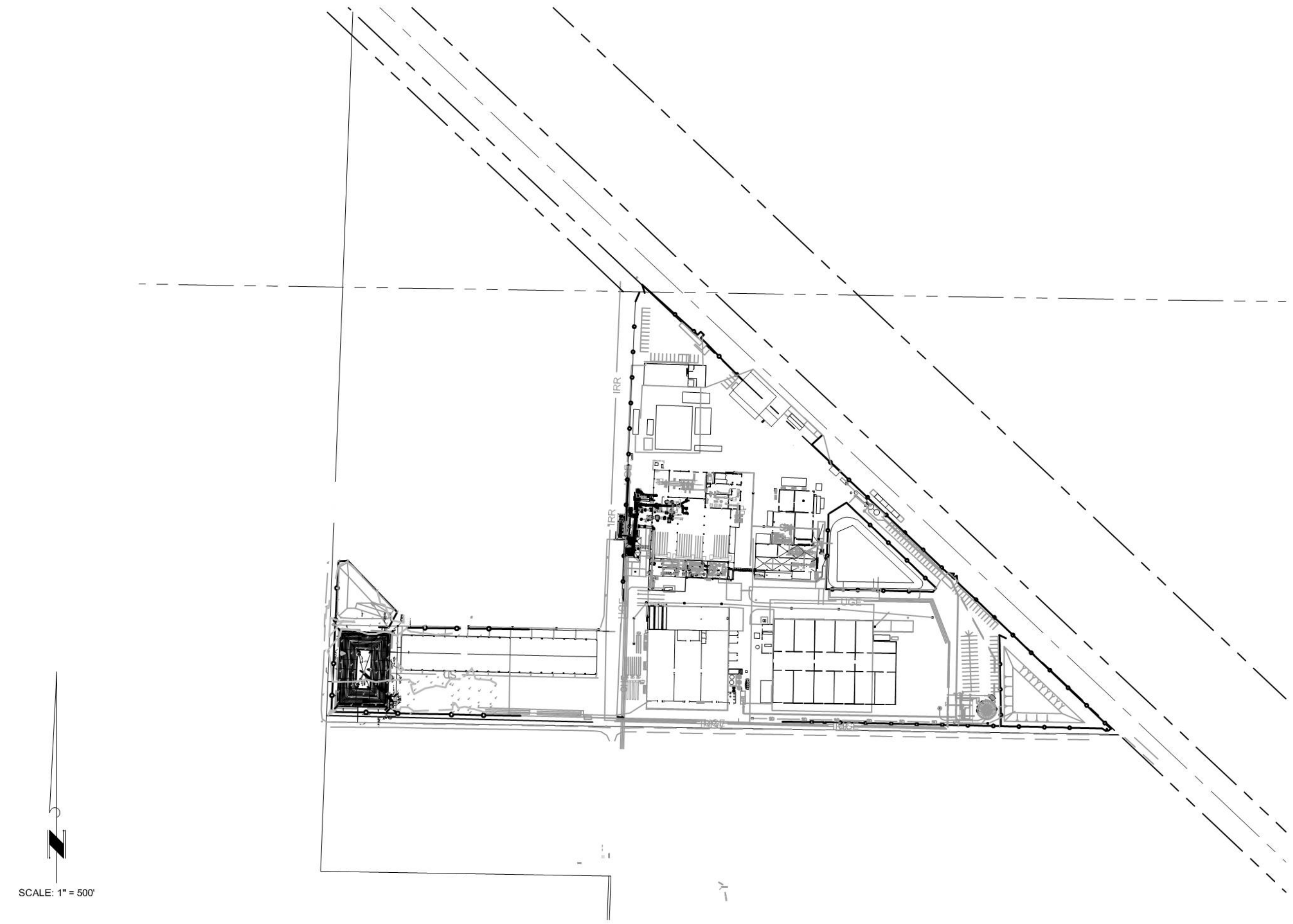
NOTE:

IF THE PROJECT IS SUBJECT TO THE PROVISIONS OF THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES), A "NOTICE OF INTENT" (NOI) TO COMPLY WITH THE TERMS OF THE GENERAL PERMIT TO DISCHARGE STORM WATER ASSOCIATED WITH CONSTRUCTION ACTIVITY
(SWRCB ORDER NO. 2009-009-DWQ AS AMENDED BY ORDER 2010-0014-DWQ AND ORDER 2012-0006-DWQ) MUST BE FILED WITH STATE WATER RESOURCES CONTROL BOARD IN SACRAMENTO BEFORE THE BEGINNING OF ANY CONSTRUCTION ACTIVITY. COMPLIANCE WITH THE GENERAL PERMIT REQUIRES THAT A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) BE PREPARED, CONTINUOUSLY CARRIED OUT, AND ALWAYS BE AVAILABLE FOR PUBLIC INSPECTION DURING NORMAL CONSTRUCTION HOURS.

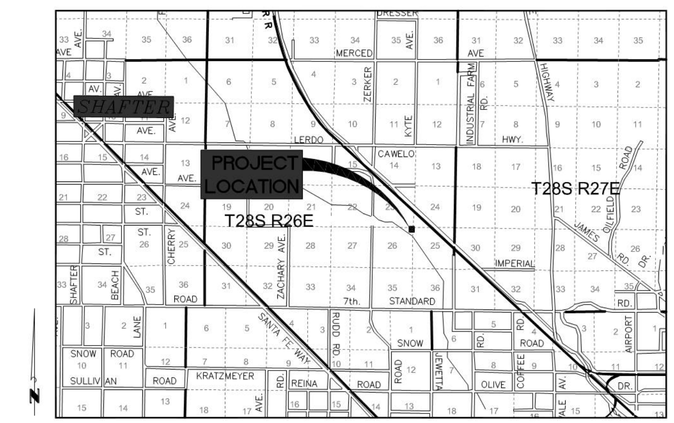
UTILITY NOTE:

NOT ALL UTILITIES WERE LOCATED BY THIS SURVEY AND LANDMARK SURVEYING AND ENGINEERING ASSUMES NO RESPONSIBILITY FOR UNDERGROUND UTILITIES OR FACILITIES NOT SHOWN OR FOR INFORMATION OBTAINED FROM OUTSIDE SOURCES.

CONTRACTOR TO VERIFY LOCATION OF ALL UTILITIES PRIOR TO ANY EXCAVATION.



INDEX MAP
NOT TO SCALE



VICINITY MAP
NO SCALE

CALIFORNIA MAP
NOT TO SCALE

LEGAL DESCRIPTION:

BEING THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER SECTION 32, TOWNSHIP 28 SOUTH, RANGE 26 EAST, MOUNT DIABLO BASE AND MERIDIAN IN THE COUNTY OF KERN, STATE OF CALIFORNIA.

APN:

APN: 091-220-04

BENCHMARK USED:

CONCRETE MONUMENT WITH BRASS CAP ALSO BEING THE NORTHEAST CORNER OF SECTION 26, T.28S., R.26E., PER RECORD OF SURVEY 8329 BK. 6, PG. 150, SAID CORNER BEING LOCATED ABOUT 153.81' ± FEET NORTHEAST OF THE NORTHEAST CORNER OF SECTION 26.

ELEVATION = 276.63' (U.S.G.S. DATUM)

BASIS OF BEARINGS:

THE BEARING OF SOUTH 02°13'08 SOUTH ALONG THE EAST LINE OF THE NORTHEAST QUARTER OF SECTION 26 PER SURVEYED CORNERS.

ENGINEER

LANDMARK SURVEYING AND ENGINEERING
3101 N. SILLECT AVE, SUITE 103
BAKERSFIELD, CA 93308
PHONE: (661) 859-1923
CONTACT: MICHAEL DAUSTER

OWNER

THE GARLIC COMPANY
18602 ZERKER ROAD,
BAKERSFIELD, CA 93314

REGISTERED PROFESSIONAL ENGINEER
JOHN H. HULSON SR.
RCE 38265
CIVIL
STATE OF CALIFORNIA

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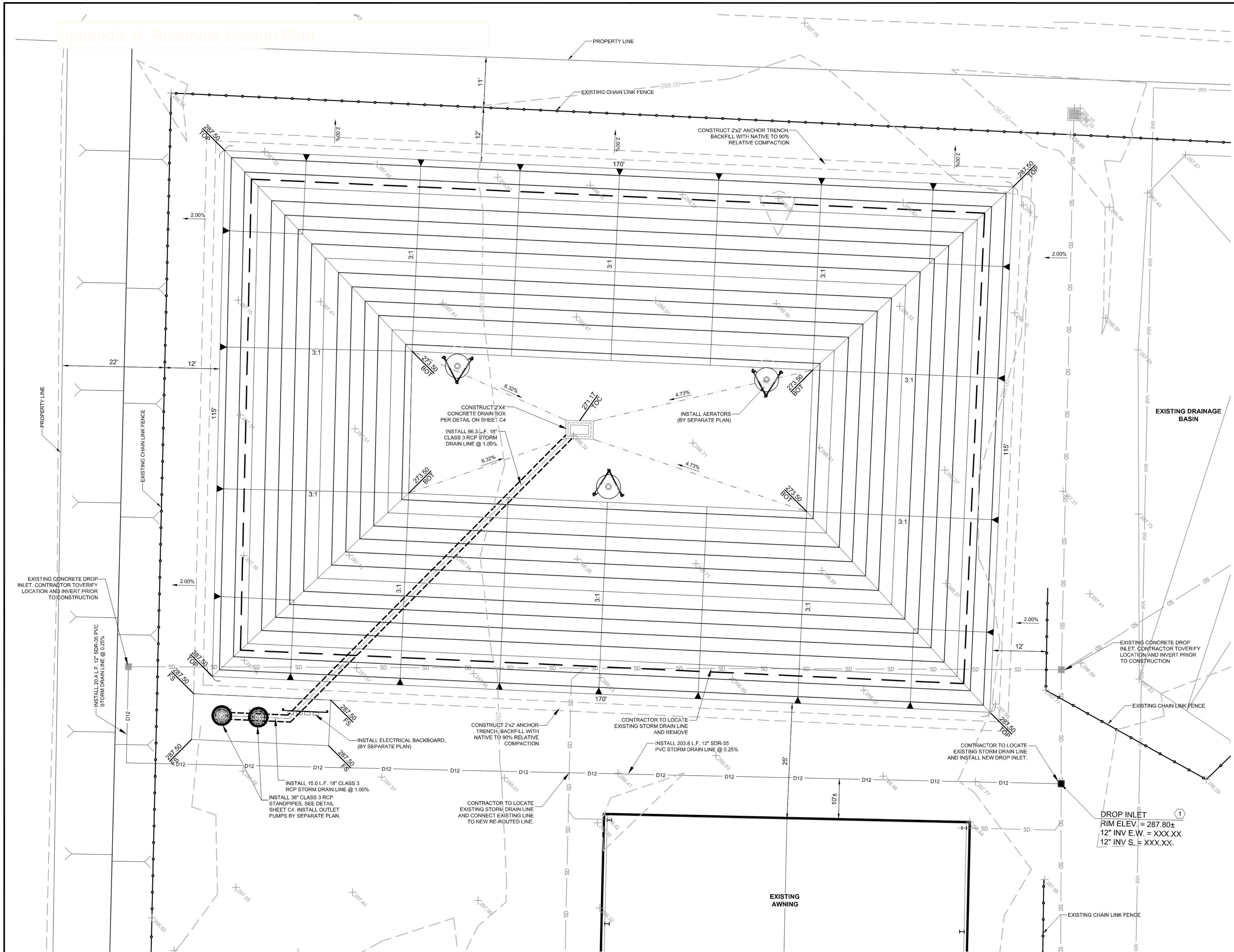
3101 N. SILLECT AVENUE | SUITE 103 | BAKERSFIELD, CA 93308
TEL: (661) 859-1923 | FAX: (661) 859-1376 | WEB: LANDMARKSE.COM

DATE	DRAWN BY	CHECKED BY	APPROVAL	ENGINEER
02/23/2018	MED	JNW	JHH	JHH
SCALE AS SHOWN	CAD FILE			PLOT SCALE

THE GARLIC COMPANY
CITY OF SHAFTER, COUNTY OF KERN, STATE OF CALIFORNIA
PROPOSED 50,000 GALLON WATER TANK GRADING

DWG. NO.	SHT.	REV.
GARLIC COMPANY	1 OF 6	0

Appendix A. Reservoir Design Plan



LEGEND

- SECTION LINE
- OE — EXISTING OVERHEAD ELECTRICAL TRANSMISSION LINES
- WS — EXISTING WATER LINE & SIZE
- D6 — EXISTING DRAIN LINE & SIZE
- UGE — EXISTING UNDERGROUND ELECTRICAL
- OE — EXISTING OVERHEAD HIGH VOLTAGE
- T — EXISTING UNDERGROUND TELEPHONE LINE
- G — EXISTING UNDERGROUND GAS LINE
- 400' — PROPOSED 1' MAJOR CONTOUR
- 401' — PROPOSED 1' MINOR CONTOUR
- 400' — EXISTING 1' MAJOR CONTOUR
- 401' — EXISTING 1' MINOR CONTOUR

- 2.0% = PROPOSED GRADIENT
- 500.00 FS = PROPOSED GRADE ELEVATION
- FL = FLOWLINE
- FS = FINISHED SURFACE
- FS-GB = FINISHED SURFACE & GRADE BREAK
- FS-BC = FINISHED SURFACE & BEGIN CURVE
- FS-EC = FINISHED SURFACE & END CURVE
- FL-HP = FLOWLINE & HIGH POINT
- EDR = EDGE OF DIRT ROAD
- TC = TOP OF CONCRETE
- TG = TOP OF GRATE
- GB = GRADE BREAK
- NG = NATURAL GRADE
- = PROPOSED ACCESS ROAD - GRAVEL (0.35" THICK CLASS 3 AGGREGATE BASE)

CONSTRUCTION NOTES

1. INSTALL CHRISTY U23 CATCH BASIN WITH U21-HT WELDED STEEL GRATE

GRADING NOTES

1. NO BUILDING PERMITS SHALL BE ISSUED UNTIL ADEQUATE ACCESS AND ADEQUATE WATER SUPPLY FOR FIRE PROTECTION PURPOSES IS PROVIDED, AS APPROVED BY THE KERN COUNTY FIRE DEPARTMENT.

2. DURING GRADING OPERATIONS, THE APPLICATION FOR A DEVELOPMENT PERMIT SHALL BE RESPONSIBLE FOR THE APPLICATION OF WATER TO DEVELOPMENT SITES TO MITIGATE THE IMPACT OF DUST AND PM-10 PARTICULATE EMISSIONS. SPRAYING SHOULD BE SUFFICIENT TO ENSURE THAT SOILS REMAIN DAMP, WITH THE FREQUENCY OF SPRAYING DEPENDENT ON WEATHER CONDITIONS. VERIFICATION OF COMPLIANCE WILL BE THE RESPONSIBILITY OF THE KERN COUNTY ENGINEERING AND SURVEY SERVICES DEPARTMENT/BUILDING INSPECTION DIVISION.

3. DURING GRADING OPERATIONS, ALL ACTIVITY SHALL BE RESTRICTED TO PERIODS OF LOW WIND TO REDUCE DUST EMISSIONS. VERIFICATION OF COMPLIANCE WILL BE THE RESPONSIBILITY OF THE KERN COUNTY ENGINEERING AND SURVEY SERVICES DEPARTMENT/BUILDING INSPECTION DIVISION.

4. CONSTRUCTION SPEED LIMITS WILL BE POSTED AT 15 MILES PER HOUR. VERIFICATION OF COMPLIANCE WILL BE THE RESPONSIBILITY OF THE KERN COUNTY ENGINEERING AND SURVEY SERVICES DEPARTMENT/BUILDING INSPECTION DIVISION.

5. DURING GRADING AND CONSTRUCTION, ALL ACTIVITIES ADJACENT TO RESIDENTIAL DEVELOPMENT SHALL BE LIMITED TO 7:00 A.M. TO 7:00 P.M., MONDAY THROUGH FRIDAY. CONSTRUCTION WILL NOT BE ALLOWED ON WEEKENDS OR ON FEDERAL HOLIDAY. VERIFICATION OF COMPLIANCE WILL BE THE RESPONSIBILITY OF THE KERN COUNTY ENGINEERING AND SURVEY SERVICES DEPARTMENT/BUILDING INSPECTION DIVISION.

6. ALL WORK WITHIN STREET RIGHT OF WAY SHALL BE DONE UNDER SEPARATE ENCROACHMENT PERMIT FROM KERN COUNTY ROADS DEPARTMENT.

WASTE WATER RESEVOIR

PROVIDED CONTAINMENT VOLUME = *882,252* GALLONS
DESIGN HIGH WATER MARK = 285.50'
MID POINT ELEVATION (GRADE CHANGE) = 273.50
LOWEST ELEVATION OF CONTAINMENT AREA = 271.17'
AVERAGE CONTAINMENT DEPTH = 12.33'
AREA OF TOP OF BASIN = 19,711 S.F.
AREA OF DESIGN WATER ELEVATION (2' FREEBOARD) = 16,418 S.F.
AREA BOTTOM OF CONTAINMENT = 2,709 S.F.
AVERAGE AREA OF CONTAINMENT = 9,564 S.F.
TOTAL VOLUME = *882,252* GALLONS
FREEBOARD VOLUME = 270,250 GALLONS

REGISTERED PROFESSIONAL ENGINEER
JOHN H. HULSON SR.
RCE 38265
CIVIL
STATE OF CALIFORNIA

10 0 5 10
1 INCH = 10 FEET

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DWG. NO.	REFERENCE DRAWINGS	NO.	MATERIAL SUMMARY DESCRIPTION	QUANTITY
		1	-	394 L.F.
				1
				2
				1

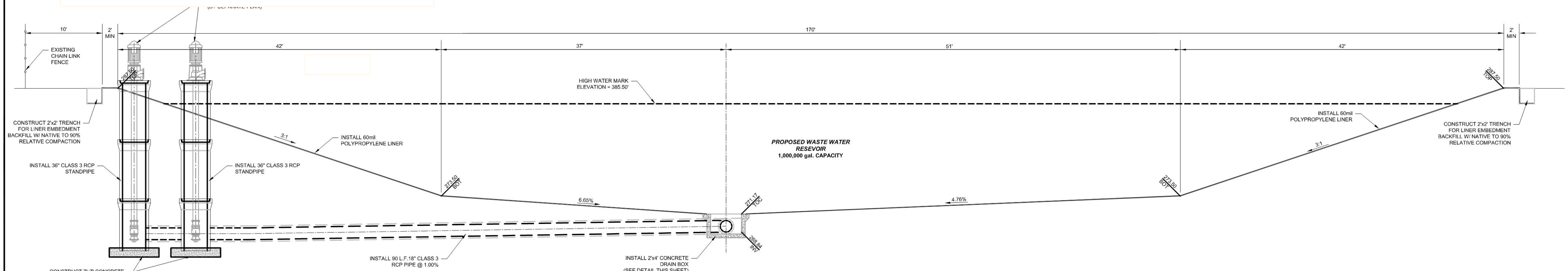
REV.	DATE	DESCRIPTION	DR.	CK.	APP'D
0	-	ISSUED FOR REVIEW	MED	JNW	JHH

DATE	DRAWN BY	CHECKED BY	APPROVAL	ENGINEER
02/23/2018	MED	JNW	JHH	JHH
SCALE: AS SHOWN	CAD FILE: -			PLOT SCALE: -

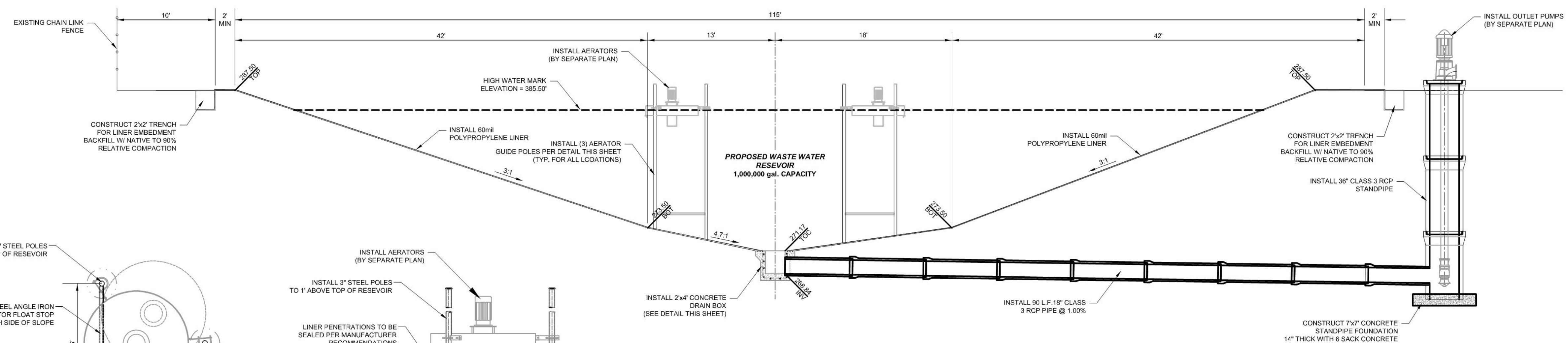
THE GARLIC COMPANY
CITY OF SHAFTER, COUNTY OF KERN, STATE OF CALIFORNIA
PROPOSED 50,000 GALLON WATER TANK GRADING

DWG. NO. GARLIC COMPANY | SHT. 3 OF 6 | REV. 0

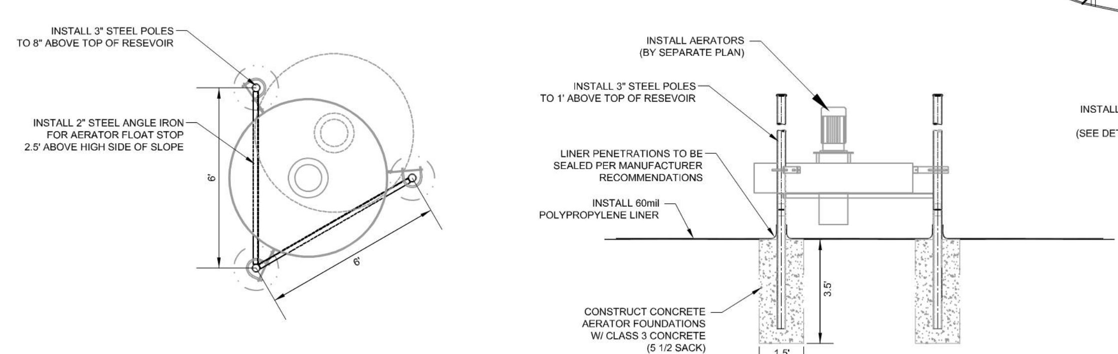
Appendix A. Reservoir Design Plan



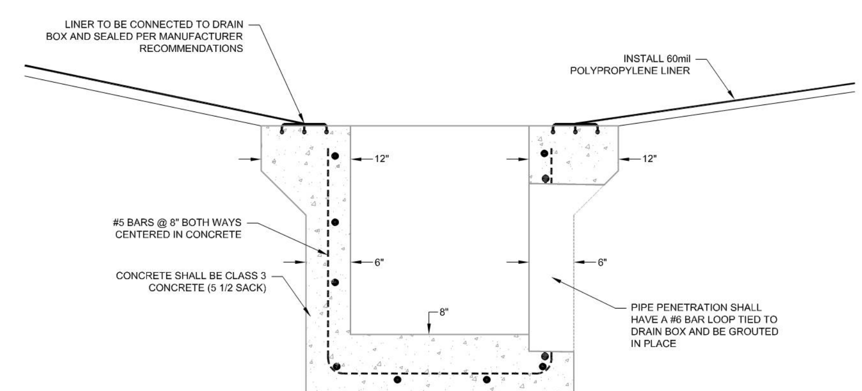
A
C4
SECTION A
(LOOKING WEST) SCALE: 1"=6'



B
C4
SECTION B
(LOOKING NORTH) SCALE: 1"=6'



C
C4
AERATOR MOUTING DETAILS
(LOOKING NORTH) SCALE: 1"=6'



C
C4
DRAIN BOX
SCALE: 1"=1'

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REGISTERED PROFESSIONAL ENGINEER JOHN H. HULSON SR RCE 38265 CIVIL STATE OF CALIFORNIA

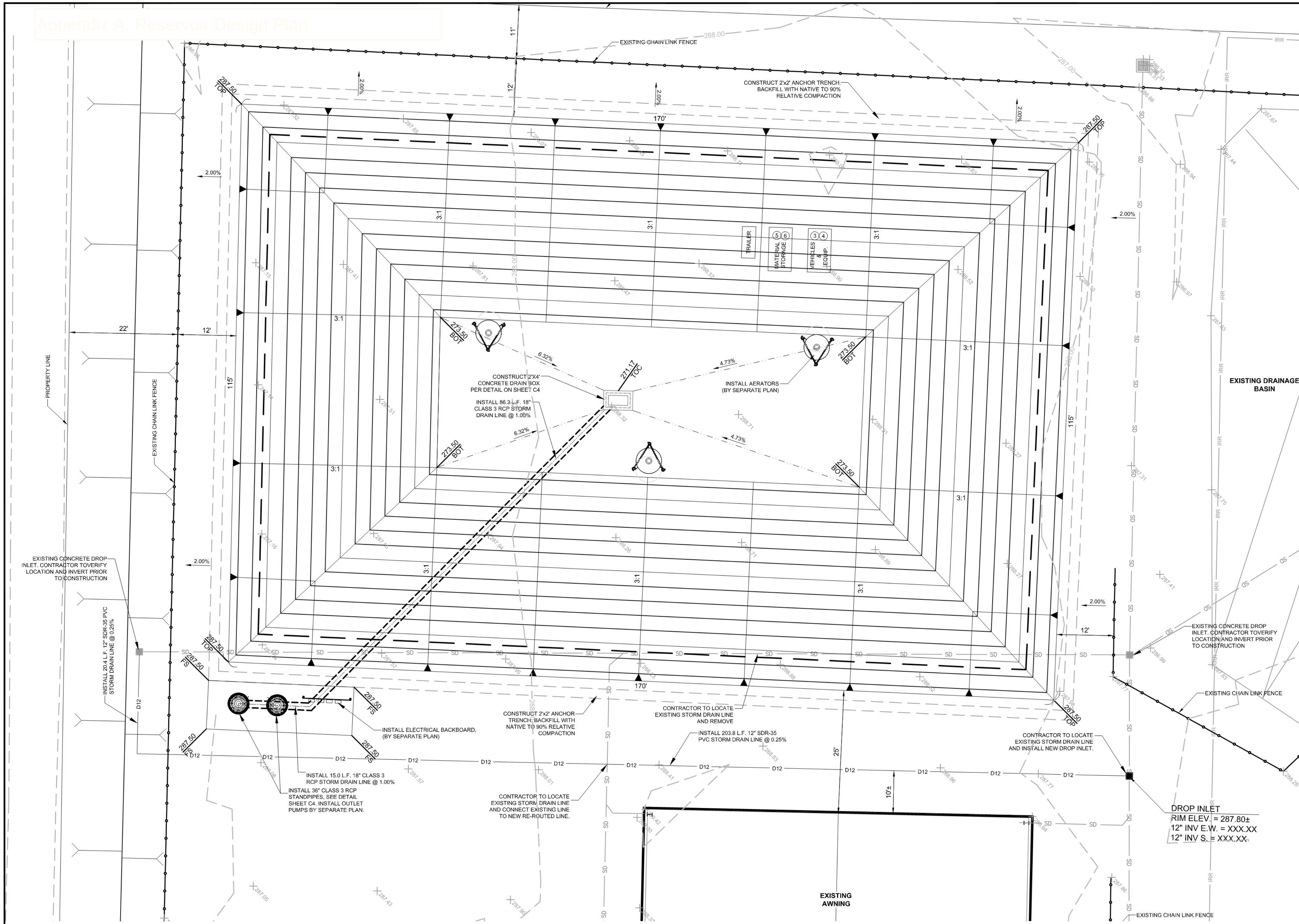
DWG. NO.	REFERENCE DRAWINGS	NO.	MATERIAL SUMMARY DESCRIPTION	QUANTITY
		1	–	394 L.F.
				1
				2
				1

REV.	DATE	DESCRIPTION	DR.	CK.	APP'D
0	–	ISSUED FOR REVIEW	MED	JNW	JHH

DATE	DRAWN BY	CHECKED BY	APPROVAL	ENGINEER
02/23/2018	MED	JNW	JHH	JHH
SCALE --	CAD FILE -			PLOT SCALE -

THE GARLIC COMPANY
CITY OF SHAFTER, COUNTY OF KERN, STATE OF CALIFORNIA
PROPOSED 50,000 GALLON WATER TANK GRADING

DWG. NO. GARLIC COMPANY
SHT. 4 OF 6
REV. 0



EROSION CONTROL PLAN
THE GARLIC COMPANY - 50,000 GALLON BOLTED TANK

THE GARLIC COMPANY
A.P.N. 091-220-04
COUNTY OF KERN, STATE OF CALIFORNIA

PROJECT STATISTICS

1. PROPERTY LOCATION: PORTION OF THE NORTHEAST QUARTER OF SECTION 26 T.28S., R.26E., M.D.B.&M. IN THE COUNTY OF KERN, STATE OF CALIFORNIA

2. PROPERTY OWNER:	THE GARLIC COMPANY
3. PROJECT OPERATOR: (RESPONSIBLE FOR DUST CONTROL PLAN IMPLEMENTATION)	THE GARLIC COMPANY
4. PROJECT ENGINEER: (RESPONSIBLE FOR DUST CONTROL PLAN PREPARATION)	LANDMARK SURVEYING AND ENGINEERING 3101 N. SILLECT AVENUE SUITE 103 BAKERSFIELD, CA 93308 PHONE: (661) 859-1923 ATTN: MICHAEL DAUSTER
5. PROJECT TYPE:	TANK PAD
6. DISTURBED AREA:	26.30 NET ACRES
7. PROPERTY BOUNDARY:	30.00 GROSS ACRES
8. AVERAGE DAILY EARTHWORK THROUGHOUT:	1,000 CY (APPROXIMATE)
9. START DATE:	____________, 2017
10. COMPLETION DATE:	__________, 2017

DUST CONTROL BEST MANAGEMENT PRACTICES:

1. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT (SJVAPCD) AND PROVIDE WRITTEN NOTIFICATION TO THE SJVAPCD VIA FAX OR EMAIL WITHIN 10 DAYS PRIOR TO THE COMMENCEMENT OF EARTHMOVING ACTIVITIES.

2. THE CONTRACTOR SHALL PREVENT A DUST NUISANCE FROM ORIGINATING FROM THE SITE OF WORK AS A RESULT OF HIS OPERATIONS DURING THE EFFECTIVE PERIOD OF THIS PROJECT. PREVENTATIVE MEASURES SHALL BE TAKEN BY THE CONTRACTOR TO MITIGATE THE IMPACT OF DUST AND PM10 EMISSIONS ACCORDING TO THE SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT REGULATION VIII (8). THE CONTRACTOR SHALL OBTAIN A COPY OF THE REGULATION FOR HIS USE. THESE MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO THE FOLLOWING:

A. PRE-ACTIVITY:
- a) PRE-WATER SITE SUFFICIENT TO LIMIT VISIBLE DUST EMISSIONS (VDE) TO 20% OPACITY.
- b) PHASE WORK TO REDUCE THE AMOUNT OF DISTURBED SURFACE AREA AT ANY ONETIME.

B. DURING ACTIVE OPERATIONS:
- a) APPLY WATER OR OTHER APPROVED SUBSTANCE SUFFICIENT TO LIMIT VISIBLE DUST EMISSIONS (VDE) TO 20% OPACITY
- b) LIMIT ACTIVITY TO PERIODS OF LOW OR NO WIND, OR CONSTRUCT AND MAINTAIN WIND BARRIERS SUFFICIENT TO LIMIT VDE TO 20% OPACITY.
- c) APPLY WATER OR OTHER APPROVED SUBSTANCE TO UNPAVED HAUL/ACCESS ROADS AND UNPAVED VEHICLE/EQUIPMENT TRAFFIC AREAS SUFFICIENT TO LIMIT VDE TO 20% OPACITY AND MEET THE CONDITIONS OF A STABILIZED UNPAVED ROAD SURFACE.

C. TEMPORARY STABILIZATION DURING PERIODS OF INACTIVITY:
- a) RESTRICT VEHICULAR ACCESS TO THE AREA.
- b) APPLY WATER OR OTHER APPROVED SUBSTANCE SUFFICIENT TO COMPLY WITH THE CONDITIONS OF A STABILIZED SURFACE. IF ANY AREA HAVING 0.5 ACRES OR MORE OF DISTURBED SURFACE AREA REMAINS UNUSED FOR SEVEN OR MORE DAYS, THE AREA MUST COMPLY WITH THE CONDITIONS FOR A STABILIZED SURFACE AREA AS DEFINED IN RULE 8011.

D. CARRYOUT AND TRACKOUT ON PUBLIC ROADS:
- a) ALL VISIBLE CARRYOUT AND TRACKOUT WITHIN 50 FEET OF THE SITE SHALL BE REMOVED AT THE END OF EACH WORKDAY. TRACKOUT BEYOND 50 FEET OR THE SITE SHALL BE REMOVED IMMEDIATELY.
- b) CLEANUP SHALL BE ACCOMPLISHED BY MANUAL SWEEPING OR APPROVED EQUIPMENT AND METHOD AS SPECIFIED BY THE SJVAPCD.
- c) THE USE OF BLOWER DEVICES OR DRY ROTARY BRUSHES OR BROOMS, FOR REMOVAL OF CARRYOUT AND TRACKOUT ON PUBLIC ROADS IS EXPRESSLY PROHIBITED.
- d) ANY PERMITS REQUIRED FOR MUD AND DIRT CLEANUP SHALL BE OBTAINED BY THE CONTRACTOR.

1. ALL CONSTRUCTION SHALL CONFORM TO THIS PLAN AND IMPLEMENTED IN ACCORDANCE WITH THE REQUIREMENTS OF THE KERN COUNTY STORMWATER MANAGEMENT PROGRAM. CONTRACTOR SHALL OBTAIN A COPY OF THE PROGRAM FOR HIS OWN USE.

2. THE CONTRACTOR MUST IMPLEMENT AN EFFECTIVE COMBINATION OF EROSION AND SEDIMENT CONTROL ON ALL DISTURBED AREAS DURING THE RAINY SEASON.

3. NON-STORMWATER DISCHARGES SHALL BE PROHIBITED FROM ENTERING THE EXISTING STREET. IN NO CASE SHALL WATERS ORIGINATING FROM THE SITE OF WORK ENTER THE ADJACENT CANAL.

4. SEDIMENT CONTROL PRACTICES SHALL EFFECTIVELY PREVENT A NET INCREASE OF SEDIMENT LOAD IN STORM WATER DISCHARGE.

5. ALL REMOVABLE PROTECTIVE DEVICES SHALL BE IN PLACE AT THE END OF EACH WORKING DAY WHEN THE FIVE-DAY RAIN PROBABILITY FORECAST EXCEEDS FORTY PERCENT (40%).

6. A STANDBY CREW FOR EMERGENCY WORK SHALL BE AVAILABLE AT ALL TIMES DURING THE RAINY SEASON (NOV. 1 TO APRIL 15). NECESSARY MATERIALS SHALL BE AVAILABLE ONSITE AND STOCKPILED AT CONVENIENT LOCATIONS TO FACILITATE RAPID CONSTRUCTION OF TEMPORARY DEVICES OR DAMAGED EROSION CONTROL MEASURES OR SEDIMENT CONTROL MEASURES WHEN RAIN IS IMMINENT.

7. AFTER A RAINSTORM, ALL SILT AND DEBRIS SHALL BE REMOVED FROM CHECK BERMS, DESILTING BASINS AND OTHER DEVICES. ANY DEVICES AND SLOPE SURFACE PROTECTION DAMAGED DURING A RAINSTORM SHALL BE IMMEDIATELY REPAIRED.

8. POLLUTANTS SHALL BE REMOVED FROM STORMWATER DISCHARGES TO THE MAXIMUM EXTENT PRACTICABLE (MEP).

9. PORTABLE SANITARY FACILITIES SHALL BE LOCATED ON RELATIVELY EVEN GROUND AWAY FROM TRAFFIC AREAS, DRAINAGE COURSES, AND STORM DRAIN INLETS AND SHALL HAVE APPROPRIATE CONTAINMENT AS REQUIRED BY THE STATE GENERAL CONSTRUCTION PERMIT.

10. EMPLOYEES, SUBCONTRACTORS AND SUPPLIERS SHALL BE EDUCATED BY THE DEVELOPER OR HIS GENERAL CONTRACTOR ON ALL BEST MANAGEMENT PRACTICES (BMPs) INCLUDING CONCRETE WASTE STORAGE AND DISPOSAL PROCEDURES.

11. ALL SEDIMENT SHALL BE REMOVED BY THE CONTRACTOR FROM THE PROPOSED ONSITE STORM DRAIN SYSTEM AFTER GRADING AND PRIOR TO COMPLETION OF PHASE 1 OF THE DEVELOPMENT.

LEGEND

SF — SILT FENCE OR FIBER ROLL PER CASQA DETAIL SE-1 OR SE-5 (CONTRACTOR TO ONLY INSTALL PRIOR TO MAJOR RAIN EVENT, CONSULT WITH ENGINEER PRIOR TO PLACEMENT)

GRAVEL ; 3" DIA., 12" DEEP 50' LONG STRETCH OF GRAVEL PER CASQA DETAIL TC-1. TO BE PLACED AT AT ACCESS TO PUBLIC STREET OR HIGHWAY

CONSTRUCTION NOTES:

1. SILT FENCE SEE DETAIL H SHEET C6
2. STABILIZED CONSTRUCTION ENTRANCE SEE DETAIL C & C-1 SHEET C6
3. VEHICLE AND EQUIPMENT FUELING SEE DETAIL G SHEET C6
4. VEHICLE AND EQUIPMENT MAINTENANCE SEE DETAIL B SHEET C6
5. MATERIAL STOCKPILE AND STORAGE SEE DETAIL E SHEET C6
6. CONCRETE WASTE MANAGEMENT SEE SHEET F SHEET C6

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1 INCH = 10 FEET

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		1	–	394 L.F.
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SCALE	CAD FILE	PLOT SCALE
AS SHOWN	-	-

THE GARLIC COMPANY
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PROPOSED 50,000 GALLON WATER TANK GRADING

DWG. NO. GARLIC COMPANY | SHT. 5 OF 6 | REV. 0

Appendix B.

Leak Detection Plan

2902 W Main Street
Visalia, CA 93291 USA
P: 559.732.3665 | cascade-earth.com

TECHNICAL MEMORANDUM

DATE: January 16, 2019

TO: Alexander Mushegan – Central Valley Regional Water Quality Control Board

FROM: Michael Sowers – Cascade Earth Sciences

SUBJECT: Leak Detection Plan for Process Wastewater Reservoir at The Garlic Company – Shafter, California

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The Garlic Company (TGC) operates a garlic processing facility (Facility) in Shafter, California that washes, processes, packages fresh garlic, and processes peeled clove garlic into garlic puree, garlic juice, and pickled garlic. Water used in processing operations (process wastewater) is recycled as an irrigation and nutrient source for agricultural production. The land treatment site is operated by TGC under Waste Discharge Requirement Order (WDR) R5-2013-0150 adopted by California Regional Water Quality Control Board – Central Valley Region (Regional Board) on December 6, 2013.

TGC is in the advanced planning stage of upgrading the process wastewater management for the Facility. These upgrades include conveyance of the process wastewater to the 99-acre land application area (99-acre Site), the addition of a new water supply well (Well 4), the installation of a 50,000-gallon mixing tank and the construction of a 1 million gallon (MG), 60-mil polypropylene-lined, process wastewater reservoir (reservoir).

The proposed reservoir will be constructed within the existing Facility boundary for usage within the existing facility process wastewater discharge operation. The proposed dimensions of the pond are identified in Table 1. A site plan of the pond and construction drawings are included in Appendix A of the Report of Water Discharge.

Pond ID	Length (ft.)	Width (ft.)	Max Depth (ft.)	Freeboard (ft.)	Side Slope
1 MG Reservoir	170	115	16.3	2	33%

The date of reservoir construction has not been determined. Construction will not commence until all necessary permits and approvals are secured.

PURPOSE

This Leak Detection Plan (LDP) has been prepared at the request of the Regional Board. The LDP provides details on the methods and technologies that will be utilized to detect leakage through the proposed 60-mil polypropylene liner (Liner) after installation and prior to filling and throughout the life of the Liner

PERSONNEL

The installation of the Liner will performed by an experienced contractor and the subsequent leak testing will be conducted by a professional leak testing contractor that has experience conducting successful electronic leak tests in the state of California using the proposed equipment. The test results will be supervised and reviewed by TGC staff and/or their environmental consultant.

PROCEDURE

There are several possible methods to conduct electronic leak detection for ponds lined with a single geomembrane liner. They are divided into two categories: Exposed Geomembrane Liners and Covered Geomembrane Liners. All types of electrical leak tests use electrical current or electrical potential to find leaks on the principal that a location where electrical current flows through the geomembrane liner will also allow liquid to flow through it. These methods not only detect leakage, but pinpoint the location of the leak. A leak is defined as any unintentional opening in the geomembrane that allows liquids or solids to flow through it (ASTM International, 2015). In all cases, the geomembrane liner must maintain intimate contact with conductive material, such as soil, beneath the geomembrane liner.

Exposed Geomembrane Liners

For exposed geomembrane liners, in ponds that do not contain water or contain very little water, there are four methods: The water puddle method (ASTM Practice D7002), the water lance method (ASTM Practice D7703), the arc testing method (ASTM Practice D7953), and the spark testing method (ASTM Practice D7240).

The water puddle method uses a squeegee or roller that maintains a puddle in contact with an electrical probe. It is best suited to clean and mostly dry geomembrane liners necessitating an empty or near empty pond for the test. It can be performed on an existing pond but is best suited to new construction.

The water lance method is similar to the water puddle method except it uses a continuous spray of water rather than a squeegee and requires similar conditions. It is best suited for clean, dry geomembrane liners such as new construction.

The arc testing method is not dependent on the use of water. It is appropriate for clean, exposed, geomembrane liners. An electrical probe connected to a very high voltage power supply is swept over the geomembrane liner surface. At the point of a leak, electrical current flows through and creates an electric arc. It is best suited for clean, dry geomembrane liners such as in new construction.

The spark testing method is similar to the arc testing method; however, this method requires the geomembrane being tested to have been manufactured with a conductive material co-extruded on the underside of the non-conductive geomembrane liner.

Covered Geomembrane Liner Methods

Methods for leak detection in situations where the geomembrane liner is covered with water or earth materials which utilize a dipole method to detect leaks, (Electronic Leak Detection, ASTM Practice D7007). They can also be used with some thickness earthen materials, sludge, or sediment on the geomembrane if covered with water.

The water-covered geomembrane liner method is used to test for leaks in geomembrane liners covered with water. A hand-held probe or probe on a long cable is dragged through the water to localize the current flowing through a leak. An electrical current flowing through a leak produces a localized anomaly in electrical potential. A high voltage power supply must be used to maximize the sensitivity of the method. The method is suited to ponds that are in-service and is not suitable for use during construction. Concrete sumps, batten strips, metal pipes such as inlet and outlet pipes can provide false leak detections. The water covering the leak locations provide good electrical conductivity with the material below the geomembrane for good sensitivity, although, thickness of earthen materials, sludge, or sediment over the geomembrane will decrease the method sensitivity to detecting leaks.

The earthen material-covered geomembrane method is similar to the water-covered method except it relies on testing the conductivity through the earthen materials on a point-by-point basis. This method is not appropriate for the TGC ponds because the geomembrane liner will not be covered with earthen materials.

Performance and Monitoring

Geomembrane liners are delicate infrastructure and requiring experience, trained personnel to inspect for properly functioning systems. Installation, leak testing, and repairs should only be performed by qualified contactors. The owner or operator will be responsible for all maintenance after the pond has been constructed. Regularly scheduled inspections and timely maintenance should be performed by experienced by personnel.

Proposed Geomembrane Liner Testing

Upon completion of the liner installation, either one or combination of the previously described methods of testing the exposed geomembrane liners will be utilized. The actual method(s) will be dependent upon the leak detection contractor's available equipment and if the liner is manufactured with conductive material.

The water-covered method for Electrical Leak Location Testing, ASTM D7007, will be performed on a regular basis once the reservoir is in operation.

Proposed Monitoring Schedule

TGC will perform liner testing prior to use and once every five years, thereafter. The performance monitoring is as follows.

Initial Testing:

1. Upon installation of the liner and prior to filling, the liner will be tested utilizing one or a combination of methods described for testing exposed geomembrane liners.
2. Any leaks detected during the testing will be repaired prior to use.

Annually:

1. Perform visible inspections of the liner and repair any leaks, slope failures, excessive embankment settlement, eroded banks, and burrowing animal disturbance.
2. Submit a summary of inspection results and repair, if applicable, as a section in the annual monitoring report

Every 5 Years:

1. Perform Electrical Leak Location Test to locate and repair hole(s)
2. Submit summary of test and repair(s) with annual monitoring report

Operation and Maintenance

The Garlic Company will be responsible for all maintenance after the pond has been constructed. Regularly scheduled inspections and timely maintenance by trained personnel will be performed annually. The following are general recommended components of a maintenance program:

- Repair of leaks, slope failures, excessive embankment settlement, and eroded banks, and management of burrowing animals.
- Regularly-scheduled testing and preventative maintenance of all mechanical components, including valves.
- Regular inspections of the embankments, and inspections after major storm events.
- Careful maintenance of safety features such as fences, warning signs, and rescue equipment.
- Limit access to only those employees who need to enter the storage pond area.
- If the reservoir requires cleaning, precautions need to be taken to prevent contact of the excavation or dredging equipment with the liner material. A cleaning service with experience in cleaning lagoons with geomembrane liners will be required.

Repairs

If the leak detection method identifies a leak or leaks, the leak detection company will be requested to estimate the size of the leak. The size of the leak or leaks will be used to estimate the leakage rate and compare it to the rate expected for the design seepage rate for the geomembrane as installed. If the geomembrane liner design seepage rate is less than the rate projected from the identified leak(s), TGC will submit to the Regional Board a work plan with a schedule for making repairs. Repairs will commence according to the approved work plan and schedule.

QUALITY ASSURANCE PLAN

The leak detection contractor will follow the requirements of the latest version of the appropriate ASTM Practice to reduce the potential for error or erroneous interpretation.

SCHEDULE

Construction of the reservoir and subsequent installation of the liner is projected to commence in the summer or fall of 2019. Construction will not begin until all required permits and authorizations are secured.

REFERENCES

ASTM International, 2015. Standard Guide for Selection of Techniques for Electrical Leak Location of Leaks in Geomembranes, D6747-15. ASTM Committee D35 on Geosynthetics, Subcommittee D35.10 on Geomembranes. ASTM Int'l, W. Conshohocken, PA. Jan 1, 2015

MSS/mjb

PN: 2016210030
Doc: TGC Leak Test Plan

Appendix C.

Safety Data Sheets for Chemical Processing

UNIVAR®

Univar USA Inc Material Safety Data Sheet

MSDS No: BCS81214

Version No: 001 2011-09-22

Order No:

Univar USA Inc., 17425 NE Union Hill Rd., Redmond WA 98052
(425) 889 3400

Emergency Assistance

For emergency assistance involving chemicals call
Chemtrec - (800) 424-9300

Quat DS

Description Quat DS is a liquid quaternary blend for use as a Disinfectant and Sanitizer for all types of hard surfaces in Dairy, Food and Beverage Plants. Recommended usage rate of 1 -2 ounces per 4 gallons of water (200 -400 ppm active) are directed with no requirement of a potable water rinse.

Product Codes 796185 (mini-bulk), 797886 (tote), 797887 (drum), 799667 (carboy) 799876 (pail)

Typical Properties

Parameter	Result
Appearance	Clear Liquid
Odor	Very Mild
Specific Gravity @ 20C	1.000
pH of a 1% solution	Neutral
Foam level	Moderate - High

See product label for complete claims and dilution ratios

Safety and Storage Quat DS is a strong solution. Individuals using this product should avoid breathing sprays or mists, ingesting, getting in eyes, on skin or on clothing. This product should be stored in a cool, dry, well ventilated place away from incompatible materials. Consult the product MSDS for additional information.

Packaging Univar can provide the appropriate size package or tank for storage and delivery service.

Contact your Univar Technical Representative for more information.

Univar
17425 NE Union Hill Road
Redmond, WA 98052-3375
USA
+1 425 889 3400

COMPANY IDENTITY: Univar
PRODUCT IDENTITY: BLEND QUAT DS

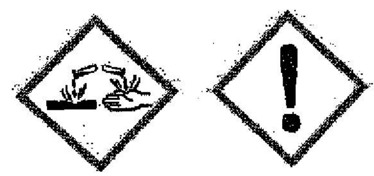
SAFETY DATA SHEET

This Safety Data Sheet conforms to ANSI Z400.S, and to the format requirements and the International Chemical Safety Cards of the Global Harmonizing System.
THIS SDS COMPLIES WITH 29 CFR 1910.1200 (HAZARD COMMUNICATION STANDARD)
IMPORTANT: Read this SDS before handling & disposing of this product.
Pass this information on to employees, customers, & users of this product.

SECTION 1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER

PRODUCT IDENTITY: BLEND QUAT DS
SDS NUMBER: BCS81214
NEW MSDS DATE: 09/22/2011
COMPANY IDENTITY: Univar
COMPANY ADDRESS: 17425 NE Union Hill Road
COMPANY CITY: Redmond, WA 98052
COMPANY PHONE: 1-425-889-3400
EMERGENCY PHONES: CHEMTREC: 1-800-424-9300 (USA)
CANUTEC: 1-613-996-6666 (CANADA)

SECTION 2. HAZARDS IDENTIFICATION



WARNING!!

RISK STATEMENTS:
R34 Causes burns.
R36/37/38 Irritating to eyes, respiratory system and skin.

SAFETY STATEMENTS:
S7 Keep container tightly closed.
S16 Keep away from sources of ignition. No smoking.
S24/25 Avoid contact with skin and eyes.
S36/37/39 Wear suitable protective clothing, gloves, and eye/face protection.
S45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

MATERIAL	CAS#	EINECS#	WT %
Water	7732-18-5	231-791-2	85-95
Alkyl Dimethyl Benzyl Ammonium Chloride	68391-01-5	-	0-10
Alkyl Dimethyl Ethylbenzyl Ammonium Chloride	68956-79-6	-	0-10
Ethanol	64-17-5	200-578-6	0- 0.4

SEE SECTIONS 8, 11 & 12 FOR TOXICOLOGICAL INFORMATION.

SECTION 4. FIRST AID MEASURES

EYE CONTACT:
If this product enters the eyes, open eyes while under gently running water. Use sufficient force to open eyelids. "Roll" eyes to expose more surface. Minimum flushing is for 15 minutes. Seek immediate medical attention.

SKIN CONTACT:
If the product contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove contaminated clothing, taking care not to contaminate eyes. If skin becomes irritated and irritation persists, medical attention may be necessary. Wash contaminated clothing before reuse, discard contaminated shoes.

INHALATION:
After high vapor exposure, remove to fresh air. If breathing is difficult, give oxygen. If breathing has stopped, trained personnel should immediately begin artificial respiration. If the heart has stopped, trained personnel should immediately begin cardiopulmonary resuscitation (CPR). Seek immediate medical attention.

SWALLOWING:
If swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, give two glasses of water to drink. DO NOT INDUCE VOMITING. Never induce vomiting or give liquids to someone who is unconscious, having convulsions, or unable to swallow. Seek immediate medical attention.

NOTES TO PHYSICIAN:
There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient. Any material aspirated during vomiting may cause lung injury. Therefore, emesis should not be induced mechanically or pharmacologically. If it is considered necessary to evacuate the stomach contents, this should be done by means least likely to cause aspiration (such as: Gastric lavage after endotracheal intubation).

Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take a copy of label and SDS to physician or health professional with victim.

SECTION 5. FIRE FIGHTING MEASURES

FIRE & EXPLOSION PREVENTIVE MEASURES
NO contact with oxidants. Use a closed system, ventilation,
explosion-proof electrical equipment, lighting.
Do NOT use compressed air for filling, discharging, or handling.

EXTINGUISHING MEDIA
Use dry powder, alcohol-resistant foam, water in large amounts, carbon dioxide.

SPECIAL FIRE FIGHTING PROCEDURES
Water spray may be ineffective on fire but can protect fire-fighters
& cool closed containers. Use fog nozzles if water is used.
Do not enter confined fire-space without full bunker gear.
(Helmet with face shield, bunker coats, gloves & rubber boots).
Use NIOSH approved positive-pressure self-contained breathing apparatus.

UNUSUAL EXPLOSION AND FIRE PROCEDURES
Noncombustible.
Isolate from oxidizers, heat, & open flame.
Closed containers may explode if exposed to extreme heat.
Applying to hot surfaces requires special precautions.

SECTION 6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE AND ENVIRONMENTAL PRECAUTIONS:
Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel.

PERSONAL PROTECTIVE EQUIPMENT
The proper personal protective equipment for incidental releases (such as: 1 Liter of the product released in a well-ventilated area), use impermeable gloves (triple-gloves (rubber gloves and nitrile gloves, over latex gloves), goggles, face shield, and appropriate body protection. In the event of a large release, use impermeable gloves, specific for the material handled, chemically resistant suit and boots, and hard hat. Self-Contained Breathing Apparatus or respirator may be required where engineering controls are not adequate or conditions for potential exposure exist. When respirators are required, select NIOSH/MSHA approved based on actual or potential airborne concentrations in accordance with latest OSHA and/or ANSI recommendations.

ENVIRONMENTAL PRECAUTIONS:
Stop spill at source. Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material. Close or cap valves and/or block or plug hole in leaking container and transfer to another container. Keep from entering storm sewers and ditches which lead to waterways, and if necessary, call the local fire or police department for immediate emergency assistance.

CONTAINMENT AND CLEAN-UP MEASURES:
Absorb spilled liquid with polypads or other suitable absorbent materials. If necessary, neutralize using suitable buffering material, (acid with soda ash or base with phosphoric acid), and test area with litmus paper to confirm neutralization. Clean up with non-combustible absorbent (such as: sand, soil, and so on). Shovel up and place all spill residue in suitable containers. dispose of at an appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal (see Section 13 - Disposal Considerations).

SECTION 7. HANDLING AND STORAGE

HANDLING
Use only with adequate ventilation. Avoid breathing of vapor or spray mist.
Avoid contact with skin & eyes.
Wear OSHA Standard goggles or face shield. Consult Safety Equipment Supplier. Wear goggles, face shield, gloves, apron & footwear impervious to material. Wash clothing before reuse. To minimize static discharge when transferring, ensure electrical continuity by bonding and grounding all equipment. Use an inlet line diameter of at least 3.5 inches (8.9 centimeters) with a maximum flow rate of 1 meter/second.

STORAGE
Keep in fireproof surroundings. Keep separated from strong oxidants. Keep cool.
Do not store above 49 C/120 F. Keep container tightly closed
& upright when not in use to prevent leakage.

NONBULK: CONTAINERS:
Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Empty containers should be handled with care. Never store food, feed, or drinking water in containers which held this product.

BULK CONTAINERS:
All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

SECTION 7. HANDLING AND STORAGE (CONTINUED)

TANK CAR SHIPMENTS:
Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cars must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tanks (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:
Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Collect all rinsates and dispose of according to applicable Federal, State, Provincial, or local procedures.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

MATERIAL	CAS#	EINECS#	TWA (OSHA)	TLV (ACGIH)
Water	7732-18-5	231-791-2	None Known	None Known
Alkyl Dimethyl Benzyl Ammonium Chloride	68391-01-5	-	None Known	None Known
Alkyl Dimethyl Ethylbenzyl Ammonium Chloride	68956-79-6	-	None Known	None Known
Ethanol	64-17-5	200-578-6	1000 ppm	1000 ppm

This product contains no EPA Hazardous Air Pollutants (HAP) in amounts > 0.1%.

RESPIRATORY EXPOSURE CONTROLS
Maintain airborne contaminant concentrations below exposure limits given above. If respiratory protection is needed, use only protection authorized in 29 CFR 1910.134, European Standard EN 149, or applicable State regulations. If adequate ventilation is not available or there is potential for airborne exposure above the exposure limits, a respirator may be worn up to the respirator exposure limitations, check with respirator equipment manufacturer's recommendations/limitations. For a higher level of protection, use positive pressure supplied air respiration protection or Self-Contained Breathing Apparatus or if oxygen levels are below 19.5% or are unknown.

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS
Positive pressure, full-face piece Self-Contained Breathing Apparatus; or positive pressure, full-face piece Self-Contained Breathing Apparatus with an auxilliary positive pressure Self-Contained Breathing Apparatus.

VENTILATION
LOCAL EXHAUST: Necessary
MECHANICAL (GENERAL): Necessary
SPECIAL: None
OTHER: None
Please refer to ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

EYE PROTECTION:
Splash goggles or safety glasses. Face-shields are recommended when the operation can generate splashes, sprays or mists.

HAND PROTECTION:
Wear appropriate impervious gloves for routine industrial use. Use impervious gloves for spill response, as stated in Section 6 of this SDS (Accidental Release Measures).
NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION (CONTINUED)

BODY PROTECTION:
Use body protection appropriate for task. Cover-all, rubber aprons, or chemical protective clothing made from impervious materials are generally acceptable, depending on the task.

WORK & HYGIENIC PRACTICES:
Provide readily accessible eye wash stations & safety showers. Wash at end of each shift & before eating, smoking or using the toilet. Remove clothing that becomes contaminated. Destroy contaminated leather articles. Launder or discard contaminated clothing.

SECTION 9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE:	Liquid, Water-White
ODOR:	Alcohol
ODOR THRESHOLD:	Not Available
pH (Neutrality):	6.0 - 8.0
MELTING POINT/FREEZING POINT:	Not Available
BOILING RANGE (IBP,50%,Dry Point):	100 100 100*C/212 212 212*F(*=End Point)
FLASH POINT (TEST METHOD):	Not Applicable
EVAPORATION RATE (n-BUTYL ACETATE=1):	Not Applicable
FLAMMABILITY CLASSIFICATION:	Non-Combustible
LOWER FLAMMABLE LIMIT IN AIR (% by vol):	Not Applicable
UPPER FLAMMABLE LIMIT IN AIR (% by vol):	Not Available
VAPOR PRESSURE (mm of Hg)@20 C	17.6
VAPOR DENSITY (air=1):	0.671
GRAVITY @ 68/68 F / 20/20 C:	
SPECIFIC GRAVITY (Water=1):	0.97 - 0.99
POUNDS/GALLON:	8.08 - 8.25
WATER SOLUBILITY:	Complete
PARTITION COEFFICIENT (n-Octane/Water):	Not Available
AUTO IGNITION TEMPERATURE:	Not Applicable
DECOMPOSITION TEMPERATURE:	Not Available
VOC'S (>0.44 Lbs/Sq In) :	0.253 Vol% / 2.0 g/L / .0 Lbs/Gal
TOTAL VOC'S (TVOC)*:	0.301 Vol% / 2.0 g/L / .0 Lbs/Gal
NONEXEMPT VOC'S (CVOC)*:	0.301 Vol% / 2.0 g/L / .0 Lbs/Gal
HAZARDOUS AIR POLLUTANTS (HAPS):	0.0 Wt% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC PARTIAL PRESSURE (mm of Hg @ 20 C)	0.086

* Using California South Coast Air Quality Management District (SCAQMD) Rule 443.1.

SECTION 10. STABILITY & REACTIVITY

STABILITY
Stable under normal conditions.

CONDITIONS TO AVOID
Isolate from oxidizers, heat, & open flame.

MATERIALS TO AVOID
Reacts with strong oxidants, causing fire & explosion hazard.

HAZARDOUS DECOMPOSITION PRODUCTS
Carbon Monoxide, Carbon Dioxide,
Hydrogen Chloride, Phosgene from heating.

HAZARDOUS POLYMERIZATION
Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

ACUTE HAZARDS

EYE & SKIN CONTACT:
Primary irritation to skin, defatting, dermatitis.
Primary irritation to eyes, redness, tearing, blurred vision.

INHALATION:
Anesthetic. Irritates respiratory tract. Acute overexposure can cause serious nervous system depression.

SWALLOWING:
Swallowing can cause abdominal irritation, nausea, vomiting & diarrhea.

SUBCHRONIC HAZARDS/CONDITIONS AGGRAVATED

MEDICAL CONDITION AGGRAVATED BY EXPOSURE:
Skin and respiratory conditions can be aggravated by over-exposure to this product.

CHRONIC HAZARDS

CANCER, REPRODUCTIVE & OTHER CHRONIC HAZARDS:
This product has no carcinogens listed by IARC, NTP, NIOSH, OSHA or ACGIH, as of this date, greater or equal to 0.1%.

IRRITANCY OF PRODUCT: This product is irritating to contaminated tissue.

SENSITIZATION TO THE PRODUCT: No component of this product is known to be a sensitizer.

MUTAGENICITY: This product is not reported to produce mutagenic effects in humans.

EMBRYOTOXICITY: This product is not reported to produce embryotoxic effects in humans.

TERATOGENICITY: This product is not reported to produce teratogenic effects in humans.

REPRODUCTIVE TOXICITY: This product is not reported to cause reproductive effects in humans.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (such as: within the eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MAMMALIAN TOXICITY INFORMATION

TOXICITY DATA: The following toxicology information is for this product in concentrated form no data exists for this product at the current dilution:
Acute LD50 (oral, rat) 650 mg/kg for males and females combined.
Acute Dermal Rabbit greater than 2000 mg/kg
Primary Skin - Severe Irritant
Primary Eye - Corrosive

SECTION 12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

EFFECT OF MATERIAL ON PLANTS OR ANIMALS:
This product may be harmful or fatal to plant and animal life if released into the environment. Refer to Section 11 (Toxicological Information) for further data on the effects of this product's components on test animals.

EFFECT OF MATERIAL ON AQUATIC LIFE:
No aquatic environmental information is available on this product.

MOBILITY IN SOIL
This material is a mobile liquid.

DEGRADABILITY
This product is completely biodegradable.

ACCUMULATION
Bioaccumulation of this product has not been determined.

SECTION 13. DISPOSAL CONSIDERATIONS

Processing, use or contamination may change the waste management options. Recycle / dispose of observing national, regional, state, provincial and local health, safety & pollution laws. If in doubt, contact appropriate agencies.

SECTION 14. TRANSPORT INFORMATION

DOT SHIPPING NAME: UN1903, Disinfectant liquid corrosive, n.o.s. (Quaternary Ammonium Compound), 8, PG-III

DRUM LABEL: Corrosive (8)

IATA / ICAO: UN1903, Disinfectant liquid corrosive, n.o.s. (Quaternary Ammonium Compound), 8, PG-III

IMO / IMDG: UN1903, Disinfectant liquid corrosive, n.o.s. (Quaternary Ammonium Compound), 8, PG-III

EMERGENCY RESPONSE GUIDEBOOK NUMBER: 153

SECTION 15. REGULATORY INFORMATION

EPA REGULATION:
SARA SECTION 311/312 HAZAROS: Acute Health

All components of this product are on the TSCA list.

SARA Title III Section 313 Supplier Notification
This product contains the indicated <*> toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning & Community Right-To-Know Act of 1986 & of 40 CFR 372. This information must be included in all MSDSs that are copied and distributed for this material.

SECTION 15. REGULATORY INFORMATION (CONTINUED)

INTERNATIONAL REGULATIONS
The components of this product are listed on the chemical inventories of the following countries:
Australia (AICS), Canada (DSL, NDSL), China (IECSC), Europe (EINECS, ELINCS), Japan (METI/CSCL, MHLW/ISHL), South Korea (KECI), New Zealand (NZIoC), Philippines (PICCS), Switzerland (SWISS), Taiwan (NECSI), USA (TSCA).

CANADA: WORKPLACE HAZARDOUS MATERIALS INFDRMATION SYSTEM (WHMIS)
This product has been classified in accordance with hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by it.
D2B: Irritating to skin / eyes.
E: Corrosive.

SECTION 16. OTHER INFORMATION

HAZARD RATINGS:
HEALTH (NFPA): 2, HEALTH (HMIS): 2, FLAMMABILITY: 0, REACTIVITY: 0
(Personal Protection Rating to be supplied by user based on use conditions.)
This information is intended solely for the use of individuals trained in the NFPA & HMIS hazard rating systems.

EMPLOYEE TRAINING
See Section 2 for Risk & Safety Statements. Employees should be made aware of all hazards of this material (as stated in this SDS) before handling it.

Univar USA Inc Material Safety Data Sheet

For Additional Information contact MSDS Coordinator during business hours, Pacific time: (425) 889-3400

Notice

Univar USA Inc. ("Univar") expressly disclaims all express or implied warranties of merchantability and fitness for a particular purpose, with respect to the product or information provided herein, and shall under no circumstances be liable for incidental or consequential damages.

Do not use ingredient information and/or ingredient percentages in this MSDS as a product specification. For product specification information refer to a product specification sheet and/or a certificate of analysis. These can be obtained from your local Univar sales office.

All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, Univar makes no representations as to its accuracy or sufficiency. Conditions of use are beyond Univar's control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling, and disposal of the product, or from the publication or use of, or reliance upon, information contained herein.

This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process

UNIVAR®

Univar USA Inc Material Safety Data Sheet

Blend Sodium Hydroxide 50% Gluconated.

MSDS No:	BCS80934
Version No:	001 2011-07-18
Order No:	

Univar USA Inc., 17425 NE Union Hill Rd., Redmond WA 98052
(425) 889 3400

Emergency Assistance

For emergency assistance involving chemicals call
Chemtrec - (800) 424-9300

COMPANY IDENTITY: Univar
PRODUCT IDENTITY: BLEND SODIUM HYDROXIDE 50% GLUCONATED

SAFETY DATA SHEET

This Safety Data Sheet conforms to ANSI Z400.5, and to the format requirements and the International Chemical Safety Cards of the Global Harmonizing System.
THIS SDS COMPLIES WITH 29 CFR 1910.1200 (HAZARD COMMUNICATION STANDARD)
IMPORTANT: Read this SDS before handling & disposing of this product.
Pass this information on to employees, customers, & users of this product.

SECTION 1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER

PRODUCT IDENTITY: BLEND SODIUM HYDROXIDE 50% GLUCONATED
SDS NUMBER: BCS80934
NEW MSDS DATE: 07/14/2011
COMPANY IDENTITY: Univar
COMPANY ADDRESS: 17425 NE Union Hill Road
COMPANY CITY: Redmond, WA 98052
COMPANY PHONE: 1-425-889-3400
EMERGENCY PHONES: CHEMTREC: 1-800-424-9300 (USA)
CANUTEC: 1-613-996-6666 (CANADA)

SECTION 2. HAZARDS IDENTIFICATION

DANGER!!

EXPOSURE PREVENTION: AVOID ALL CONTACT!

RISK STATEMENTS:
R35 Causes severe burns.

SAFETY STATEMENTS:
S1/2 Keep locked up and out of the reach of children.
S24/25 Avoid contact with skin and eyes.
S36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S45 In case of accident, or if you feel unwell, seek medical advice immediately. (Show the label where possible).

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

MATERIAL	CAS#	EINECS#	WT %
Sodium Hydroxide*	1310-73-2	215-185-5	30-50
Water	7732-18-5	231-791-2	45-55
Sodium Gluconate	527-07-1	-	0-10

Other components: Each of the other components are present in < 1% concentration, 0.1% for potential carcinogens, reproductive toxins, respiratory tract sensitizers, and mutagens.
None of the other components contribute significant additional hazards at the concentrations present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards, and Canadian Hazardous Materials Identification system Standards (CPR 4).

SEE SECTIONS 8, 11 & 12 FOR TOXICOLOGICAL INFORMATION.

SECTION 4. FIRST AID MEASURES

EYE CONTACT:
If this product enters the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelides. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention.

SKIN CONTACT:
If the product contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove contaminated clothing, taking care not to contaminate eyes. If skin becomes irritated and irritation persists, medical attention may be necessary. Wash contaminated clothing before reuse, discard contaminated shoes.

INHALATION:
After high vapor exposure, remove to fresh air. If breathing is difficult, give oxygen. If breathing has stopped, trained personnel should immediately begin artificial respiration. If the heart has stopped, trained personnel should immediately begin cardiopulmonary resuscitation (CPR).

SWALLOWING:
Rinse mouth. Give plenty of water to drink. Do NOT induce vomiting.
GET MEDICAL ATTENTION IMMEDIATELY. Do NOT give liquids to an unconscious or convulsing person.

SECTION 5. FIRE FIGHTING MEASURES

FIRE & EXPLOSION PREVENTIVE MEASURES
Isolate from acids, extreme heat and open flame.

EXTINGUISHING MEDIA
In case of fire in surroundings, water spray, carbon dioxide, foam, dry chemical, Halon, or any "ABC" Class extinguisher.

SPECIAL FIRE FIGHTING PROCEDURES
Water spray may be ineffective on fire but can protect fire-fighters & cool closed containers. Use fog nozzles if water is used.
Do not enter confined fire-space without full bunker gear.
(Helmet with face shield, bunker coats, gloves & rubber boots).
Use NIOSH approved positive-pressure self-contained breathing apparatus.

UNUSUAL EXPLOSION AND FIRE PROCEDURES
Noncombustible.
Isolate from acids. Closed containers may burst if exposed to extreme heat.
Applying to hot surfaces requires special precautions.
Run-off from fire control can cause pollution.

SECTION 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PROTECTIVE MEASURES:
Keep unprotected personnel away.
Use complete chemical protective suit with self-contained breathing apparatus.

ENVIRONMENTAL PRECAUTIONS:
Keep from entering storm sewers and ditches which lead to waterways.

CONTAINMENT AND CLEAN-UP MEASURES:
Stop spill at source. Dike and contain.
Sweep spilled material into dry, sealable containers.
Wash away remainder with plenty of water.

COMPANY IDENTITY: Univar
PRODUCT IDENTITY: BLEND SODIUM HYDROXIDE 50% GLUCONATED

SECTION 7. HANDLING AND STORAGE

HANDLING
Use only with adequate ventilation. Do not get in eyes, on skin or clothing. Wear OSHA Standard full face shield. Consult Safety Equipment Supplier. Wear goggles, face shield, gloves, apron & footwear impervious to material. Wash clothing before reuse. NEVER pour water into this substance. When dissolving or diluting, always add it slowly to the water.
To minimize static discharge when transferring, ensure electrical continuity by bonding and grounding all equipment. Use an inlet line diameter of at least 3.5 inches (8.9 centimeters) with a maximum flow rate of 1 meter/second.

STORAGE
Keep separated from strong oxidants, strong acids, metals, food & feedstuffs. Keep dry. Do not store above 49 C/120 F. Keep container tightly closed & upright when not in use to prevent leakage.
Wear full face shield, gloves & full protective clothing when opening or handling.
When empty, drain completely, replace bungs securely.

NONBULK: CONTAINERS:
If this product is transferred into another container, only use portable containers and dispensing equipment (faucet, pump, drip can) approved for corrosive, acidic liquids. Store containers in a cool, dry location,k away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Storage areas should be made of corrosion resistant materials. Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Empty containers may contain residual liquid or vapors which are corrosive; therefore, empty containers should be handled with care. Never store food, feed, or drinking water in containers which held this product.

BULK CONTAINERS:
All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

TANK CAR SHIPMENTS:
Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cares must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tanks (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:
Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment before maintenance begins by a triple-rinse with water followed, if necessary, by using sodium bicarbonate and an additional rinse. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

MATERIAL	CAS#	EINECS#	TWA (OSHA)	TLV (ACGIH)
Sodium Hydroxide*	1310-73-2	215-185-5	None Known	None Known
Water	7732-18-5	231-791-2	None Known	None Known
Sodium Gluconate	527-07-1	-	None Known	None Known

MATERIAL	CAS#	EINECS#	CEILING	IDHL	HAP
Sodium Hydroxide*	1310-73-2	215-185-5	2 mg/m3	10 mg/m3	No

This product contains no EPA Hazardous Air Pollutants (HAP) in amounts > 0.1%.

RESPIRATORY EXPOSURE CONTROLS
Maintain airborne contaminant concentrations below exposure limits given above. If respiratory protection is needed, use only protection authorized in 29 CFR 1910.134, European Standard EN 149, or applicable State regulations. If adequate ventilation is not available or there is potential for airborne exposure above the exposure limits, a respirator may be worn up to the respirator exposure limitations, check with respirator equipment manufacturer's recommendations/limitations. For a higher level of protection, use positive pressure supplied air respiration protection or Self Contained Breathing Apparatus or if oxygen levels are below 19.5% or are unknown.

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS
Positive pressure, full-face piece Self Contained Breathing Apparatus; or positive pressure, full-face piece Salf Contained Breathing Apparatus with an auxilliary positive pressure Self Contained Breathing Apparatus.

VENTILATION

LOCAL EXHAUST:	Necessary	MECHANICAL (GENERAL):	Necessary
SPECIAL:	None	OTHER:	None

Please refer to ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

EYE PROTECTION:
Splash goggles or safety glasses. Face-shields are recommended when the operation can generate splashes, sprays or mists.

HAND PROTECTION:
Wear appropriate impervious gloves for routine industrial use. Use impervious gloves for spill response, as stated in Section 6 of this SDS (Accidental Release Measures).
NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

BODY PROTECTION:
Use body protection appropriate for task. Cover-all, rubber aprons, or chemical protective clothing made from impervious materials are generally acceptable, depending on the task.

WORK & HYGIENIC PRACTICES:
Provide readily accessible eye wash stations & safety showers.
Wash at end of each workshift & before eating, smoking or using the toilet.
Promptly remove clothing that becomes contaminated. Destroy contaminated leather articles. Launder or discard contaminated clothing.

SECTION 9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE:	Liquid, Water-White
ODOR:	None
ODOR THRESHOLD:	Not Available
pH (Neutrality):	14.0
MELTING POINT/FREEZING POINT:	12 C / 54 F
BOILING POINT:	140 C / 284 F
FLASH POINT (TEST METHOD):	Not Applicable
EVAPORATION RATE (n-BUTYL ACETATE=1):	Not Applicable
FLAMMABILITY CLASSIFICATION:	Non-Combustible
LOWER FLAMMABLE LIMIT IN AIR (% by vol):	Not Applicable
UPPER FLAMMABLE LIMIT IN AIR (% by vol):	Not Available
VAPOR PRESSURE (mm of Hg)@20 C	13
VAPOR DENSITY (air=1):	Not Available
GRAVITY @ 68/68F / 20/20C:	
SPECIFIC GRAVITY (Water=1):	1.520
POUNDS/GALLON:	12.662
WATER SOLUBILITY:	Complete
PARTITION COEFFICIENT (n-Octane/Water):	Not Available
AUTO IGNITION TEMPERATURE:	Not Applicable
DECOMPOSITION TEMPERATURE:	Not Available
VOC'S (>0.44 Lbs/Sq In) :	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
TOTAL VOC'S (TVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC'S (CVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
HAZARDOUS AIR POLLUTANTS (HAPS):	0.0 Wt% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC PARTIAL PRESSURE (mm of Hg @ 20 C)	0.0

* Using California South Coast Air Quality Management District (SCAQMD) Rule 443.1.

SECTION 10. STABILITY & REACTIVITY

STABILITY
Stable under normal conditions.

CONDITIONS TO AVOID
Isolate from extreme heat and open flame.

MATERIALS TO AVOID
Reacts violently with fire extinguishers containing water.
The substance is a strong base, reacts violently with acids and is corrosive.
Reacts with water generating sufficient heat to ignite combustible materials.
Reacts violently with strong acids, causing fire & explosion hazard. Attacks
many plastics, rubber, coatings, many metals, such as aluminum, zinc, tin, & lead.
forming flammable/explosive gas (hydrogen).
Reacts with ammonium salts to produce ammonia & causing fire hazard.
Rapidly absorbs carbon dioxide & water from the air.
Contact with moisture will generate heat.
Avoid contact with leather or wool. Reactions with food sugars may form carbon monoxide.

HAZARDOUS DECOMPOSITION PRODUCTS
Sodium Oxide & Hydroxide from heating.

HAZARDOUS POLYMERIZATION
Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

ACUTE HAZARDS

EYE & SKIN CONTACT:
Severe burns to skin, defatting, dermatitis.
Severe burns to eyes, redness, tearing, blurred vision.
Liquid can cause severe skin & eye burns. Wash thoroughly after handling.

INHALATION:
Severe respiratory tract irritation may occur. Vapor harmful.
The applicable occupational exposure limit value should not be exceeded during any part of the working exposure.

SWALLOWING:
Harmful or fatal if swallowed.

SUBCHRONIC HAZARDS/CONDITIONS AGGRAVATED

CONDITIONS AGGRAVATED:
None Known.

CHRONIC HAZARDS

CANCER, REPRODUCTIVE & OTHER CHRONIC HAZARDS:
This product has no carcinogens listed by IARC, NTP, NIOSH, OSHA or ACGIH, as of this date, greater or equal to 0.1%.

MUTAGENICITY: This product is not reported to produce mutagenic effects in humans. Mutation data obtained during clinical studies on test animal tissues or micro-organisms, are available for the following components of this product:

EMBRYOTOXICITY: This product is not reported to produce embryotoxic effects in humans.

TERATOGENICITY: This product is not reported to produce teratogenic effects in humans.

REPRODUCTIVE TOXICITY: This product is not reported to cause reproductive effects in humans.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (such as: within the eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MAMMALIAN TOXICITY INFORMATION

TOXICITY DATA: Toxicology information for components > 1% concentration is given below:

SODIUM HYDROXIDE:

Eye irritancy (monkey):	1%, 24 hours (severe)
Eye irritancy (rabbit):	500 ml, 24 hours (severe)
Eye irritancy (rabbit):	1% solution (severe)
Eye irritancy (rabbit):	1 mg, 24 hours (severe)
Cytogenic analysis system (grasshopper parenteral):	20 mg
LD50 (interperoneal, mouse):	40 mg/kg
LDLo (oral, rabbit):	500 mg/kg

SODIUM GLUCONATE:

LDLo (intravenous, rabbit):	7630 mg/kg

SECTION 12. ECOLOGICAL INFORMATION

AQUATIC ANIMAL INFORMATION:
SODIUM HYDROXIDE:

LC100 (Cyprimus carpio):	180 ppm/24 hours/25 C
TLm (mosquito fish):	125 ppm/96 hour (fresh water)
TLm (bluegill):	99 mg/L/48 hour (tap water)

MOBILITY IN SOIL
Mobility of this material has not been determined.

DEGRADABILITY
This product is completely biodegradable.

ACCUMULATION
Bioaccumulation of this product has not been determined.

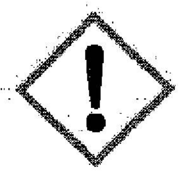
SECTION 13. DISPOSAL CONSIDERATIONS

Processing, use or contamination may change the waste management options. Recycle / dispose of observing national, regional, state, provincial and local health, safety & pollution laws. If in doubt, contact appropriate agencies.

SECTION 14. TRANSPORT INFORMATION

IF > 2043 LB / 947 KG OF THIS PRODUCT IN 1 CONTAINER,
IT EXCEEDS THE "RQ" OF SODIUM HYDROXIDE.

DOT SHIPPING NAME: UN1824, RQ, Sodium Hydroxide solution, 8, PG-II
DRUM LABEL: (CORROSIVE)
IATA / ICAO: UN1824, Sodium Hydroxide solution, 8, PG-II
IMO / IMDG: UN1824, Sodium Hydroxide solution, 8, PG-II
EMERGENCY RESPONSE GUIDEBOOK NUMBER: 154

SECTION 15. REGULATORY INFORMATION

EPA REGULATION:
SARA SECTION 311/312 HAZARDS: Acute Health

All components of this product are on the TSCA list.
SARA Title III Section 313 Supplier Notification
This product contains the indicated <*> toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning & Community Right-To-Know Act of 1986 & of 40 CFR 372. This information must be included in all MSDSs that are copied and distributed for this material.

SARA TITLE III INGREDIENTS	CAS#	EINECS#	WT%	(REG.SECTION)	RQ(LBS)
Sodium Hydroxide*	1310-73-2	215-185-5	30-50	(311,312)	1000
*Sodium Gluconate	527-07-1	-	0-10	(302,313,RCRA)	1000

SECTION 15. REGULATORY INFORMATION (CONTINUED)

> 2083 LB / 947 KG OF THIS PRODUCT IN 1 CONTAINER EXCEEDS THE "RQ" OF SODIUM HYDROXIDE. Any release equal to or exceeding the RQ must be reported to the National Response Center (800-424-8802) and appropriate state and local regulatory agencies as described in 40 CFR 302.6 and 40 CFR 355.40 respectively. Failure to report may result in substantial civil and criminal penalties. State & local regulations may be more restrictive than federal regulations.

STATE REGULATIONS:
CALIFORNIA PROPOSITION 65: This product contains no chemicals known to the State of California to cause cancer & reproductive toxicity.

U.S. STATE REGULATED COMPONENTS: (HAZARDOUS SUBSTANCE LISTS):

COMPONENT	AK	CA	FL	IL	KS	MA	MI	MN	MD	NJ	ND
Sodium Hydroxide	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

COMPONENT	PA	RI	TX	WV	WI
Sodium Hydroxide	Yes	Yes	Yes	Yes	Yes

INTERNATIONAL REGULATIONS
The components of this product are listed on the chemical inventories of the following countries:
Australia (AICS), Canada (DSL, NDSL), China (IECSC), Europe (EINECS, ELINCS), Japan (METI/CSCL, MHLW/ISHL), South Korea (KECI), New Zealand (NZIoC), Philippines (PICCS), Switzerland (SWISS), Taiwan (NECSI), USA (TSCA).

CANADA: WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)
D2B: Irritating to skin / eyes.
E: Corrosive Material.

SECTION 16. OTHER INFORMATION

HAZARD RATINGS:
HEALTH (NFPA): 0, HEALTH (HMIS): 3, FLAMMABILITY: 0, REACTIVITY: 0
(Personal Protection Rating to be supplied by user based on use conditions.)
This information is intended solely for the use of individuals trained in the NFPA & HMIS hazard rating systems.

EMPLOYEE TRAINING
See Section 2 for Risk & Safety Statements. Employees should be made aware of all hazards of this material (as stated in this SDS) before handling it.

Univar USA Inc Material Safety Data Sheet

For Additional Information contact MSDS Coordinator during business hours, Pacific time: (425) 889-3400

Notice

Univar USA Inc. ("Univar") expressly disclaims all express or implied warranties of merchantability and fitness for a particular purpose, with respect to the product or information provided herein, and shall under no circumstances be liable for incidental or consequential damages.

Do not use ingredient information and/or ingredient percentages in this MSDS as a product specification. For product specification information refer to a product specification sheet and/or a certificate of analysis. These can be obtained from your local Univar sales office.

All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, Univar makes no representations as to its accuracy or sufficiency. Conditions of use are beyond Univar's control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling, and disposal of the product, or from the publication or use of, or reliance upon, information contained herein.

This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process

UNIVAR®

Univar USA Inc Material Safety Data Sheet

MSDS No:	BCS80879
Version No:	001 2011-07-18
Order No:	

Univar USA Inc., 17425 NE Union Hill Rd., Redmond WA 98052
(425) 889 3400

Emergency Assistance

For emergency assistance involving chemicals call
Chemtrec - (800) 424-9300

SAFETY DATA SHEET

This Safety Data Sheet conforms to ANSI Z400.5, and to the format requirements and the International Chemical Safety Cards of the Global Harmonizing System.
THIS SDS COMPLIES WITH 29 CFR 1910.1200 (HAZARD COMMUNICATION STANDARD)
IMPORTANT: Read this SDS before handling & disposing of this product.
Pass this information on to employees, customers, & users of this product.

SECTION 1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER

PRODUCT IDENTITY: BLEND FOAMING ACID RED
SDS NUMBER: BCS80879
NEW MSDS DATE: 07/11/2011
COMPANY IDENTITY: Univar
COMPANY ADDRESS: 17425 NE Union Hill Road
COMPANY CITY: Redmond, WA 98052
COMPANY PHONE: 1-425-889-3400
EMERGENCY PHONES: CHEMTREC: 1-800-424-9300 (USA)
CANUTEC: 1-613-996-6666 (CANADA)

SECTION 2. HAZARDS IDENTIFICATION

WARNING!


RISK STATEMENTS:
R34 Causes burns.

SAFETY STATEMENTS:
S1/2 Keep locked up and out of the reach of children.
S24/25 Avoid contact with skin and eyes.
S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S45 In case of accident, or if you feel unwell, seek medical advice immediately. (Show the label where possible).

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

MATERIAL	CAS#	EINECS#	WT %
Water	7732-18-5	231-791-2	40-80
Phosphoric Acid	7664-38-2	231-633-2	20-40

Other components: Each of the other components are present in < 1% concentration, 0.1% for potential carcinogens, reproductive toxins, respiratory tract sensitizers, and mutagens.
None of the other components contribute significant additional hazards at the concentrations present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards, and Canadian Hazardous Materials Identification system Standards (CPR 4).

SEE SECTIONS 8, 11 & 12 FOR TOXICOLOGICAL INFORMATION.

SECTION 4. FIRST AID MEASURES

EYE CONTACT:
For eyes, flush with plenty of water for 15 minutes & get medical attention.

SKIN CONTACT:
In case of contact with skin immediately remove contaminated clothing.
Wash thoroughly with soap & water. Wash contaminated clothing before reuse.

INHALATION:
After high vapor exposure, remove to fresh air. If breathing is difficult, give oxygen. If breathing has stopped, trained personnel should immediately begin artificial respiration. If the heart has stopped, trained personnel should immediately begin cardiopulmonary resuscitation (CPR).

SWALLOWING:
Rinse mouth. Give plenty of water to drink. Do NOT induce vomiting.
GET MEDICAL ATTENTION IMMEDIATELY. Do NOT give liquids to an unconscious or convulsing person.

SECTION 5. FIRE FIGHTING MEASURES

FIRE & EXPLOSION PREVENTIVE MEASURES
Isolate from most metals, and alkalis.

EXTINGUISHING MEDIA
Use dry powder, In case of fire in surroundings, . .
use appropriate extinguishing media.

SPECIAL FIRE FIGHTING PROCEDURES
Water spray may be ineffective on fire but can protect fire-fighters & cool closed containers. Use fog nozzles if water is used.
Do not enter confined fire-space without full bunker gear.
(Helmet with face shield, bunker coats, gloves & rubber boots).
Use NIOSH approved positive-pressure self-contained breathing apparatus.

UNUSUAL EXPLOSION AND FIRE PROCEDURES
Noncombustible.
Reacts with most metals producing hydrogen which is extremely flammable & may explode.
Applying to hot surfaces requires special precautions. Closed containers may explode if exposed to extreme heat.

SECTION 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PROTECTIVE MEASURES:
Keep unprotected personnel away.
Use complete chemical protective suit with self-contained breathing apparatus.

ENVIRONMENTAL PRECAUTIONS:
Keep from entering storm sewers and ditches which lead to waterways.

CONTAINMENT AND CLEAN-UP MEASURES:
Stop spill at source. Dike and contain.
Sweep spilled material into dry, sealable containers.
Carefully collect remainder, remove to safe place.

SECTION 7. HANDLING AND STORAGE

HANDLING
Use only with adequate ventilation. Do not get in eyes, on skin or clothing. Wear OSHA Standard full face shield. Consult Safety Equipment Supplier. Wear goggles, face shield, gloves, apron & footwear impervious to material. Wash clothing before reuse.
NEVER pour water into this substance. When dissolving or diluting, always add it slowly to the water.
To minimize static discharge when transferring, ensure electrical continuity by bonding and grounding all equipment. Use an inlet line diameter of at least 3.5 inches (8.9 centimeters) with a maximum flow rate of 1 meter/second.

STORAGE
Keep separated from strong oxidants, food & feedstuffs. Keep dry.
See: Section 10, <Materials to Avoid>. Do not store above 49 C/120 F.
Keep container tightly closed & upright when not in use to prevent leakage.
Reacts with most metals producing hydrogen which is extremely flammable & may explode.
Wear full face shield, gloves & full protective clothing when opening or handling.
When empty, drain completely, replace bungs securely.

NONBULK: CONTAINERS:
If this product is transferred into another container, only use portable containers and dispensing equipment (faucet, pump, drip can) approved for corrosive, acidic liquids. Store containers in a cool, dry location,k away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Storage areas should be made of corrosion resistant materials. Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Empty containers may contain residual liquid or vapors which are corrosive; therefore, empty containers should be handled with care. Never store food, feed, or drinking water in containers which held this product.

BULK CONTAINERS:
All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

TANK CAR SHIPMENTS:
Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cares must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tanks (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:
Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment before maintenance begins by a triple-rinse with water followed, if necessary, by using sodium bicarbonate and an additional rinse. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

MATERIAL	CAS#	EINECS#	TWA (OSHA)	TLV (ACGIH)
Water	7732-18-5	231-791-2	None Known	None Known
Phosphoric Acid	7664-38-2	231-633-2	None Known	None Known

MATERIAL	CAS#	EINECS#	CEILING	STEL(OSHA/ACGIH)	HAP
Phosphoric Acid	7664-38-2	231-633-2	None Known	3 ppm	No

This product contains no EPA Hazardous Air Pollutants (HAP) in amounts > 0.1%.

RESPIRATORY EXPOSURE CONTROLS

A respiratory protection program that meets OSHA 29 CFR 1910.134 and ANSI Z86.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

VENTILATION

LOCAL EXHAUST: Necessary MECHANICAL (GENERAL): Necessary
SPECIAL: None OTHER: None

Please refer to ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

PERSONAL PROTECTIONS:

Wear OSHA Standard full face shield. Consult Safety Equipment Supplier. Wear goggles, face shield, gloves, apron & footwear impervious to material. Wash clothing before reuse.

WORK & HYGIENIC PRACTICES:

Provide readily accessible eye wash stations & safety showers.
Wash at end of each workshift & before eating, smoking or using the toilet.
Promptly remove clothing that becomes contaminated. Destroy contaminated leather articles. Launder or discard contaminated clothing.

SECTION 9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE:	Liquid, Water-White
ODOR:	None
ODOR THRESHOLD:	Not Available
pH (Neutrality):	1.0
MELTING POINT/FREEZING POINT:	Not Available
BOILING POINT:	135 C / 275 F
FLASH POINT (TEST METHOD):	Not Applicable
EVAPORATION RATE (n-BUTYL ACETATE=1):	Not Applicable
FLAMMABILITY CLASSIFICATION:	Non-Combustible
LOWER FLAMMABLE LIMIT IN AIR (% by vol):	Not Applicable
UPPER FLAMMABLE LIMIT IN AIR (% by vol):	Not Available
VAPOR PRESSURE (mm of Hg)@20 C	17.5
VAPOR DENSITY (air=1):	0.670
GRAVITY @ 68/68 F / 20/20 C:	
SPECIFIC GRAVITY (Water=1):	1.19
POUNDS/GALLON:	9.91
WATER SOLUBILITY:	Complete
PARTITION COEFFICIENT (n-Octane/Water):	Not Available
AUTO IGNITION TEMPERATURE:	Not Applicable
DECOMPOSITION TEMPERATURE:	Not Available
VOC'S (>0.44 Lbs/Sq In) :	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
TOTAL VOC'S (TVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC'S (CVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
HAZARDOUS AIR POLLUTANTS (HAPS):	0.0 Wt% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC PARTIAL PRESSURE (mm of Hg @ 20 C)	0.0

* Using California South Coast Air Quality Management District (SCAQMD) Rule 443.1.

SECTION 10. STABILITY & REACTIVITY

STABILITY
Stable but Reacts with alkalis and most metals producing hydrogen which is extremely flammable & may explode.

CONDITIONS TO AVOID
Isolate from extreme heat and open flame.

MATERIALS TO AVOID
The substance is a medium strong acid, reacts violently with bases and is corrosive. This substance violently polymerizes under the influence of azo compounds, and epoxides. On combustion forms irritating and toxic gases including phosphorus oxides, Reacts violently with strong bases, causing fire & explosion hazard. Reacts with alcohols, aldehydes, ketones, phenols, esters, halogenated organics. Reacts with amines, cyanides. sulfides. producing toxic fumes. Attacks many metals. forming flammable/explosive gas (hydrogen) .

HAZARDOUS DECOMPOSITION PRODUCTS
Phosphorus Pentoxide from heating.

HAZARDOUS POLYMERIZATION
Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

ACUTE HAZARDS

EYE & SKIN CONTACT:
Severe burns to skin, defatting, dermatitis.
Severe burns to eyes, redness, tearing, blurred vision.
Liquid can cause severe skin & eye burns. Wash thoroughly after handling.

INHALATION:
Severe respiratory tract irritation may occur. Vapor harmful.

SWALLOWING:
Harmful or fatal if swallowed.

SUBCHRONIC HAZARDS/CONDITIONS AGGRAVATED

CONDITIONS AGGRAVATED:
None Known.

CHRONIC HAZARDS

CANCER, REPRODUCTIVE & OTHER CHRONIC HAZARDS:
This product has no carcinogens listed by IARC, NTP, NIOSH, OSHA or ACGIH, as of this date, greater or equal to 0.1%.

MAMMALIAN TOXICITY INFORMATION

LD50 (oral, rat):	1530 mg/kg
LD50 (oral, rat) (85% Aqueous solution):	3500 mg/kg
LD50 (oral, rat) (80% Aqueous solution):	4200 mg/kg
LD50 (oral, rat) (5% Aqueous solution):	4400 mg/kg
LD50 (oral, mouse):	1250 mg/kg
LC50 (mouse)	25.5 mg/m3
LD50 (skin, rabbit)	2740 mg/kg
Skin irritancy (rabbit):	595 mg/24 hours (severe)
Skin irritancy (rabbit):	0.5 ml/75-85%/24 hours (corrosive)
Skin irritancy (rabbit):	0.5 ml/85%/4 hours (corrosive)
Eye irritancy (rabbit):	119 mg (severe)
Eye irritancy (rabbit):	0.1 mL/75-85% (corrosive)
Eye irritancy (rabbit):	17% solution (mild)
Acute Skin Contact (rabbit):	631-7940 mg/kg/24 hours: reduced appetite, increasing weakness, collapse, death.
LDLo (unreported, man):	220 mg/kg
TCLo (inhalation, human):	100 mg/m3

SECTION 12. ECOLOGICAL INFORMATION

AQUATIC ANIMAL INFORMATION:
No aquatic environmental information is available on this product.

MOBILITY IN SOIL
Mobility of this material has not been determined.

DEGRADABILITY
The components of this product are relatively stable in the environment; they may degrade, after time, into other organic and inorganic constituents. The following environmental data are available for the components of this product:
PHOSPHORIC ACID: Food chain concentration potential: Very Low
Chronic Hazard Level: The abundance of phosphates threatens
algal blooms in fresh and some salt waters.
BOD: None, Water Solubility: 548 g/ 100 cc (cold).
TLm (immersion, mosquito fish): 138 ppm/24 - 96 hours/ turbid water.

ACCUMULATION
Bioaccumulation of this product has not been determined.

SECTION 13. DISPOSAL CONSIDERATIONS

Processing, use or contamination may change the waste management options. Recycle / dispose of observing national, regional, state, provincial and local health, safety & pollution laws. If in doubt, contact appropriate agencies.

SECTION 14. TRANSPORT INFORMATION

IF > 7014 LB / 3188 KG OF THIS PRODUCT IN 1 CONTAINER,
IT EXCEEDS THE "RQ" OF PHOSPHORIC ACID.

DOT SHIPPING NAME: UN3264, Corrosive liquid, acidic, inorganic, n.o.s. (contains: Phosphoric Acid), 8, PG-III
DRUM LABEL: (CORROSIVE)
IATA / ICAO: UN3264, Corrosive liquid, acidic, inorganic, n.o.s. (contains: Phosphoric Acid), 8, PG-III
IMO / IMDG: UN3264, Corrosive liquid, acidic, inorganic, n.o.s. (contains: Phosphoric Acid), 8, PG-III
EMERGENCY RESPONSE GUIDEBOOK NUMBER: 154

SECTION 15. REGULATORY INFORMATION

EPA REGULATION:
SARA SECTION 311/312 HAZARDS: Acute Health

All components of this product are on the TSCA list.
This material contains no known products restricted under SARA Title III, Section 313 in amounts greater or equal to 1%.

SARA TITLE III INGREDIENTS	CAS#	EINECS#	WT%	(REG.SECTION)	RQ(LBS)
Phosphoric Acid	7664-38-2	231-633-2	45-60	(302,311,312)	5000

SECTION 15. REGULATORY INFORMATION (CONTINUED)

> 7014 LB / 3188 KG OF THIS PRODUCT IN 1 CONTAINER EXCEEDS THE "RQ" OF PHOSPHORIC ACID. Any release equal to or exceeding the RQ must be reported to the National Response Center (800-424-8802) and appropriate state and local regulatory agencies as described in 40 CFR 302.6 and 40 CFR 355.40 respectively. Failure to report may result in substantial civil and criminal penalties. State & local regulations may be more restrictive than federal regulations.

STATE REGULATIONS:
CALIFORNIA PROPOSITION 65: This product contains no chemicals known to the State of California to cause cancer & reproductive toxicity.

U.S. STATE REGULATED COMPONENTS: (HAZARDOUS SUBSTANCE LISTS):

COMPONENT	AK	CA	FL	IL	KS	MA	MI	MN	MO	NJ	ND
Phosphoric Acid	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

COMPONENT	PA	RI	TX	WV	WI
Phosphoric Acid	Yes	Yes	Yes	Yes	Yes

INTERNATIONAL REGULATIONS
The components of this product are listed on the chemical inventories of the following countries:
Australia (AICS), Canada (DSL, NDSL), China (IECSC), Europe (EINECS, ELINCS), Japan (METI/CSCL, MHLW/ISHL), South Korea (KECI), New Zealand (NZIoC), Philippines (PICCS), Switzerland (SWISS), Taiwan (NECSI), USA (TSCA).

CANADA: WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)
D2B: Irritating to skin / eyes.
E: Corrosive Material.

SECTION 16. OTHER INFORMATION

HAZARD RATINGS:
HEALTH (NFPA): 3, HEALTH (HMIS): 3, FLAMMABILITY: 0, REACTIVITY: 1
(Personal Protection Rating to be supplied by user based on use conditions.)
This information is intended solely for the use of individuals trained in the NFPA & HMIS hazard rating systems.

EMPLOYEE TRAINING
See Section 2 for Risk & Safety Statements. Employees should be made aware of all hazards of this material (as stated in this SDS) before handling it.

Univar USA Inc Material Safety Data Sheet

For Additional Information contact MSDS Coordinator during business hours, Pacific time: (425) 889-3400

Notice

Univar USA Inc. ("Univar") expressly disclaims all express or implied warranties of merchantability and fitness for a particular purpose, with respect to the product or information provided herein, and shall under no circumstances be liable for incidental or consequential damages.

Do not use ingredient information and/or ingredient percentages in this MSDS as a product specification. For product specification information refer to a product specification sheet and/or a certificate of analysis. These can be obtained from your local Univar sales office.

All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, Univar makes no representations as to its accuracy or sufficiency. Conditions of use are beyond Univar's control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling, and disposal of the product, or from the publication or use of, or reliance upon, information contained herein.

This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process

UNIVAR®

Univar USA Inc Material Safety Data Sheet

Blend Foaming Acid Cleaner.

MSDS No: BCS80876

Version No: 001 2011-07-18

Order No:

Univar USA Inc., 17425 NE Union Hill Rd., Redmond WA 98052
(425) 889 3400

Emergency Assistance

For emergency assistance involving chemicals call
Chemtrec - (800) 424-9300

SAFETY DATA SHEET

This Safety Data Sheet conforms to ANSI Z400.5, and to the format requirements and the International Chemical Safety Cards of the Global Harmonizing System.
THIS SDS COMPLIES WITH 29 CFR 1910.1200 (HAZARD COMMUNICATION STANDARD)
IMPORTANT: Read this SDS before handling & disposing of this product.
Pass this information on to employees, customers, & users of this product.

SECTION 1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER

PRODUCT IDENTITY: BLEND FOAMING ACID CLEANER
SDS NUMBER: BCS80876
NEW MSDS DATE: 07/08/2011
COMPANY IDENTITY: Univar
COMPANY ADDRESS: 17425 NE Union Hill Road
COMPANY CITY: Redmond, WA 98052
COMPANY PHONE: 1-425-889-3400
EMERGENCY PHONES: CHEMTREC: 1-800-424-9300 (USA)
CANUTEC: 1-613-996-6666 (CANADA)

SECTION 2. HAZARDS IDENTIFICATION

WARNING!

RISK STATEMENTS:
R34 Causes burns.

SAFETY STATEMENTS:
S1/2 Keep locked up and out of the reach of children.
S24/25 Avoid contact with skin and eyes.
S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S45 In case of accident, or if you feel unwell, seek medical advice immediately. (Show the label where possible).

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

MATERIAL	CAS#	EINECS#	WT %
Water	7732-18-5	231-791-2	55-70
Phosphoric Acid	7664-38-2	231-633-2	30-40
Surfactant	Proprietary	Proprietary	1- 5

Other components: Each of the other components are present in < 1% concentration, 0.1% for potential carcinogens, reproductive toxins, respiratory tract sensitizers, and mutagens.
None of the other components contribute significant additional hazards at the concentrations present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards, and Canadian Hazardous Materials Identification system Standards (CPR 4).

SEE SECTIONS 8, 11 & 12 FOR TOXICOLOGICAL INFORMATION.

SECTION 4. FIRST AID MEASURES

EYE CONTACT:
For eyes, flush with plenty of water for 15 minutes & get medical attention.

SKIN CONTACT:
In case of contact with skin immediately remove contaminated clothing.
Wash thoroughly with soap & water. Wash contaminated clothing before reuse.

INHALATION:
After high vapor exposure, remove to fresh air. If breathing is difficult, give oxygen. If breathing has stopped, trained personnel should immediately begin artificial respiration. If the heart has stopped, trained personnel should immediately begin cardiopulmonary resuscitation (CPR).

SWALLOWING:
Rinse mouth. Give plenty of water to drink. Do NOT induce vomiting.
GET MEDICAL ATTENTION IMMEDIATELY. Do NOT give liquids to an unconscious or convulsing person.

SECTION 5. FIRE FIGHTING MEASURES

FIRE & EXPLOSION PREVENTIVE MEASURES
Isolate from most metals and alkalis.

EXTINGUISHING MEDIA
Use dry powder, In case of fire in surroundings, . .
use appropriate extinguishing media.

SPECIAL FIRE FIGHTING PROCEDURES
Water spray may be ineffective on fire but can protect fire-fighters
& cool closed containers. Use fog nozzles if water is used.
Do not enter confined fire-space without full bunker gear.
(Helmet with face shield, bunker coats, gloves & rubber boots).
Use NIOSH approved positive-pressure self-contained breathing apparatus.

SECTION 5. FIRE FIGHTING MEASURES (CONTINUED)

UNUSUAL EXPLOSION AND FIRE PROCEDURES
Noncombustible.
Reacts with most metals producing hydrogen which is extremely flammable & may explode.
Applying to hot surfaces requires special precautions. Closed containers may explode if exposed to extreme heat.

SECTION 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PROTECTIVE MEASURES:
Keep unprotected personnel away.
Use complete chemical protective suit with self-contained breathing apparatus.

ENVIRONMENTAL PRECAUTIONS:
Keep from entering storm sewers and ditches which lead to waterways.

CONTAINMENT AND CLEAN-UP MEASURES:
Stop spill at source. Dike and contain.
Sweep spilled material into dry, sealable containers.
Carefully collect remainder, remove to safe place.

SECTION 7. HANDLING AND STORAGE

HANDLING

Use only with adequate ventilation. Do not get in eyes, on skin or clothing. Wear OSHA Standard full face shield. Consult Safety Equipment Supplier. Wear goggles, face shield, gloves, apron & footwear impervious to material. Wash clothing before reuse. NEVER pour water into this substance. When dissolving or diluting, always add it slowly to the water.
To minimize static discharge when transferring, ensure electrical continuity by bonding and grounding all equipment. Use an inlet line diameter of at least 3.5 inches (8.9 centimeters) with a maximum flow rate of 1 meter/second.

STORAGE

Keep separated from strong oxidants, food & feedstuffs. Keep dry.
See: Section 10, <Materials to Avoid>. Do not store above 49 C/120 F.
Keep container tightly closed & upright when not in use to prevent leakage.
Reacts with most metals producing hydrogen which is extremely flammable & may explode.
Wear full face shield, gloves & full protective clothing when opening or handling.
When empty, drain completely, replace bungs securely.

NONBULK: CONTAINERS:

If this product is transferred into another container, only use portable containers and dispensing equipment (faucet, pump, drip can) approved for corrosive, acidic liquids. Store containers in a cool, dry location,k away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Storage areas should be made of corrosion resistant materials. Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Empty containers may contain residual liquid or vapors which are corrosive; therefore, empty containers should be handled with care. Never store food, feed, or drinking water in containers which held this product.

BULK CONTAINERS:

All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

TANK CAR SHIPMENTS:

Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cares must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tanks (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:

Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment before maintenance begins by a triple-rinse with water followed, if necessary, by using sodium bicarbonate and an additional rinse. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

MATERIAL	CAS#	EINECS#	TWA (OSHA)	TLV (ACGIH)
Water	7732-18-5	231-791-2	None Known	None Known
Phosphoric Acid	7664-38-2	231-633-2	None Known	None Known
Surfactant	Proprietary	-	None Known	None Known

MATERIAL	CAS#	EINECS#	CEILING	STEL(OSHA/ACGIH)	HAP
Phosphoric Acid	7664-38-2	231-633-2	None Known	3 ppm	No

This product contains no EPA Hazardous Air Pollutants (HAP) in amounts > 0.1%.

RESPIRATORY EXPOSURE CONTROLS
A respiratory protection program that meets OSHA 29 CFR 1910.134 and ANSI Z86.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

VENTILATION

LOCAL EXHAUST:	Necessary	MECHANICAL (GENERAL):	Necessary
SPECIAL:	None	OTHER:	None

Please refer to ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

PERSONAL PROTECTIONS:
Wear OSHA Standard full face shield. Consult Safety Equipment Supplier. Wear goggles, face shield, gloves, apron & footwear impervious to material. Wash clothing before reuse.

WORK & HYGIENIC PRACTICES:
Provide readily accessible eye wash stations & safety showers.
Wash at end of each workshift & before eating, smoking or using the toilet.
Promptly remove clothing that becomes contaminated. Destroy contaminated leather articles. Launder or discard contaminated clothing.

SECTION 9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE:	Liquid, Water-White
ODOR:	None
ODOR THRESHOLD:	Not Available
pH (Neutrality):	1 - 2
MELTING POINT/FREEZING POINT:	Not Available
BOILING POINT:	100 C / 212 F (*=End Point)
FLASH POINT (TEST METHOD):	Not Applicable
EVAPORATION RATE (n-BUTYL ACETATE=1):	Not Applicable
FLAMMABILITY CLASSIFICATION:	Non-Combustible
LOWER FLAMMABLE LIMIT IN AIR (% by vol):	Not Applicable
UPPER FLAMMABLE LIMIT IN AIR (% by vol):	Not Available
VAPOR PRESSURE (mm of Hg)@20 C	17.5
VAPOR DENSITY (air=1):	0.670
GRAVITY @ 68/68 F / 20/20 C:	
SPECIFIC GRAVITY (Water=1):	1.30
POUNDS/GALLON:	10.83
WATER SOLUBILITY:	Complete
PARTITION COEFFICIENT (n-Octane/Water):	Not Available
AUTO IGNITION TEMPERATURE:	Not Applicable
DECOMPOSITION TEMPERATURE:	Not Available
VOC'S (>0.44 Lbs/Sq In) :	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
TOTAL VOC'S (TVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC'S (CVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
HAZARDOUS AIR POLLUTANTS (HAPS):	0.0 Wt% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC PARTIAL PRESSURE (mm of Hg @ 20 C)	0.0

* Using California South Coast Air Quality Management District (SCAQMD) Rule 443.1.

SECTION 10. STABILITY & REACTIVITY

STABILITY
Stable but Reacts with alkalis and most metals producing hydrogen which is extremely flammable & may explode.

CONDITIONS TO AVOID
Isolate from extreme heat and open flame.

MATERIALS TO AVOID
The substance is a medium strong acid, reacts violently with bases and is corrosive. This substance violently polymerizes under the influence of azo compounds, and epoxides. On combustion forms irritating and toxic gases including phosphorus oxides, Reacts violently with strong bases, causing fire & explosion hazard. Reacts with alcohols, aldehydes, ketones, phenols, esters, halogenated organics. Reacts with amines, cyanides. sulfides. producing toxic fumes. Attacks many metals. forming flammable/explosive gas (hydrogen) .

HAZARDOUS DECOMPOSITION PRODUCTS
Phosphorus Pentoxide, Carbon Oxides, and Sulfur Oxides from heating.

HAZARDOUS POLYMERIZATION
Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

ACUTE HAZARDS

EYE & SKIN CONTACT:
Severe burns to skin, defatting, dermatitis.
Severe burns to eyes, redness, tearing, blurred vision.
Liquid can cause severe skin & eye burns. Wash thoroughly after handling.

INHALATION:
Severe respiratory tract irritation may occur. Vapor harmful.

SWALLOWING:
Harmful or fatal if swallowed.

SUBCHRONIC HAZARDS/CONDITIONS AGGRAVATED

CONDITIONS AGGRAVATED:
None Known.

CHRONIC HAZARDS

CANCER, REPRODUCTIVE & OTHER CHRONIC HAZARDS:
This product has no carcinogens listed by IARC, NTP, NIOSH, OSHA or ACGIH, as of this date, greater or equal to 0.1%.

MAMMALIAN TOXICITY INFORMATION

No mammalian information is available on this product.

SECTION 12. ECOLOGICAL INFORMATION

AQUATIC ANIMAL INFORMATION:
No aquatic environmental information is available on this product.

MOBILITY IN SOIL
Mobility of this material has not been determined.

DEGRADABILITY
The components of this product are relatively stable in the environment; they may degrade, after time, into other organic and inorganic constituents. The following environmental data are available for the components of this product:
PHOSPHORIC ACID: Food chain concentration potential: Very Low
Chronic Hazard Level: The abundance of phosphates threatens algal blooms in fresh and some salt waters.
BOD: None, Water Solubility: 548 g/ 100 cc (cold).
TLm (mmersion, mosquito fish): 138 ppm/24 - 96 hours/ turbid water.

ACCUMULATION
Bioaccumulation of this product has not been determined.

SECTION 13. DISPOSAL CONSIDERATIONS

Processing, use or contamination may change the waste management options. Recycle / dispose of observing national, regional, state, provincial and local health, safety & pollution laws. If in doubt, contact appropriate agencies.

SECTION 14. TRANSPORT INFORMATION

IF > 14285 LB / 6494 KG OF THIS PRODUCT IN 1 CONTAINER,
IT EXCEEDS THE "RQ" OF PHOSPHORIC ACID.

DOT SHIPPING NAME: UN3264, Corrosive liquid, acidic, inorganic, n.o.s. (contains: Phosphoric Acid), 8, PG-III
DRUM LABEL: (CORROSIVE)
IATA / ICAO: UN3264, Corrosive liquid, acidic, inorganic, n.o.s. (contains: Phosphoric Acid), 8, PG-III
IMO / IMDG: UN3264, Corrosive liquid, acidic, inorganic, n.o.s. (contains: Phosphoric Acid), 8, PG-III
EMERGENCY RESPONSE GUIDEBOOK NUMBER: 154

SECTION 15. REGULATORY INFORMATION

EPA REGULATION:
SARA SECTION 311/312 HAZARDS: Acute Health

All components of this product are on the TSCA list.
This material contains no known products restricted under SARA Title III, Section 313 in amounts greater or equal to 1%.

SARA TITLE III INGREDIENTS	CAS#	EINECS#	WT%	(REG.SECTION)	RQ(LBS)
Phosphoric Acid	7664-38-2	231-633-2	30-40	(302,311,312)	5000

SECTION 15. REGULATORY INFORMATION (CONTINUED)

> 14285 LB / 6494 KG OF THIS PRODUCT IN 1 CONTAINER EXCEEDS THE "RQ" OF PHOSPHORIC ACID.
Any release equal to or exceeding the RQ must be reported to the National Response Center (800-424-8802) and appropriate state and local regulatory agencies as described in 40 CFR 302.6 and 40 CFR 355.40 respectively.
Failure to report may result in substantial civil and criminal penalties.
State & local regulations may be more restrictive than federal regulations.

STATE REGULATIONS:
CALIFORNIA PROPOSITION 65: This product contains no chemicals known to the State of California to cause cancer & reproductive toxicity.

INTERNATIONAL REGULATIONS
The components of this product are listed on the chemical inventories of the following countries:
Australia (AICS), Canada (DSL, NDSL), China (IECSC), Europe (EINECS, ELINCS), Japan (METI/CSCL, MHLW/ISHL), South Korea (KECI), New Zealand (NZIoC), Philippines (PICCS), Switzerland (SWISS), Taiwan (NECSI), USA (TSCA).

CANADA: WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)
D2B: Irritating to skin / eyes.
E: Corrosive Material.

SECTION 16. OTHER INFORMATION

HAZARD RATINGS:
HEALTH (NFPA): 3, HEALTH (HMIS): 3, FLAMMABILITY: 0, REACTIVITY: 1
(Personal Protection Rating to be supplied by user based on use conditions.)
This information is intended solely for the use of individuals trained in the NFPA & HMIS hazard rating systems.

EMPLOYEE TRAINING
See Section 2 for Risk & Safety Statements. Employees should be made aware of all hazards of this material (as stated in this SDS) before handling it.

Univar USA Inc Material Safety Data Sheet

For Additional Information contact MSDS Coordinator during business hours, Pacific time: (425) 889-3400

Notice

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This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process

UNIVAR®

Univar USA Inc Material Safety Data Sheet

MSDS No: BCS80984

Version No: 002 2011-07-29

Order No:

Univar USA Inc., 17425 NE Union Hill Rd., Redmond WA 98052
(425) 889 3400

Emergency Assistance

For emergency assistance involving chemicals call
Chemtrec - (800) 424-9300

DATE: 07/27/11
PAGE: 1 OF 7

COMPANY IDENTITY: Univar
PRODUCT IDENTITY: BLEND GENERAL CLEANER

SAFETY DATA SHEET

This Safety Data Sheet conforms to ANSI Z400.5, and to the format requirements and the International Chemical Safety Cards of the Global Harmonizing System.
THIS SDS COMPLIES WITH 29 CFR 1910.1200 (HAZARD COMMUNICATION STANDARD)
IMPORTANT: Read this SDS before handling & disposing of this product.
Pass this information on to employees, customers, & users of this product.

SECTION 1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER

PRODUCT IDENTITY: BLEND GENERAL CLEANER
SDS NUMBER: BCSB0984
NEW MSDS DATE: 07/27/2011
COMPANY IDENTITY: Univar
COMPANY ADDRESS: 17425 NE Union Hill Road
COMPANY CITY: Redmond, WA 98052
COMPANY PHONE: 1-425-889-3400
EMERGENCY PHONES: CHEMTREC: 1-800-424-9300 (USA)
CANUTEC: 1-613-996-6666 (CANADA)

SECTION 2. HAZARDS IDENTIFICATION

CAUTION

RISK STATEMENTS:
R36/37/38 Irritating to eyes, respiratory system, and skin.

SAFETY STATEMENTS:
S24/25 Avoid contact with skin and eyes.
S36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

MATERIAL	CAS#	EINECS#	WT %
Water	7732-18-5	231-791-2	75-90
Quaternary Ammonium Compound	Proprietary	Proprietary	<10
Ethoxylated Alcohol	Proprietary	Proprietary	2- 3
Proprietary Diluent	Proprietary	Proprietary	4- 5
Tetrapotassium Pyrophosphate	7320-34-5	-	1- 3
Tetrasodium salt of Ethylenediaminetetraacetic Acid	68956-79-6	-	1- 3

Trace components: Trace ingredients (if any) are present in < 1% concentration, (< 0.1% for potential carcinogens, reproductive toxins, respiratory tract mutagens, and sensitizers). None of the trace ingredients contribute significant additional hazards at the concentrations present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalents, and Canadian Hazardous Materials Identification System Standard (CPR 4).

SEE SECTIONS 8, 11 & 12 FOR TOXICOLOGICAL INFORMATION.

SECTION 4. FIRST AID MEASURES

EYE CONTACT:
If this product enters the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention.

SKIN CONTACT:
If the product contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove contaminated clothing, taking care not to contaminate eyes. If skin becomes irritated and irritation persists, medical attention may be necessary. Wash contaminated clothing before reuse, discard contaminated shoes.

INHALATION:
After high vapor exposure, remove to fresh air. If breathing is difficult, give oxygen. If breathing has stopped, trained personnel should immediately begin artificial respiration. If the heart has stopped, trained personnel should immediately begin cardiopulmonary resuscitation (CPR).

INGESTION:
Do not induce vomiting. Drink several glasses of water. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek immediate medical attention.

RESCUERS:
Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with victim.

SECTION 5. FIRE FIGHTING MEASURES

FIRE & EXPLOSION PREVENTIVE MEASURES
Not Applicable.

EXTINGUISHING MEDIA
Use dry powder, carbon dioxide, or water spray extinguisher.

SPECIAL FIRE FIGHTING PROCEDURES
Water spray may be ineffective on fire but can protect fire-fighters & cool closed containers. Use fog nozzles if water is used.
Do not enter confined fire-space without full bunker gear.
(Helmet with face shield, bunker coats, gloves & rubber boots).
Use NIOSH approved positive-pressure self-contained breathing apparatus.

UNUSUAL EXPLOSION AND FIRE PROCEDURES
Do not direct solid stream of water at fire because this may cause frothing which may increase fire intensity.

SECTION 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PROTECTIVE MEASURES:
Keep unprotected personnel away.
Use complete chemical protective suit with self-contained breathing apparatus.

ENVIRONMENTAL PRECAUTIONS:
Do NOT let this chemical enter the environment.
Keep from entering storm sewers and ditches which lead to waterways.

CONTAINMENT AND CLEAN-UP MEASURES:
Stop spill at source. Dike and contain. Sweep spilled material into dry, sealable containers. Wash away remainder with plenty of water.
Do NOT absorb in sawdust or other combustible absorbents.

COMPANY IDENTITY: Univar
PRODUCT IDENTITY: BLEND GENERAL CLEANER

SECTION 7. HANDLING AND STORAGE

HANOLING
Use only with adequate ventilation. Do not get in eyes, on skin or clothing. Wear OSHA Standard full face shield. Consult Safety Equipment Supplier. Wear goggles, face shield, gloves, apron & footwear impervious to material. Wash clothing before reuse.

STORAGE
Keep cool. Keep dry. See: Section 10, <Materials to Avoid>. Do not store above 49 C/120 F. Keep container tightly closed & upright when not in use to prevent leakage. Wear full face shield, gloves & full protective clothing when opening or handling. When empty, drain completely, replace bungs securely.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTMINATED EQUIPMENT:
Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely, if necessary. Collect all rinsates and dispose of according to applicable Federal, State (or Provincial), or local procedures and standards.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

MATERIAL	CAS#	EINECS#	TWA (OSHA)	TLV (ACGIH)
Water	7732-18-5	231-791-2	None Known	None Known
Quaternary Ammonium Compound	Proprietary	Proprietary	None Known	None Known
Ethoxylated Alcohol	Proprietary	Proprietary	None Known	None Known
Proprietary Diluent	Proprietary	Proprietary	None Known	None Known
Tetrapotassium Pyrophosphate	7320-34-5	-	None Known	None Known
Tetrasodium salt of Ethylenediaminetetraacetic Acid	68956-79-6	-	None Known	None Known

This product contains no EPA Hazardous Air Pollutants (HAP) in amounts > 0.1%.

RESPIRATORY EXPOSURE CONTROLS
Maintain airborne contaminant concentrations below exposure limits given above. If respiratory protection is needed, use only protection authorized in 29 CFR 1910.134, European Standard EN 149, or applicable State regulations.

VENTILATION
LOCAL EXHAUST: Necessary
MECHANICAL (GENERAL): Necessary
SPECIAL: None
OTHER: None
Please refer to ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

EYE PROTECTION:
Splash goggles or safety glasses. Face-shields are recommended when the operation can generate splashes, sprays or mists.

HAND PROTECTION:
Wear appropriate impervious gloves for routine industrial use. Use impervious gloves for spill response, as stated in Section 6 of this SDS (Accidental Release Measures).

BODY PROTECTION:
Use body protection appropriate for task. Cover-all, rubber aprons, or chemical protective clothing made from impervious materials are generally acceptable, depending on the task.

WORK & HYGIENIC PRACTICES:
Provide readily accessible eye wash stations & safety showers. Wash at end of each workshift & before eating, smoking or using the toilet. Promptly remove clothing that becomes contaminated. Destroy contaminated leather articles. Launder or discard contaminated clothing.

COMPANY IDENTITY: Univar
PRODUCT IDENTITY: BLEND GENERAL CLEANER

SECTION 9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE:	Liquid, Clear
ODOR:	Slight Odor
ODOR THRESHOLD:	Not Available
pH (Neutrality):	9.73 (1% Solution)
MELTING POINT/FREEZING POINT:	Not Available
BOILING RANGE (IBP,50%,Dry Point):	Not Available
FLASH POINT (TEST METHOD):	Not Applicable
EVAPORATION RATE (n-BUTYL ACETATE=1):	Not Applicable
FLAMMABILITY CLASSIFICATION:	Non-Combustible
LOWER FLAMMABLE LIMIT IN AIR (% by vol):	Not Applicable
UPPER FLAMMABLE LIMIT IN AIR (% by vol):	Not Available
VAPOR PRESSURE (mm of Hg)@20 C	Not Available
VAPOR DENSITY (air=1):	0.670
GRAVITY @ 68/68 F / 20/20 C:	
SPECIFIC GRAVITY (Water=1):	1.16
POUNDS/GALLON:	9.66
WATER SOLUBILITY:	Complete
PARTITION COEFFICIENT (n-Octane/Water):	Not Available
AUTO IGNITION TEMPERATURE:	Not Applicable
DECOMPOSITION TEMPERATURE:	Not Available
VOC'S (>0.44 Lbs/Sq In) :	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
TOTAL VOC'S (TVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC'S (CVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
HAZARDOUS AIR POLLUTANTS (HAPS):	0.0 Wt% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC PARTIAL PRESSURE (mm of Hg @ 20 C)	0.0

* Using California South Coast Air Quality Management District (SCAQMD) Rule 443.1.

SECTION 10. STABILITY & REACTIVITY

STABILITY
Stable under normal conditions.

CONDITIONS TO AVOID
Isolate from extreme temperatures and incompatible chemicals.

MATERIALS TO AVOID
Avoid strong bases at high temperatures, strong acids, strong oxidizing agents, avoid contact with metals such as aluminum, which react forming flammable hydrogen gas.

HAZARDOUS DECOMPOSITION PRODUCTS
Carbon Oxides, Potassium Oxide & Hydroxide, from heating.

HAZARDOUS POLYMERIZATION
Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

ACUTE HAZARDS

EYE & SKIN CONTACT:
Irritating to skin, defatting, dermatitis. Irritating to eyes, redness, tearing, blurred vision. Wash thoroughly after handling.

INHALATION:
Respiratory tract irritation may occur.

SWALLOWING:
Harmful if swallowed.

SUBCHRONIC HAZARDS/CONDITIONS AGGRAVATED

CONDITIONS AGGRAVATED:
Skin disorders can be aggravated by over-exposure to this product. Inhalation of this product's mists may aggravate respiratory conditions.

CHRONIC HAZARDS

IRRITANCY OF PRODUCT: This product is irritating to contaminated tissue.

SENSITIZATION TO THE PRODUCT:
No component of this product is known to be a sensitizer.

CANCER, REPRODUCTIVE & OTHER CHRONIC HAZARDS:
No component of this product is known to be a carcinogen.

MUTAGENICITY: This product is not reported to produce mutagenic effects in humans.

EMBRYOTOXICITY: This product is not reported to produce embryotoxic effects in humans.

TERATOGENICITY: This product is not reported to produce teratogenic effects in humans.

REPRODUCTIVE TOXICITY: This product is not reported to cause reproductive effects in humans.

A <u>mutagen</u> is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An <u>embryotoxin</u> is a chemical which causes damage to a developing embryo (such as: within the eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A <u>teratogen</u> is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A <u>reproductive toxin</u> is any substance which interferes in any way with the reproductive process.

MAMMALIAN TOXICITY INFORMATION

None available at this time.

COMPANY IOENTITY: Univar
PRODUCT IDENTITY: BLEND GENERAL CLEANER

SECTION 12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

EFFECT OF MATERIAL ON PLANTS OR ANIMALS:
Do not flush spills to natural waters. May be harmful to Plants and Aquatic Life.

EFFECT OF MATERIAL ON AQUATIC LIFE:
Oo not flush spills to natural waters. May be harmful to Plants and Aquatic Life.

MOBILITY IN SOIL
Mobility of this material has not been determined.

DEGRAOABILITY
This product is completely biodegradable.

ACCUMULATION
Bioaccumulation of this product has not been determined.

SECTION 13. DISPOSAL CONSIDERATIONS

Processing, use or contamination may change the waste management options.
Recycle / dispose of observing national, regional, state, provincial and local
health, safety & pollution laws. If in doubt, contact appropriate agencies.
EPA WASTE #: D002 (Characteristic: Corrosivity): Wastes consisting only of this solution.

SECTION 14. TRANSPORT INFORMATION

DOT SHIPPING NAME: None
DRUM LABEL: None
IATA / ICAO: None
IMO / IMDG: None
EMERGENCY RESPONSE GUIDEBOOK NUMBER: None
CANADA: DANGEROUS GOODS TRANSPORT:
This material is not considered as dangerous goods.

SECTION 15. REGULATORY INFORMATION

EPA REGULATION:
SARA SECTION 311/312 HAZARDS: Acute Health

All components of this product are on the TSCA list.
This material contains no known products restricted under SARA Title III,
Section 313 in amounts greater or equal to 1%.

COMPANY IDENTITY: Univar
PRODUCT IDENTITY: BLEND GENERAL CLEANER

SECTION 15. REGULATORY INFORMATION (CONTINUED)

STATE REGULATIONS:
CALIFORNIA PROPOSITION 65: This product does not contain any components known to the State of California to cause cancer & reproductive toxicity.

U.S. STATE REGULATED COMPONENTS: (HAZARDOUS SUBSTANCE LISTS):

AK	CA	FL	IL	KS	MA	MI	MN	MO	NJ
No	No	No	No	No	No	No	No	No	No

ND	PA	RI	TX	WV	WI
No	No	No	No	No	No

INTERNATIONAL REGULATIONS
The components of this product are listed on the chemical inventories of the following countries:
Australia (AICS), Canada (DSL, NDSL), China (IECSC), Europe (EINECS, ELINCS), Japan (METI/CSCL, MHLW/ISHL), South Korea (KECI), New Zealand (NZIoC), Philippines (PICCS), Switzerland (SWISS), Taiwan (NECSI), USA (TSCA).

CANADA: WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)
D2B: Irritating to skin / eyes.

SECTION 16. OTHER INFORMATION

HAZARD RATINGS:
HEALTH (NFPA): 2, HEALTH (HMIS): 2, FLAMMABILITY: 1, REACTIVITY: 0
(Personal Protection Rating to be supplied by user based on use conditions.)
This information is intended solely for the use of individuals trained in the NFPA & HMIS hazard rating systems.

EMPLOYEE TRAINING
See Section 2 for Risk & Safety Statements. Employees should be made aware of all hazards of this material (as stated in this SDS) before handling it.

Univar USA Inc Material Safety Data Sheet

For Additional Information contact MSDS Coordinator during business hours, Pacific time: (425) 889-3400

Notice

Univar USA Inc. ("Univar") expressly disclaims all express or implied warranties of merchantability and fitness for a particular purpose, with respect to the product or information provided herein, and shall under no circumstances be liable for incidental or consequential damages.

Do not use ingredient information and/or ingredient percentages in this MSDS as a product specification. For product specification information refer to a product specification sheet and/or a certificate of analysis. These can be obtained from your local Univar sales office.

All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, Univar makes no representations as to its accuracy or sufficiency. Conditions of use are beyond Univar's control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling, and disposal of the product, or from the publication or use of, or reliance upon, information contained herein.

This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process

UNIVAR®

Univar USA Inc Material Safety Data Sheet

MSDS No:	BCS80954
Version No:	001 2011-07-21
Order No:	

Univar USA Inc., 17425 NE Union Hill Rd., Redmond WA 98052
(425) 889 3400

Emergency Assistance

For emergency assistance involving chemicals call
Chemtrec - (800) 424-9300

SAFETY DATA SHEET

This Safety Data Sheet conforms to ANSI Z400.5, and to the format requirements and the International Chemical Safety Cards of the Global Harmonizing System.
THIS SDS COMPLIES WITH 29 CFR 1910.1200 (HAZARD COMMUNICATION STANDARD)
IMPORTANT: Read this SDS before handling & disposing of this product.
Pass this information on to employees, customers, & users of this product.

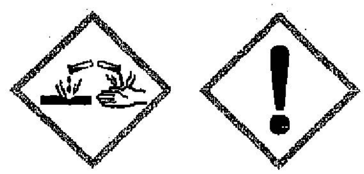
SECTION 1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER

PRODUCT IDENTITY: BLEND NC FOAM CLEANER
SDS NUMBER: BCS80954
NEW MSDS DATE: 07/20/2011
COMPANY IDENTITY: Univar
COMPANY ADDRESS: 17425 NE Union Hill Road
COMPANY CITY: Redmond, WA 98052
COMPANY PHONE: 1-425-889-3400
EMERGENCY PHONES: CHEMTREC: 1-800-424-9300 (USA)
CANUTEC: 1-613-996-6666 (CANADA)

SECTION 2. HAZARDS IDENTIFICATION

DANGER!!

EXPOSURE PREVENTION: STRICT HYGIENE! AVOID ALL CONTACT!



RISK STATEMENTS:

R35	Causes severe burns.
R50	Very toxic to aquatic organisms.

SAFETY STATEMENTS:

S1/2	Keep locked up and out of the reach of children.
S24/25	Avoid contact with skin and eyes.
S36/37/39	Wear suitable protective clothing, gloves and eye/face protection.
S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S28	After contact with skin, wash immediately with plenty of water.
S45	In case of accident, or if you feel unwell, seek medical advice immediately. (Show the label where possible).
S61	Avoid release to the environment. Refer to special instructions/safety data sheet.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

MATERIAL	CAS#	EINECS#	WT %
Water	7732-18-5	231-791-2	70-90
Potassium Hydroxide	1310-58-3	215-181-3	10-20
Tetrapotassium Pyrophosphate	7320-34-5	231-668-3	2- 5
Surfactant	Proprietary	Proprietary	< 4

Trace components: Trace ingredients (if any) are present in < 1% concentration, (< 0.1% for potential carcinogens, reproductive toxins, respiratory tract mutagens, and sensitizers). None of the trace ingredients contribute significant additional hazards at the concentrations present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalents, and Canadian Hazardous Materials Identification System Standard (CPR 4).

SEE SECTIONS 8, 11 & 12 FOR TOXICOLOGICAL INFORMATION.

SECTION 4. FIRST AID MEASURES

EYE CONTACT:
If this product enters the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention.

SKIN CONTACT:
If the product contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove contaminated clothing, taking care not to contaminate eyes. If skin becomes irritated and irritation persists, medical attention may be necessary. Wash contaminated clothing before reuse, discard contaminated shoes.

INHALATION:
After high vapor exposure, remove to fresh air. If breathing is difficult, give oxygen. If breathing has stopped, trained personnel should immediately begin artificial respiration. If the heart has stopped, trained personnel should immediately begin cardiopulmonary resuscitation (CPR).

SWALLOWING:
Rinse mouth. Give plenty of water to drink. Do NOT induce vomiting. GET MEDICAL ATTENTION IMMEDIATELY. Do NOT give liquids to an unconscious or convulsing person.

SECTION 5. FIRE FIGHTING MEASURES

FIRE & EXPLOSION PREVENTIVE MEASURES
Not Applicable.

EXTINGUISHING MEDIA
Use dry powder, foam, carbon dioxide, water spray, halon, or any "ABC" Class extinguisher.

SPECIAL FIRE FIGHTING PROCEDURES
Water spray may be ineffective on fire but can protect fire-fighters & cool closed containers. Use fog nozzles if water is used. Do not enter confined fire-space without full bunker gear. (Helmet with face shield, bunker coats, gloves & rubber boots). Use NIOSH approved positive-pressure self-contained breathing apparatus.

UNUSUAL EXPLOSION AND FIRE PROCEDURES
Noncombustible.
Isolate from reducers, acids, wood, organic materials, and most metals. Oxidizer fumes damage lungs. Symptoms may be delayed. Do not breathe fumes.

SECTION 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PROTECTIVE MEASURES:
Keep unprotected personnel away.
Use complete chemical protective suit with self-contained breathing apparatus.

ENVIRONMENTAL PRECAUTIONS:
Do NOT let this chemical enter the environment.
Keep from entering storm sewers and ditches which lead to waterways.

CONTAINMENT AND CLEAN-UP MEASURES:
Stop spill at source. Dike and contain.
Sweep spilled material into dry, sealable containers.
Wash away remainder with plenty of water.
Do NOT absorb in sawdust or other combustible absorbents.

SECTION 7. HANDLING AND STORAGE

HANDLING

Use only with adequate ventilation. Do not get in eyes, on skin or clothing. Wear OSHA Standard full face shield. Consult Safety Equipment Supplier. Wear goggles, face shield, gloves, apron & footwear impervious to material. Wash clothing before reuse. NEVER pour water into this substance. When dissolving or diluting, always add it slowly to the water.
To minimize static discharge when transferring, ensure electrical continuity by bonding and grounding all equipment. Use an inlet line diameter of at least 3.5 inches (8.9 centimeters) with a maximum flow rate of 1 meter/second.

STORAGE

Keep separated from strong oxidants, strong acids, combustible & reducing substances, metals, food & feedstuffs. Keep cool. Keep dry. Keep in the dark. See: Section 10, <Materials to Avoid>. Do not store above 49 C/120 F. Keep container tightly closed & upright when not in use to prevent leakage.
Wear full face shield, gloves & full protective clothing when opening or handling.
When empty, drain completely, replace bungs securely.

NONBULK: CONTAINERS:

Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Empty containers should be handled with care. Never store food, feed, or drinking water in containers which held this product.

BULK CONTAINERS:

All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

TANK CAR SHIPMENTS:

Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cares must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tanks (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:

Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

MATERIAL	CAS#	EINECS#	TWA (OSHA)	TLV (ACGIH)
Water	7732-18-5	231-791-2	None Known	None Known
Potassium Hydroxide	1310-58-3	215-181-3	None Known	None Known
Tetrapotassium Pyrophosphate	7320-34-5	231-668-3	None Known	None Known
Surfactant	Proprietary	Proprietary	None Known	None Known

MATERIAL	CAS#	EINECS#	CEILING	STEL(OSHA/ACGIH)	HAP
Potassium Hydroxide	1310-58-3	215-181-3	2 ppm	None Known	No

This product contains no EPA Hazardous Air Pollutants (HAP) in amounts > 0.1%.

RESPIRATORY EXPOSURE CONTROLS
Maintain airborne contaminant concentrations below exposure limits given above. If respiratory protection is needed, use only protection authorized in 29 CFR 1910.134, European Standard EN 149, or applicable State regulations. If adequate ventilation is not available or there is potential for airborne exposure above the exposure limits, a respirator may be worn up to the respirator exposure limitations, check with respirator equipment manufacturer's recommendations/limitations. For a higher level of protection, use positive pressure supplied air respiration protection or Self Contained Breathing Apparatus or if oxygen levels are below 19.5% or are unknown.

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS
Positive pressure, full-face piece Self Contained Breathing Apparatus; or positive pressure, full-face piece Salf Contained Breathing Apparatus with an auxilliary positive pressure Self Contained Breathing Apparatus.

VENTILATION

LOCAL EXHAUST:	Necessary	MECHANICAL (GENERAL):	Necessary
SPECIAL:	None	OTHER:	None

Please refer to ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

EYE PROTECTION:
Splash goggles or safety glasses. Face-shields are recommended when the operation can generate splashes, sprays or mists.

HAND PROTECTION:
Wear appropriate impervious gloves for routine industrial use. Use impervious gloves for spill response, as stated in Section 6 of this SDS (Accidental Release Measures).
NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

BODY PROTECTION:
Use body protection appropriate for task. Cover-all, rubber aprons, or chemical protective clothing made from impervious materials are generally acceptable, depending on the task.

WORK & HYGIENIC PRACTICES:
Provide readily accessible eye wash stations & safety showers.
Wash at end of each workshift & before eating, smoking or using the toilet.
Promptly remove clothing that becomes contaminated. Destroy contaminated leather articles. Launder or discard contaminated clothing.

SECTION 9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE:	Liquid, Clear, Amber to Light Brown
ODOR:	Chlorine-like
ODOR THRESHOLD:	0.06 ppm (detection), for Chlorine
pH (Neutrality):	12 - 14
MELTING POINT/FREEZING POINT:	Not Available
BOILING RANGE (IBP,50%,Dry Point):	Not Available
FLASH POINT (TEST METHOD):	Not Applicable
EVAPORATION RATE (n-BUTYL ACETATE=1):	Not Applicable
FLAMMABILITY CLASSIFICATION:	Non-Combustible
LOWER FLAMMABLE LIMIT IN AIR (% by vol):	Not Applicable
UPPER FLAMMABLE LIMIT IN AIR (% by vol):	Not Available
VAPOR PRESSURE (mm of Hg)@20 C	Not Available
VAPOR DENSITY (air=1):	0.670
GRAVITY @ 68/68 F / 20/20 C:	
SPECIFIC GRAVITY (Water=1):	1.012
POUNDS/GALLON:	8.43
WATER SOLUBILITY:	Complete
PARTITION COEFFICIENT (n-Octane/Water):	Not Available
AUTO IGNITION TEMPERATURE:	Not Applicable
DECOMPOSITION TEMPERATURE:	Not Available
VOC'S (>0.44 Lbs/Sq In) :	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
TOTAL VOC'S (TVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC'S (CVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
HAZARDOUS AIR POLLUTANTS (HAPS):	0.0 Wt% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC PARTIAL PRESSURE (mm of Hg @ 20 C)	0.0

* Using California South Coast Air Quality Management District (SCAQMD) Rule 443.1.

SECTION 10. STABILITY & REACTIVITY

STABILITY
Stable under normal conditions.

CONDITIONS TO AVOID
Isolate from extreme temperatures and incompatible chemicals.

MATERIALS TO AVOID
Reacts violently with fire extinguishers containing water.
The substance is a strong base, reacts violently with acids and is corrosive.
Decomposes on heating and on contact with strong acids,
(such as sulfuric acid) producing, toxic & corrosive fumes including,
chlorine, phosgene, & hydrogen chloride.
The substance is a strong oxidant & reacts violently with combustible &,
reducing materials.
Reacts with water generating sufficient heat to ignite combustible materials.
Reacts violently with strong acids, causing fire & explosion hazard. Attacks
many plastics, rubber, coatings, many metals, such as aluminum, zinc, tin, & lead.
forming flammable/explosive gas (hydrogen).
Reacts with ammonium salts to produce ammonia & causing fire hazard.
Rapidly absorbs carbon dioxide & water from the air.

HAZARDOUS DECOMPOSITION PRODUCTS
Hydrogen Chloride, Phosgene, Potassium Oxide & Hydroxide , Phosphorus Pentoxide
from heating.

HAZARDOUS POLYMERIZATION
Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

ACUTE HAZARDS

EYE & SKIN CONTACT:
Severe burns to skin, defatting, dermatitis.
Severe burns to eyes, redness, tearing, blurred vision.
Liquid can cause severe skin & eye burns. Wash thoroughly after handling.

INHALATION:
Severe respiratory tract irritation may occur. Vapor harmful. The applicable occupational exposure limit value should not be exceeded during any part of the working exposure.

SWALLOWING:
Harmful or fatal if swallowed.

SUBCHRONIC HAZARDS/CONDITIONS AGGRAVATED

CONDITIONS AGGRAVATED:
Skin disorders can be aggravated by over-exposure to this product. Inhalation of this product"s fumes may aggravate respiratory conditions.

CHRONIC HAZARDS

CANCER, REPRODUCTIVE & OTHER CHRONIC HAZARDS:
Tetrapotassium Pyrophosphate: All phosphorus compounds may be reasonably expected to contain arsenic, cadmium, and/or lead in concentrations ranging from a few parts per billion to a few parts per million.

MUTAGENICITY: This product is not reported to produce mutagenic effects in humans. Mutation data, obtained during clinical studies on test animal tissues or micro-organisms are available for Potassium Hydroxide.

EMBRYOTOXICITY: This product is not reported to produce embryotoxic effects in humans.

TERATOGENICITY: This product is not reported to produce teratogenic effects in humans.

REPRODUCTIVE TOXICITY: This product is not reported to cause reproductive effects in humans.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (such as: within the eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MAMMALIAN TOXICITY INFORMATION

POTASSIUM HYDROXIDE:
Skin (Human): 50 mg/24 hours, Severe irritating effects
Skin (Adult Rabbit): 50 mg/24 hours, Severe irritating effects
Eye Effects (Adult Rabbit): 1 mg/24 hours, rinse: Moderate irritation
Cytogenetic Analysis (Rat/ast): 1800 mg/kg
LD50 Oral (Rat): 273 mg/kg

Detergent Mixture: LD50 (mouse): 2700 mg/kg
Tetrapotassium Pyrophosphate: No toxicology data is currently available for this product.

SECTION 12. ECOLOGICAL INFORMATION

EFFECT OF MATERIAL ON PLANTS OR ANIMALS:
This product may be harmful or fatal to plant and animal life if released into the environment. Refer to Section 11 (Toxicological Information) for further data on the effects of this product's components on test animals.

EFFECT OF MATERIAL ON AQUATIC LIFE:
The substance is toxic to aquatic organisms.
The substance may be hazardous in the environment.
Special attention should be given to water organisms.

MOBILITY IN SOIL
Mobility of this material has not been determined.

DEGRADABILITY
This product is completely biodegradable.

ACCUMULATION
Bioaccumulation of this product has not been determined.

SECTION 13. DISPOSAL CONSIDERATIONS

Processing, use or contamination may change the waste management options.
Recycle / dispose of observing national, regional, state, provincial and local health, safety & pollution laws. If in doubt, contact appropriate agencies.

SECTION 14. TRANSPORT INFORMATION

IF > 333 LB / 152 KG OF THIS PRODUCT IN 1 CONTAINER,
IT EXCEEDS THE "RQ" OF POTASSIUM HYDROXIDE.

DOT SHIPPING NAME: UN3266, Corrosive liquid, basic, inorganic, n.o.s. (contains: Potassium Hydroxide), 8, PG-II
DRUM LABEL: (CORROSIVE)
IATA / ICAO: UN3266, Corrosive liquid, basic, inorganic, n.o.s. (contains: Potassium Hydroxide), 8, PG-II
IMO / IMDG: UN3266, Corrosive liquid, basic, inorganic, n.o.s. (contains: Potassium Hydroxide), 8, PG-II
EMERGENCY RESPONSE GUIDEBOOK NUMBER: 154

SECTION 15. REGULATORY INFORMATION

EPA REGULATION:
SARA SECTION 311/312 HAZARDS: Acute Health

All components of this product are on the TSCA list.
This material contains no known products restricted under SARA Title III, Section 313 in amounts greater or equal to 1%.

SARA TITLE III INGREDIENTS	CAS#	EINECS#	WT%	(REG.SECTION)	RQ(LBS)
Potassium Hydroxide	1310-58-3	215-181-3	30-40	(311,312)	1000

SECTION 15. REGULATORY INFORMATION (CONTINUED)

> 333 LB / 152 KG OF THIS PRODUCT IN 1 CONTAINER EXCEEDS THE "RQ" OF POTASSIUM HYDROXIDE. Any release equal to or exceeding the RQ must be reported to the National Response Center (800-424-8802) and appropriate state and local regulatory agencies as described in 40 CFR 302.6 and 40 CFR 355.40 respectively. Failure to report may result in substantial civil and criminal penalties. State & local regulations may be more restrictive than federal regulations.

STATE REGULATIONS:
CALIFORNIA PROPOSITION 65: This product contains no chemicals known to the State of California to cause cancer & reproductive toxicity.

U.S. STATE REGULATED COMPONENTS: (HAZARDOUS SUBSTANCE LISTS):

COMPONENT	AK	CA	FL	IL	KS	MA	MI	MN	MO	NJ
Potassium Hydroxide	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes

COMPONENT	ND	PA	RI	TX	WV	WI
Potassium Hydroxide	Yes	Yes	Yes	No	No	No

INTERNATIONAL REGULATIONS
The components of this product are listed on the chemical inventories of the following countries:
Australia (AICS), Canada (DSL, NDSL), China (IECSC), Europe (EINECS, ELINCS), Japan (METI/CSCL, MHLW/ISHL), South Korea (KECI), New Zealand (NZIoC), Philippines (PICCS), Switzerland (SWISS), Taiwan (NECSI), USA (TSCA).

CANADA: WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)
C: Oxidizing Material.
D2B: Irritating to skin / eyes.
E: Corrosive Material.

SECTION 16. OTHER INFORMATION

HAZARD RATINGS:
HEALTH (NFPA): 3, HEALTH (HMIS): 3, FLAMMABILITY: 0, REACTIVITY: 1
(Personal Protection Rating to be supplied by user based on use conditions.)
This information is intended solely for the use of individuals trained in the NFPA & HMIS hazard rating systems.

EMPLOYEE TRAINING
See Section 2 for Risk & Safety Statements. Employees should be made aware of all hazards of this material (as stated in this SDS) before handling it.

Univar USA Inc Material Safety Data Sheet

For Additional Information contact MSDS Coordinator during business hours, Pacific time: (425) 889-3400

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This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process

SAFETY DATA SHEET

This Safety Data Sheet conforms to ANSI Z400.5, and to the format requirements and the International Chemical Safety Cards of the Global Harmonizing System.
THIS SDS COMPLIES WITH 29 CFR 1910.1200 (HAZARD COMMUNICATION STANDARD)
IMPORTANT: Read this SDS before handling & disposing of this product.
Pass this information on to employees, customers, & users of this product.

SECTION 1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER

PRODUCT IDENTITY: BLEND CONCLEAN
SDS NUMBER: BCS80960
NEW MSDS DATE: 07/21/2011
COMPANY IDENTITY: Univar
COMPANY ADDRESS: 17425 NE Union Hill Road
COMPANY CITY: Redmond, WA 98052
COMPANY PHONE: 1-425-889-3400
EMERGENCY PHONES: CHEMTREC: 1-800-424-9300 (USA)
CANUTEC: 1-613-996-6666 (CANADA)

SECTION 2. HAZARDS IDENTIFICATION

DANGER!!

CORROSIVE MATERIAL!
LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE.
MAY BE FATAL IF SWALLOWED.
HARMFUL IF INHALED. MAY CAUSE LUNG DAMAGE.

RISK STATEMENTS:

R34	Causes burns.
R36/37/38	Irritating to eyes, respiratory system and skin.
R23	Toxic by inhalation.

SAFETY STATEMENTS:

S24/25	Avoid contact with skin and eyes.
S36/37/39	Wear suitable protective clothing, gloves and eye/face protection.
S9	Keep container in a well-ventilated place.
S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S45	In case of accident, or if you feel unwell, seek medical advice immediately. (Show the label where possible).
S62	If swallowed, do not induce vomiting; seek medical advice immediately and show this container or label.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

MATERIAL	CAS#	EINECS#	WT %
Water	7732-18-5	231-791-2	40-55
Hydrochloric Acid (31%)	7647-01-0	231-595-7	45-55
Polyoxyethylene (16-C) Tallow ethylmonium ethosulfate	68071-95-4	-	1- 5

Trace components: Trace ingredients (if any) are present in < 1% concentration, (< 0.1% for potential carcinogens, reproductive toxins, respiratory tract mutagens, and sensitizers). None of the trace ingredients contribute significant additional hazards at the concentrations present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalents, and Canadian Hazardous Materials Identification System Standard (CPR 4).

SEE SECTIONS 8, 11 & 12 FOR TOXICOLOGICAL INFORMATION.

SECTION 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PROTECTIVE MEASURES:
EVACUATE DANGER AREA! Consult an expert!
Keep unprotected personnel away.
Use complete chemical protective suit with self-contained breathing apparatus.

ENVIRONMENTAL PRECAUTIONS:
Keep from entering storm sewers and ditches which lead to waterways.

CONTAINMENT AND CLEAN-UP MEASURES:
Stop spill at source. Dike and contain.
Collect leaking & spilled liquid in sealable containers as far as possible.

SECTION 7. HANDLING AND STORAGE

HANDLING
Use only with adequate ventilation. Avoid breathing of vapor or spray mist.
Do not get in eyes, on skin or clothing.
Wear OSHA Standard full face shield. Consult Safety Equipment Supplier. Wear goggles, face shield, gloves, apron & footwear impervious to material. Wash clothing before reuse. NEVER pour water into this substance. When dissolving or diluting, always add it slowly to the water.
To minimize static discharge when transferring, ensure electrical continuity by bonding and grounding all equipment. Use an inlet line diameter of at least 3.5 inches (8.9 centimeters) with a maximum flow rate of 1 meter/second.

STORAGE
Keep separated from strong oxidants, strong bases, combustible & reducing substances, metals. Keep cool.Keep dry.
Keep inside a well-ventilated room. Do not store above 49 C/120 F.
Keep container tightly closed & upright when not in use to prevent leakage.
Reacts with most metals producing hydrogen which is extremely flammable & may explode.
Wear full face shield, gloves & full protective clothing when opening or handling.
When empty, drain completely, replace bungs securely.

NONBULK: CONTAINERS:
If this product is transferred into another container, only use portable containers and dispensing equipment (faucet, pump, drip can) approved for corrosive, acidic liquids. Store containers in a cool, dry location,k away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Storage areas should be made of corrosion resistant materials. Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Empty containers may contain residual liquid or vapors which are corrosive; therefore, empty containers should be handled with care. Never store food, feed, or drinking water in containers which held this product.

BULK CONTAINERS:
All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

TANK CAR SHIPMENTS:
Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cares must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tanks (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

COMPANY IDENTITY: Univar
PRODUCT IDENTITY: BLEND CONCLEAN

SECTION 9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE:	Liquid, Water-White
ODOR:	Sharp, acid
ODOR THRESHOLD:	Not Available
pH (Neutrality):	0 - 1
MELTING POINT/FREEZING POINT:	Not Available
BOILING POINT:	105 C / 221 F
FLASH POINT (TEST METHOD):	Not Applicable
EVAPORATION RATE (n-BUTYL ACETATE=1):	Not Applicable
FLAMMABILITY CLASSIFICATION:	Non-Combustible
LOWER FLAMMABLE LIMIT IN AIR (% by vol):	Not Applicable
UPPER FLAMMABLE LIMIT IN AIR (% by vol):	Not Available
VAPOR PRESSURE (mm of Hg)@20 C	17.0
VAPOR DENSITY (air=1):	0.794
GRAVITY @ 68/68 F / 20/20 C:	
SPECIFIC GRAVITY (Water=1):	1.070
POUNDS/GALLON:	8.913
WATER SOLUBILITY:	Complete
PARTITION COEFFICIENT (n-Octane/Water):	Not Available
AUTO IGNITION TEMPERATURE:	Not Applicable
DECOMPOSITION TEMPERATURE:	Not Available
VOC'S (>0.44 Lbs/Sq In) :	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
TOTAL VOC'S (TVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC'S (CVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
HAZARDOUS AIR POLLUTANTS (HAPS):	25.0 Wt% / 262.0 g/L / 2.1 Lbs/Gal
NONEXEMPT VOC PARTIAL PRESSURE (mm of Hg @ 20 C)	0.0

* Using California South Coast Air Quality Management District (SCAQMD) Rule 443.1.

SECTION 10. STABILITY & REACTIVITY

STABILITY
Stable but Reacts with most metals producing hydrogen which is extremely flammable & may explode.

CONDITIONS TO AVOID
Isolate from extreme heat and open flame.

MATERIALS TO AVOID
The substance is a strong acid, reacts violently with bases and is corrosive. Reacts violently with strong oxidants, forming toxic gas (chlorine). Reacts violently with strong bases, causing fire & explosion hazard. Attacks many metals. forming flammable/explosive gas (hydrogen). This product reacts with strong oxidizing agents, reducing agents, metals, bases, aldehydes, epoxides, explosives, acetylides, borides, carbides, silicides, cyanides, sulfides, and phosphides. Do not mix this product with sodium hypochlorite, sodium bisulfite, chlorine sanitizers, or chlorinated cleaners: a deadly gas can be formed.

HAZARDOUS DECOMPOSITION PRODUCTS
Hydrogen Chloride, Phosgene, Carbon Oxides, Sulfur Oxides, Phosphorous Oxides from heating.

HAZARDOUS POLYMERIZATION
Will not occur.

SECTION 12. ECOLOGICAL INFORMATION

EFFECT OF MATERIAL ON PLANTS OR ANIMALS:
This product may be harmful or fatal to plant and animal life if released into the environment. Refer to Section 11 (Toxicological Information) for further data on the effects of this product's components on test animals.

EFFECT OF MATERIAL ON AQUATIC LIFE:
HYDROCHLORIC ACID:

LC50 (mosquito fish):	282 mg/L, 96 hours
LC50 (fathead minnow):	21900 ug/L, 96 hours
LC50 (trout):	10 mg/L, 24 hours
LC50 (shrimp):	100 to 330 mg/L, 48 hours (salt water)
LC50 (gold fish):	178 mg/L, 48 hours (salt water)

MOBILITY IN SOIL
Mobility of this material has not been determined.

DEGRADABILITY
This product is partially biodegradable.

ACCUMULATION
Bioaccumulation of this product has not been determined.

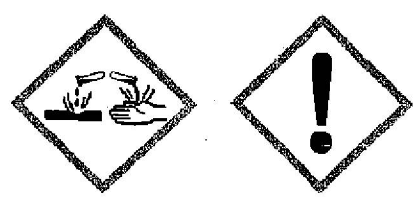
SECTION 13. DISPOSAL CONSIDERATIONS

Processing, use or contamination may change the waste management options. Recycle / dispose of observing national, regional, state, provincial and local health, safety & pollution laws. If in doubt, contact appropriate agencies.

SECTION 14. TRANSPORT INFORMATION

IF > 9091 LB / 4132 KG OF THIS PRODUCT IN 1 CONTAINER,
IT EXCEEDS THE "RQ" OF HYDROCHLORIC ACID.

DOT SHIPPING NAME: UN3264, RQ, Corrosive liquid, acidic, inorganic, n.o.s. (contains: Hydrochloric Acid), 8, PG-II
DRUM LABEL: (CORROSIVE)
IATA / ICAO: UN3264, Corrosive liquid, acidic, inorganic, n.o.s. (contains: Hydrochloric Acid), 8, PG-II
IMO / IMDG: UN3264, Corrosive liquid, acidic, inorganic, n.o.s. (contains: Hydrochloric Acid), 8, PG-II
EMERGENCY RESPONSE GUIDEBOOK NUMBER: 154
CANADA: DANGEROUS GOODS TRANSPORT:
This material is considered as DANGEROUS GOODS.



SECTION 15. REGULATORY INFORMATION

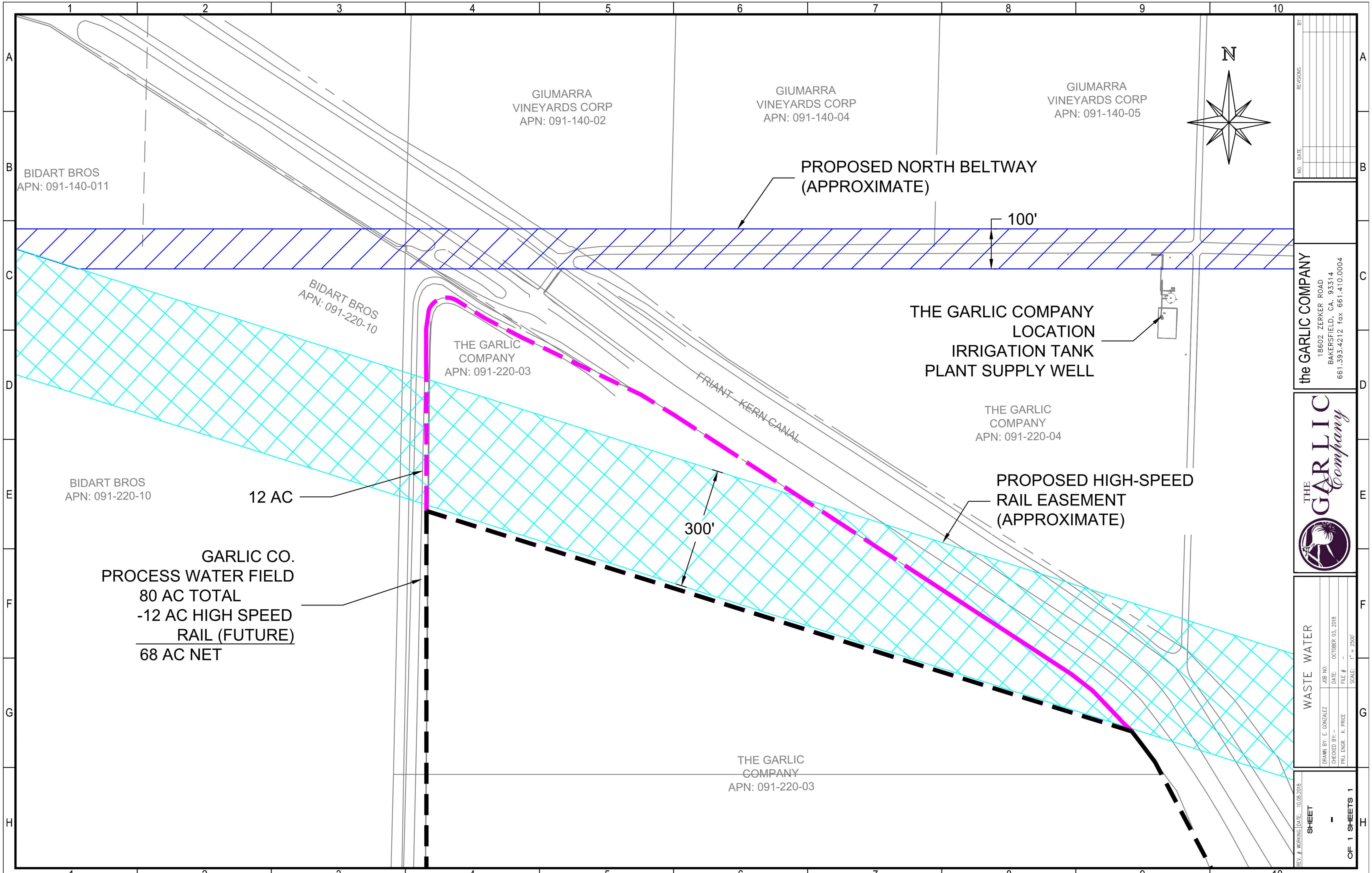
EPA REGULATION:
SARA SECTION 311/312 HAZARDS: Acute Health

All components of this product are on the TSCA list.
SARA Title III Section 313 Supplier Notification
This product contains the indicated <*> toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning & Community Right-To-Know Act of 1986 & of 40 CFR 372. This information must be included in all MSDSs that are copied and distributed for this material.

SARA TITLE III INGREDIENTS	CAS#	EINECS#	WT%	(REG.SECTION)	RQ(LBS)
*Hydrochloric Acid	7647-01-0	231-595-7	10-25	(302,311,312,313)	5000

Appendix D.

High Speed Rail Easement


GIUMARRA VINEYARDS CORP APN: 091-140-02
GIUMARRA VINEYARDS CORP APN: 091-140-04
GIUMARRA VINEYARDS CORP APN: 091-140-05
N
BIDART BROS APN: 091-140-011
PROPOSED NORTH BELTWAY (APPROXIMATE)
100'
BIDART BROS APN: 091-220-10
THE GARLIC COMPANY LOCATION IRRIGATION TANK PLANT SUPPLY WELL
THE GARLIC COMPANY APN: 091-220-03
FRIANT - KERN CANAL
THE GARLIC COMPANY APN: 091-220-04
BIDART BROS APN: 091-220-10
12 AC
PROPOSED HIGH-SPEED RAIL EASEMENT (APPROXIMATE)
300'
GARLIC CO. PROCESS WATER FIELD
80 AC TOTAL
-12 AC HIGH SPEED RAIL (FUTURE)
68 AC NET
THE GARLIC COMPANY APN: 091-220-03
NO. DATE REVISIONS BY
the GARLIC COMPANY
18602 ZERKER ROAD
BAKERSFIELD, CA. 93314
661.393.4212 fax 661.410.0004
THE GARLIC Company
WASTE WATER
DRAWN BY: E. GONZALEZ
CHECKED BY: -
PRJ. ENGR. K. PRICE
JOB NO:
DATE: OCTOBER 03, 2018
FILE # -
SCALE: 1" = 2500'
REV. # WORKING DATE: 10.08.2018
SHEET
-
OF 1 SHEETS 1

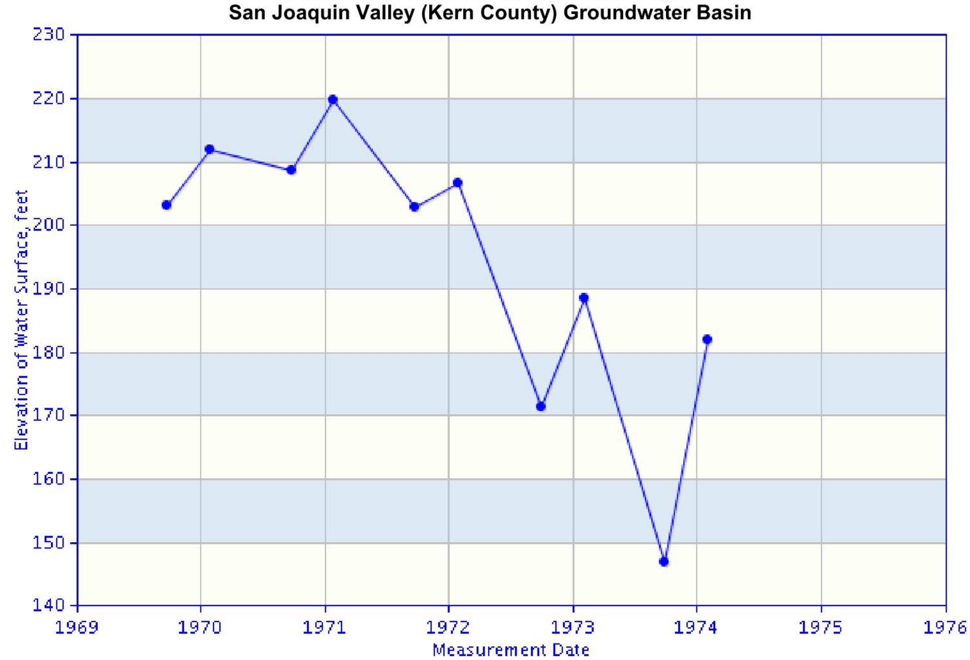
Appendix E.

California Water Resources Groundwater Level Data Records

Groundwater Level Data for Well 28S26E22A001M

Your selection returned a total of **12** records. Wells in the Department of Water Resources monitoring network are identified by a State Well Number, which is based on the Public Land Grid System. The table headings and records contain several codes and abbreviations. Press the ***New Search*** or ***Nearby Search*** buttons or at the bottom of the page to begin a new data retrieval. Data for this well can also be downloaded in MS Excel or text delimited format.

Groundwater Levels in Well 28S26E22A001M
San Joaquin Valley (Kern County) Groundwater Basin



NOTE: red circles denote questionable measurements. Please see the data table below for specifics.

Groundwater Level Readings

Meas. Date	R.P. Elev.	G.S. Elev.	RPWS	WSE	GSWS	QM Code	NM Code	Agency	Comment
09-24-1969	403.8	403.8	200.7	203.1	200.7			5001	
01-28-1970	403.8	403.8	191.9	211.9	191.9			5001	
09-23-1970	403.8	403.8	195.0	208.8	195.0			5001	
01-27-1971	403.8	403.8	184.0	219.8	184.0			5001	
09-23-1971	403.8	403.8	200.9	202.9	200.9			5001	
01-27-1972	403.8	403.8	197.0	206.8	197.0			5001	
09-28-1972	403.8	403.8	232.4	171.4	232.4			5001	
02-02-1973	403.8	403.8	215.2	188.6	215.2			5001	
09-25-1973	403.8	403.8	256.8	147.0	256.8			5001	
01-31-1974	403.8	403.8	221.7	182.1	221.7			5001	
09-26-1974	403.8	403.8					7	5001	
01-22-1975	403.8	403.8					0	5001	

Well Coordinates

Projection	Datum	Easting	Northing	Units	Zone
UTM	NAD27	304727	3928761	metres	11
LL	NAD27	119.1525	35.4850	decimal degrees	
LL	NAD83	119.1534	35.4850	decimal degrees	

Well Use: Undetermined

For more information contact:
Department of Water Resources, San Joaquin District
Water Management Section
3374 East Shields Avenue
Fresno, CA 93726

Phone: 559-230-3326
Fax: 559-230-3301

Grou lwater Level Data for Well 28S26E26A001M

Your se tion returned a total of **1** records. Wells in the Department of Water Resources monitoring network are identified by a State Well Number, which is based on the Public Land Grid System. The table headings and records contain several codes and abbreviations. Press the ***New Search*** or ***Nearby Search*** buttons or at the bottom of the page to begin a new data retrieval. Data for this well can also be downloaded in MS Excel or text delimited format.

NOTE: red circles denote questionable measurements. Please see the data table below for specifics.

Groundwater Level Readings

Meas. Date	R.P. Elev.	G.S. Elev.	RPWS	WSE	GSWS	QM Code	NM Code	Agency	Comment
01-27-1971	393.0	392.6	182.7	210.3	182.3			5001	

Well Coordinates

Projection	Datum	Easting	Northing	Units	Zone
UTM	NAD27	306041	3927411	metres	11
LL	NAD27	119.1368	35.4714	decimal degrees	
LL	NAD83	119.1377	35.4714	decimal degrees	

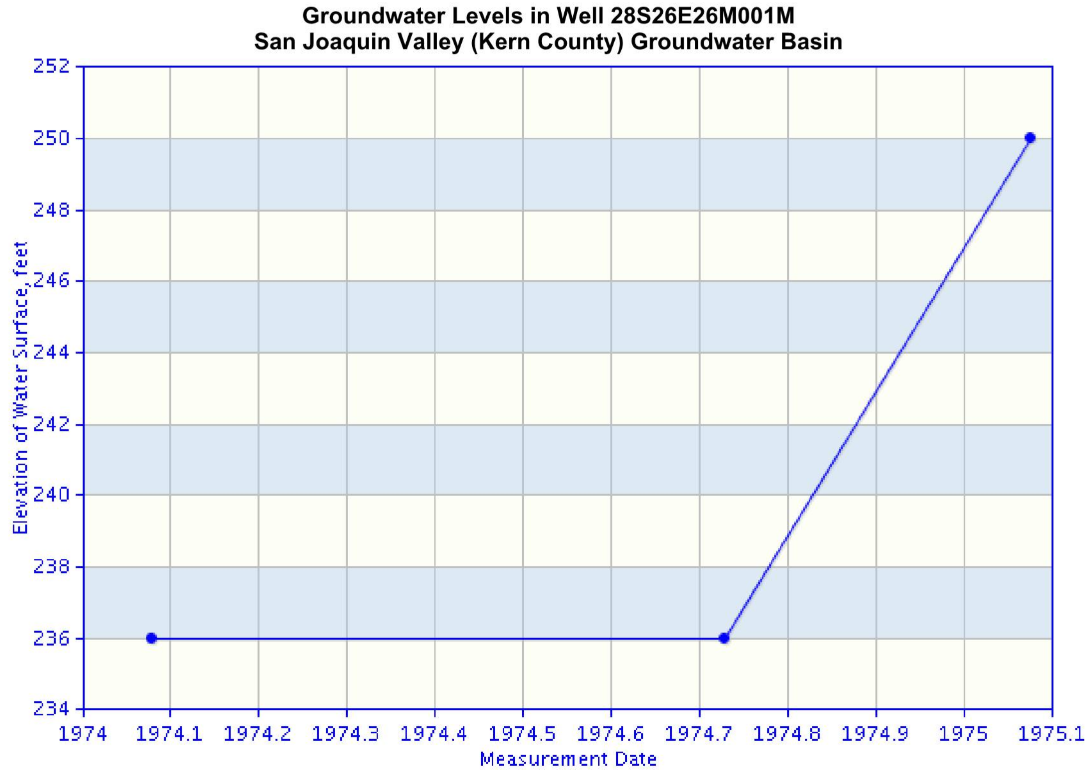
Well Use: Undetermined

For more information contact:
Department of Water Resources, San Joaquin District
Water Management Section
3374 East Shields Avenue
Fresno, CA 93726

Phone: 559-230-3326
Fax: 559-230-3301

Groundwater Level Data for Well 28S26E26M001M

Your selection returned a total of **3** records. Wells in the Department of Water Resources monitoring network are identified by a State Well Number, which is based on the Public Land Grid System. The table headings and records contain several codes and abbreviations. Press the ***New Search*** or ***Nearby Search*** buttons or at the bottom of the page to begin a new data retrieval. Data for this well can also be downloaded in MS Excel or text delimited format.



NOTE: red circles denote questionable measurements. Please see the data table below for specifics.

Groundwater Level Readings

Meas. Date	R.P. Elev.	G.S. Elev.	RPWS	WSE	GSWS	QM Code	NM Code	Agency	Comment
01-29-1974	376.5	376.0	140.5	236.0	140.0			5050	
09-23-1974	376.5	376.0	140.5	236.0	140.0			5050	
01-28-1975	376.5	376.0	126.5	250.0	126.0			5050	

Well Coordinates

Projection	Datum	Easting	Northing	Units	Zone
UTM	NAD27	305028	3926350	metres	11
LL	NAD27	119.1486	35.4633	decimal degrees	
LL	NAD83	119.1495	35.4633	decimal degrees	

Well Use: Undetermined

For more information contact:
Department of Water Resources, San Joaquin District
Water Management Section
3374 East Shields Avenue
Fresno, CA 93726

Phone: 559-230-3326
Fax: 559-230-3301

Key to Groundwater Level Report Codes and Abbreviations

This page explains the codes, abbreviations, and headings used in reports provided by the various pages from this web site. Not all reports show all the items listed here.

State Well Number

An identification number assigned to each monitoring site. The State Well Number is based on the public land grid, and includes the township, range, and section in which the well is located.

Measurement Date

The date on which the groundwater level reading was taken.

Reference Point Elevation

Listed on some reports as **"R.P. Elev."**, is the elevation of the point from which the groundwater level reading was taken. The reference point for a well is selected for its permanence, such as the top of casing, or the edge of a concrete pad. Some reference points are below ground surface, for example, when the well is located in a cellar. Occassionally, due to activity at the well, the reference point is changed to a more accessible point on the well.

Ground Surface Elevation

Listed on some reports as **"G.S. Elev."**, is the average elevation of the ground surface in the vicinity of the well. In a few cases, the ground surface elevation is determined by surveying methods. More often, the ground surface elevation is determined by interpolation from a USGS 7.5-minute topographic map. Thus, the accuracy of the reported ground surface elevation is a function of the contour interval of the topographic map. Most wells are located in areas where the contour interval of the topographic maps is 5 feet; however, some maps are accurate to only 20 or 40 feet.

Depth to Water

Depth to water is listed in two columns of each report. The first, **"RPWS"**, is the measured distance between the reference point and the water level in the well. The second, **"GSWS"**, is the measured distance from the ground surface to the water level in the well.

Water Surface Elevation

The water surface elevation, listed on some reports as **"WSE"** is the elevation of the measured groundwater level relative to mean sea level. It is calculated by subtracting the depth to water below reference point measurement from the elevation of the reference point.

No Measurement Codes

Listed on some reports as **"NMC"**. When it is not possible to measure the water level in a well, a code is entered in this field to explain the reason for the missed measurement. The valid codes are shown in the following table. Sometimes an entry is made in the Remarks field supplement the no measurement code.

Code	Definition
0.	Discontinued
1.	Pumping
2.	Pumphouse locked
3.	Tape hung up
4.	Can't get tape in casing
5.	Unable to locate well
6.	Well destroyed
7.	Special
8.	Casing leaking or wet
9.	Temporarily inaccessible
D.	Dry well
F.	Flowing well

Questionable Measurement Codes

Listed on some reports as **"QMC"**. When conditions at a well effect the quality of a measurement, a code is entered in this field to explain the reason for the questionable. The valid codes are shown in the following table. Sometimes an entry is made in the Remarks field to supplement the questionable measurement code.

Code	Definition
0.	Caved or deepened
1.	Pumping
2.	Nearby pump operating
3.	Casing leaking or wet
4.	Pumped recently
5.	Air or pressure gauge measurement
6.	Other
7.	Recharge operation at nearby well
8.	Oil in casing
9.	Acoustical sounder measurement

Comments

Any pertinent remarks that help explain why a measurement was missed or is questionable, or other comments about conditions at the site when it was visited.

Agency

A code representing the agency that made the measurement. To look up an agency, enter its four-digit Agency Code and click on the ***Submit*** button to retrieve the Agency Name (opens a new browser window).

Agency Code		Submit

Appendix F.

Kern County Water Agency Groundwater Quality Data Records

Data obtained from Zack Smith on 3/27/06 via email to jp2@valmont.com
Kern County Water Agency
3200 Rio Mirada
Bakersfield, CA 93308
661-634-1400

STATE WELL NUMBER	WELL NAME	SAMPLING DATE	As ug/l	B mg/l	Ca mg/l	Cl mg/l	F (tot) mg/l	HCO3 mg/l	Mg mg/l	Na mg/l	NO2 ug/l	NO3 mg/l	Pb ug/l	pH (Lab) su	SEC umhos/cm	SO4 mg/l	TDS (analysis) mg/l
28S/26E-13A01		09-Jun-42				75											
28S/26E-13A01		15-Jun-42				75											
28S/26E-13A01		25-Jul-47		0.09		69								8.6			198
28S/26E-13A01		04-Aug-50		0.04		70								8.6			198
28S/26E-13A01		31-Aug-55		0.03	4	53	0.2			63		0.2		8.7	306		227
28S/26E-13A01		10-Jul-56			6	75	0.1			80		1.3		7.4	412		306
28S/26E-13C01		18-Mar-76		0.1	18	106				100		1			606		339
28S/26E-13J01		01-Sep-55			8	65	0.2			71		0.7		7.9	379		
28S/26E-13J01		26-Aug-69													433		303
28S/26E-13N01		03-Sep-82		1.2	185	158				105		42.8		8	1260		1647
28S/26E-14A01		13-Oct-36			4	46				63				9	317		172
28S/26E-14A01		22-Jul-42				53				74							
28S/26E-14A01		26-Jun-43			8	78				80					401		
28S/26E-14A01		08-May-45				79								7.6			266
28S/26E-14A01		30-Apr-47		0.02		118								7.5			343
28S/26E-14A01		31-Aug-55			66	241	0.1			162		58		7.6	1240		800
28S/26E-14D01		13-Oct-36		0.1	41	74								8.3	665		443
28S/26E-14D01		05-Oct-38		0.01		82								8.4			454
28S/26E-14D01		26-May-43				234				244							
28S/26E-14D01		12-May-44				138											
28S/26E-14D01		04-May-45				125								7.6			582
28S/26E-14D01		30-Apr-47		0.03		137								8.4			554
28S/26E-15A01		09-May-47		0.02		162								7.5			648
28S/26E-15B01		19-May-43				114											
28S/26E-15B01		09-May-47		0.02		162								7.5			648
28S/26E-15B01		28-Nov-79			75	136	0.15			160		42		7.7	1120		717
28S/26E-15B02		09-May-47				114				65							648
28S/26E-15D01		26-Dec-85			123	250	0.12	27	1	229		69	0.04	7.6	1700	360	1051
28S/26E-15F01		09-May-47		0.09		307								7.5			1235
28S/26E-15F01		01-Sep-55		0.1	284	480	0.2			374		36		7.8	2960		
28S/26E-15F01		26-Aug-69													3080		2156
28S/26E-15G01		18-Mar-76			101	287				258		59			1780		1080
28S/26E-15T80		28-Nov-79			75	136	0.2			160		42			1120		717
28S/26E-22A01		12-Apr-39		0.17	29	92				105				7.9			436
28S/26E-22A01		26-Aug-69													4480		3136
28S/26E-22B01		13-Oct-47			60	140				119				8.4	865		608
28S/26E-22G01		13-Oct-36		0.4	434	406				342				8.1	4104		2740
28S/26E-22G01		09-Mar-39		0.22	338	407				381				6.8	3643		2580
28S/26E-22L01		17-Mar-76		0.1	44	44				108		11			690		442
28S/26E-22P01		02-May-85		0.38	17	93		70		94				8.2	460	49	293
28S/26E-23C01		17-Mar-76		0.1	98	236				275		8.5			1750		1140

Data obtained from Zack Smith on 3/27/06 via email to jp2@valmont.com
Kern County Water Agency
3200 Rio Mirada
Bakersfield, CA 93308
661-634-1400

STATE WELL NUMBER	WELL NAME	SAMPLING DATE	As ug/l	B mg/l	Ca mg/l	Cl mg/l	F (tot) mg/l	HCO3 mg/l	Mg mg/l	Na mg/l	NO2 ug/l	NO3 mg/l	Pb ug/l	pH (Lab) su	SEC umhos/cm	SO4 mg/l	TDS (analysis) mg/l
28S/26E-23H01		27-Apr-39		0.03	229	397				363				7.4	2876		1980
28S/26E-23T80		23-Mar-79		1.3	130	275				380		17.6		7.8	2600		1500
28S/26E-23T81		23-Mar-79		1.3	130	275				380	17.6	78			2600		1500
28S/26E-24A01		13-Oct-36			3	63				63				8.9	324		187
28S/26E-24A01		17-May-57		0.24	20	130	0.2			115		13		7.4	686		381
28S/26E-24C01		13-Mar-36			169	277				205					1780		1223
28S/26E-24C01		13-Oct-36		0.2	168	263				213					1335		1223
28S/26E-24C01		20-May-43				216				308							
28S/26E-24C01		26-Jun-47		0.31		167								7.4			1044
28S/26E-24F01		17-Mar-76			205	495				395		122			2830		1810
28S/26E-24H01		17-May-57		0.12	601	1070				480		507		7.3	5170		
28S/26E-24R		03-Jun-88		0.13	7.6	50.3		52		68				7.5	370	50	228
28S/26E-24R01		13-Oct-36		0.2	35	263				213				8.3	826		491
28S/26E-24R01		19-May-43				110				151							
28S/26E-24R01		22-Jul-47		0.31		167								8.1			621
28S/26E-25L01		22-May-36		0.4		441								8.3			
28S/26E-25L01		13-Oct-36		2.2	276	441				562				8	4089		2742
28S/26E-25L01		30-May-47		2.2	248	1124				662				7.8	4305		2360
28S/26E-25Q01		13-Oct-36		0.3	108	147				156				8.1	1257		846
28S/26E-25Q01		17-Apr-39		1.25	159	202				387				8.1	2602		1910
28S/26E-26B02		17-Apr-39		0.85	88	89				220				8.1	1487		1180
28S/26E-26B02		22-Jul-42				32				140							
28S/26E-26G01		24-Feb-88		0.14	9	72		61		72				8.8	410	26	244
28S/26E-26R01		02-May-85		0.1	70	73		42		92	5.8	25.7		7.9	680	215	520
28S/26E-27A01		17-Sep-87		0.12	23	65		42		105		3.5		8.7	610	148	392
28S/26E-27C01	4E27-2	18-Oct-54		0.05	40	75				87		5		7.7	641		382
28S/26E-27C01	4E27-2	17-Mar-76		0.1		17				63		5.8			424		267
28S/26E-27C01	4E27-2	06-Jul-87		0.45	24	124		198	1	159		4.4		8.1	330	65	478
28S/26E-27G01		09-Sep-82		1	50	8				18		4.4		8.1	170		
28S/26E-27H01		14-May-36		1.35	121	101				248				7.8	1770		1262
28S/26E-27T80		18-Oct-76				136	0.4			72		5.8			845		504
Minimum		**13-Mar-36**		**0.01**	**3**	**8**	**0.1**	**27**	**1**	**18**	**5.8**	**0.2**	**0.04**	**6.8**	**170**	**26**	**172**
Maximum		**03-Jun-88**		**2.2**	**601**	**1124**	**0.4**	**198**	**1**	**662**	**17.6**	**507**	**0.04**	**9**	**5170**	**360**	**3136**
Average				**0.42**	**112**	**190**	**0.2**	**70**	**1**	**198**	**11.7**	**47**	**0.04**	**8.0**	**1558**	**130**	**919**

Note:

Blank cells indicate parameter not tested or below detection limit. Data base provided by Kern County Water Agency does not designate whether the parameter was not tested or below detection limit.

Appendix G.

Custom Soil Report

United States Department of Agriculture

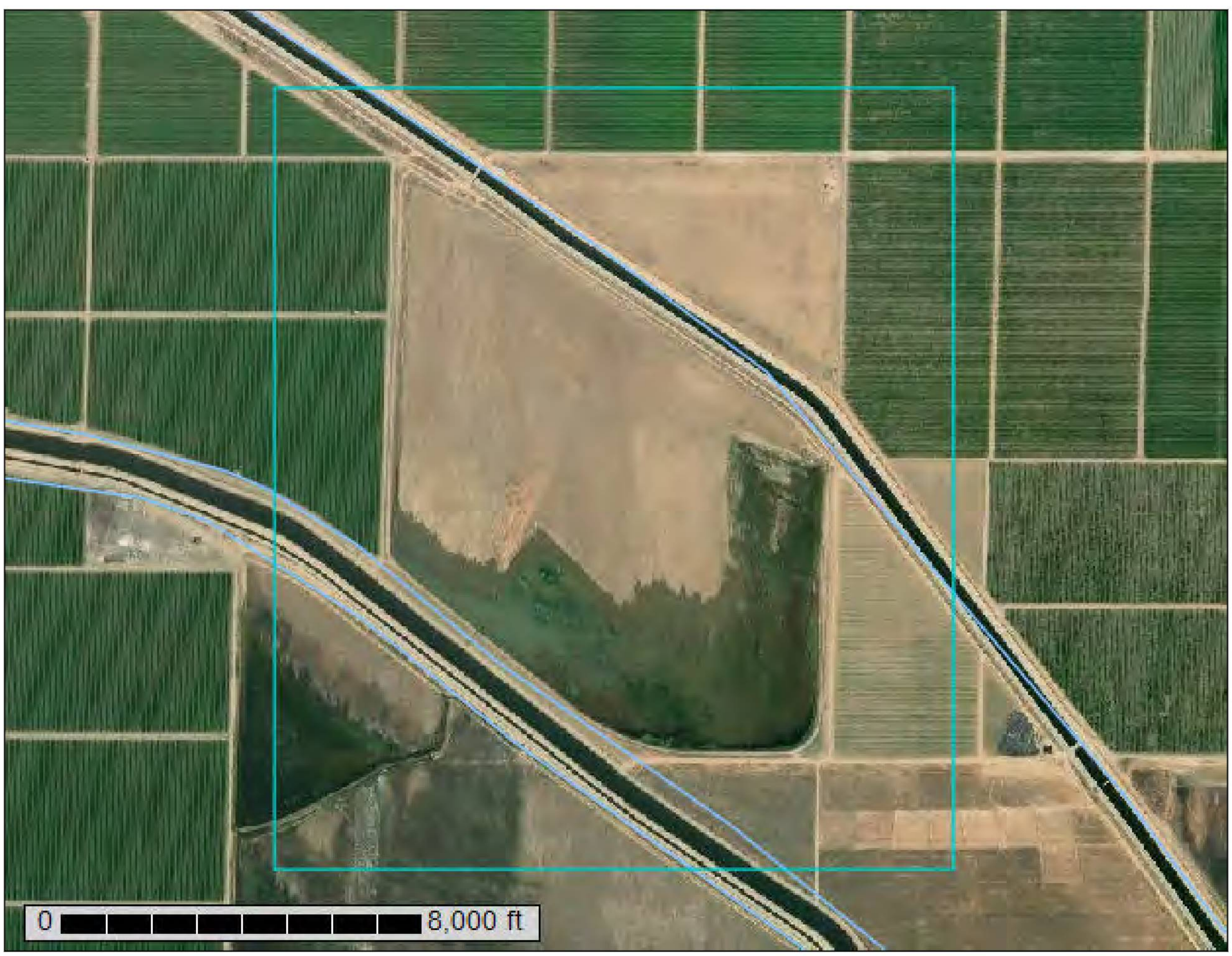
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Kern County, California, Northwestern Part

99-Acre Site



November 13, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:7,010 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 100, 200, 400, 600

Feet: 0, 300, 600, 1200, 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kern County, California, Northwestern Part
Survey Area Data: Version 11, Sep 14, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 15, 2016—Nov 5, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
145	Driver coarse sandy loam, 0 to 2 percent slopes	149.6	64.3%
243	Wasco sandy loam	80.7	34.7%
257	Water	2.4	1.0%
Totals for Area of Interest		**232.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Kern County, California, Northwestern Part

145—Driver coarse sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hkhr
Elevation: 400 to 520 feet
Mean annual precipitation: 7 inches
Mean annual air temperature: 63 to 64 degrees F
Frost-free period: 275 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Driver and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Driver

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

Ap - 0 to 16 inches: coarse sandy loam
Bt - 16 to 27 inches: clay loam
Cq - 27 to 37 inches: sandy loam
2C - 37 to 65 inches: stratified loamy coarse sand to loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 30 inches to abrupt textural change
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Lewkalb

Percent of map unit: 5 percent
Hydric soil rating: No

Wasco

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed, hardpan soil

Percent of map unit: 5 percent
Hydric soil rating: No

243—Wasco sandy loam

Map Unit Setting

National map unit symbol: hklx
Elevation: 250 to 3,700 feet
Mean annual precipitation: 4 to 7 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 210 to 275 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Wasco and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wasco

Setting

Landform: Alluvial fans, flood plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

Ap - 0 to 15 inches: sandy loam
C - 15 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare

Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

257—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the following National Soil Survey Handbook link: “National Soil Survey Handbook.”

ABC soil

A soil having an A, a B, and a C horizon.

Ablation till

Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

AC soil

A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil

The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil

Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial cone

A semiconical type of alluvial fan having very steep slopes. It is higher, narrower, and steeper than a fan and is composed of coarser and thicker layers of material deposited by a combination of alluvial episodes and (to a much lesser degree) landslides (debris flow). The coarsest materials tend to be concentrated at the apex of the cone.

Alluvial fan

A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium

Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl

A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM)

The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions

Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon

A subsoil horizon characterized by an accumulation of illuvial clay.

Arroyo

The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed.

Aspect

The direction toward which a slope faces. Also called slope aspect.

Association, soil

A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity)

The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low: 0 to 3
Low: 3 to 6
Moderate: 6 to 9
High: 9 to 12
Very high: More than 12

Backslope

The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp

A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

Badland

A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Bajada

A broad, gently inclined alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically, it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins.

Basal area

The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation

The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology)

A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane

A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology) from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedding system

A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock

The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography

A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace

A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum

Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout (map symbol)

A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed. The adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

Borrow pit (map symbol)

An open excavation from which soil and underlying material have been removed, usually for construction purposes.

Bottom land

An informal term loosely applied to various portions of a flood plain.

Boulders

Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks

A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.

Breast height

An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management

Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte

An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Cable yarding

A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil

A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche

A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

California bearing ratio (CBR)

The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy

The leafy crown of trees or shrubs. (See Crown.)

Canyon

A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

Capillary water

Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena

A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation

An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity

The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps

See Terracettes.

Cement rock

Shaly limestone used in the manufacture of cement.

Channery soil material

Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment

Control of unwanted vegetation through the use of chemicals.

Chiseling

Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque

A steep-walled, semicircular or crescent-shaped, half-bowl-like recess or hollow, commonly situated at the head of a glaciated mountain valley or high on the side of a mountain. It was produced by the erosive activity of a mountain glacier. It commonly contains a small round lake (tarn).

Clay

As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions

See Redoximorphic features.

Clay film

A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clay spot (map symbol)

A spot where the surface texture is silty clay or clay in areas where the surface layer of the soils in the surrounding map unit is sandy loam, loam, silt loam, or coarser.

Claypan

A dense, compact subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. The layer restricts the downward movement of water through the soil. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community

The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil

Sand or loamy sand.

Cobble (or cobblestone)

A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material

Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility)

See Linear extensibility.

Colluvium

Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

Complex slope

Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil

A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions

See Redoximorphic features.

Conglomerate

A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system

Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage

A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil

Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping

Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section

The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat)

A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Corrosion (geomorphology)

A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations)

Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop

A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management

Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system

Growing crops according to a planned system of rotation and management practices.

Cross-slope farming

Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown

The upper part of a tree or shrub, including the living branches and their foliage.

Cryoturbate

A mass of soil or other unconsolidated earthy material moved or disturbed by frost action. It is typically coarser than the underlying material.

Cuesta

An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homocline produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks.

Culmination of the mean annual increment (CMAI)

The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave

The walls of excavations tend to cave in or slough.

Decreasers

The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing

Postponing grazing or resting grazing land for a prescribed period.

Delta

A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer

A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depression, closed (map symbol)

A shallow, saucer-shaped area that is slightly lower on the landscape than the surrounding area and that does not have a natural outlet for surface drainage.

Depth, soil

Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Desert pavement

A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments mantling a desert surface. It forms where wind action and sheetwash have removed all smaller particles or where rock fragments have migrated upward through sediments to the surface. It typically protects the finer grained underlying material from further erosion.

Diatomaceous earth

A geologic deposit of fine, grayish siliceous material composed chiefly or entirely of the remains of diatoms.

Dip slope

A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace)

A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming

A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural)

Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface

Runoff, or surface flow of water, from an area.

Drainageway

A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw

A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

Drift

A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.

Drumlin

A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

Duff

A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune

A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.

Earthy fill

See Mine spoil.

Ecological site

An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation

The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation

A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit

Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Ephemeral stream

A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation

A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion

The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (accelerated)

Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion (geologic)

Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion pavement

A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Erosion surface

A land surface shaped by the action of erosion, especially by running water.

Escarpment

A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Escarpment, bedrock (map symbol)

A relatively continuous and steep slope or cliff, produced by erosion or faulting, that breaks the general continuity of more gently sloping land surfaces. Exposed material is hard or soft bedrock.

Escarpment, nonbedrock (map symbol)

A relatively continuous and steep slope or cliff, generally produced by erosion but in some places produced by faulting, that breaks the continuity of more gently sloping land surfaces. Exposed earthy material is nonsoil or very shallow soil.

Esker

A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

Extrusive rock

Igneous rock derived from deep-seated molten matter (magma) deposited and cooled on the earth's surface.

Fallow

Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan remnant

A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

Fertility, soil

The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat)

The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity

The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fill slope

A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil

Sandy clay, silty clay, or clay.

Firebreak

An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom

An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material

Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone

A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain

The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms

A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay

A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step

An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial

Of or pertaining to rivers or streams; produced by stream or river action.

Foothills

A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope

The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb

Any herbaceous plant not a grass or a sedge.

Forest cover

All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type

A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan

A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil

The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai

Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Glaciofluvial deposits

Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine deposits

Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.

Gleyed soil

Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping

Growing crops in strips that grade toward a protected waterway.

Grassed waterway

A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel

Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravel pit (map symbol)

An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel.

Gravelly soil material

Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Gravelly spot (map symbol)

A spot where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter in an area that has less than 15 percent rock fragments.

Green manure crop (agronomy)

A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water

Water filling all the unblocked pores of the material below the water table.

Gully (map symbol)

A small, steep-sided channel caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage whereas a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock

Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hard to reclaim

Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Hardpan

A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope (geomorphology)

A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat)

Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops

Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill

A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope

A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

Horizon, soil

A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon: An organic layer of fresh and decaying plant residue.

L horizon: A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

A horizon: The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon: The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon: The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon: The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon: Soft, consolidated bedrock beneath the soil.

R layer: Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

M layer: A root-limiting subsoil layer consisting of nearly continuous, horizontally oriented, human-manufactured materials.

W layer: A layer of water within or beneath the soil.

Humus

The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups

Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties include depth to a seasonal high water table, the infiltration rate, and depth to a layer that significantly restricts the downward movement of water. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock

Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

Illuviation

The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil

A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers

Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration

The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity

The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate

The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate

The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Very low: Less than 0.2
Low: 0.2 to 0.4
Moderately low: 0.4 to 0.75
Moderate: 0.75 to 1.25
Moderately high: 1.25 to 1.75
High: 1.75 to 2.5
Very high: More than 2.5

Interfluve

A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology)

A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream

A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders

On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions

See Redoximorphic features.

Irrigation

Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin: Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border: Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding: Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation: Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle): Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow: Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler: Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation: Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding: Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame

A low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

Karst (topography)

A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll

A small, low, rounded hill rising above adjacent landforms.

Ksat

See Saturated hydraulic conductivity.

Lacustrine deposit

Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain

A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace

A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landfill (map symbol)

An area of accumulated waste products of human habitation, either above or below natural ground level.

Landslide

A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones

Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lava flow (map symbol)

A solidified, commonly lobate body of rock formed through lateral, surface outpouring of molten lava from a vent or fissure.

Leaching

The removal of soluble material from soil or other material by percolating water.

Levee (map symbol)

An embankment that confines or controls water, especially one built along the banks of a river to prevent overflow onto lowlands.

Linear extensibility

Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^{1}/_{3}$- or $^{1}/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit

The moisture content at which the soil passes from a plastic to a liquid state.

Loam

Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess

Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength

The soil is not strong enough to support loads.

Low-residue crops

Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl

An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Marsh or swamp (map symbol)

A water-saturated, very poorly drained area that is intermittently or permanently covered by water. Sedges, cattails, and rushes are the dominant vegetation in marshes, and trees or shrubs are the dominant vegetation in swamps. Not used in map units where the named soils are poorly drained or very poorly drained.

Mass movement

A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

Masses

See Redoximorphic features.

Meander belt

The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Meander scar

A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.

Meander scroll

One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment

Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil

Very fine sandy loam, loam, silt loam, or silt.

Mesa

A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

Metamorphic rock

Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth’s crust. Nearly all such rocks are crystalline.

Mine or quarry (map symbol)

An open excavation from which soil and underlying material have been removed and in which bedrock is exposed. Also denotes surface openings to underground mines.

Mine spoil

An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

Mineral soil

Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage

Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area

A kind of map unit that has little or no natural soil and supports little or no vegetation.

Miscellaneous water (map symbol)

Small, constructed bodies of water that are used for industrial, sanitary, or mining applications and that contain water most of the year.

Moderately coarse textured soil

Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil

Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon

A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine

In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

Morphology, soil

The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil

Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain

A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

Muck

Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mucky peat

See Hemic soil material.

Mudstone

A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

Munsell notation

A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon

A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil

A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules

See Redoximorphic features.

Nose slope (geomorphology)

A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Nutrient, plant

Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter

Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low: Less than 0.5 percent
Low: 0.5 to 1.0 percent
Moderately low: 1.0 to 2.0 percent
Moderate: 2.0 to 4.0 percent
High: 4.0 to 8.0 percent
Very high: More than 8.0 percent

Outwash

Stratified and sorted sediments (chiefly sand and gravel) removed or “washed out” from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.

Outwash plain

An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace

An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan

A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material

The unconsolidated organic and mineral material in which soil forms.

Peat

Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped

An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment

A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

Pedon

The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation

The movement of water through the soil.

Perennial water (map symbol)

Small, natural or constructed lakes, ponds, or pits that contain water most of the year.

Permafrost

Ground, soil, or rock that remains at or below 0 degrees C for at least 2 years. It is defined on the basis of temperature and is not necessarily frozen.

pH value

A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil

A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping

Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting

Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit

The moisture content at which a soil changes from semisolid to plastic.

Plasticity index

The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology)

A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Playa

The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Plinthite

The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan

A compacted layer formed in the soil directly below the plowed layer.

Ponding

Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded

Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings

See Redoximorphic features.

Potential native plant community

See Climax plant community.

Potential rooting depth (effective rooting depth)

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning

Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil

The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil

A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use

Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland

Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil

A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid: Less than 3.5

Extremely acid: 3.5 to 4.4

Very strongly acid: 4.5 to 5.0

Strongly acid: 5.1 to 5.5

Moderately acid: 5.6 to 6.0

Slightly acid: 6.1 to 6.5

Neutral: 6.6 to 7.3

Slightly alkaline: 7.4 to 7.8

Moderately alkaline: 7.9 to 8.4

Strongly alkaline: 8.5 to 9.0

Very strongly alkaline: 9.1 and higher

Red beds

Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations

See Redoximorphic features.

Redoximorphic depletions

See Redoximorphic features.

Redoximorphic features

Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
   A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*
   B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*
   C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.
2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
   A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*
   B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).
3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix

See Redoximorphic features.

Regolith

All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief

The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material)

Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill

A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Riser

The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut

A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments

Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop (map symbol)

An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock or where “Rock outcrop” is a named component of the map unit.

Root zone

The part of the soil that can be penetrated by plant roots.

Runoff

The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil

A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Saline spot (map symbol)

An area where the surface layer has an electrical conductivity of 8 mmhos/cm more than the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has an electrical conductivity of 2 mmhos/cm or less.

Sand

As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone

Sedimentary rock containing dominantly sand-sized particles.

Sandy spot (map symbol)

A spot where the surface layer is loamy fine sand or coarser in areas where the surface layer of the named soils in the surrounding map unit is very fine sandy loam or finer.

Sapric soil material (muck)

The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (Ksat)

The ease with which pores of a saturated soil transmit water. Formally, the proportionality coefficient that expresses the relationship of the rate of water movement to hydraulic gradient in Darcy's Law, a law that describes the rate of water movement through porous media. Commonly abbreviated as "Ksat." Terms describing saturated hydraulic conductivity are:

Very high: 100 or more micrometers per second (14.17 or more inches per hour)

High: 10 to 100 micrometers per second (1.417 to 14.17 inches per hour)

Moderately high: 1 to 10 micrometers per second (0.1417 inch to 1.417 inches per hour)

Moderately low: 0.1 to 1 micrometer per second (0.01417 to 0.1417 inch per hour)

Low: 0.01 to 0.1 micrometer per second (0.001417 to 0.01417 inch per hour)

Very low: Less than 0.01 micrometer per second (less than 0.001417 inch per hour).

To convert inches per hour to micrometers per second, multiply inches per hour by 7.0572. To convert micrometers per second to inches per hour, multiply micrometers per second by 0.1417.

Saturation

Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification

The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Sedimentary rock

A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Sequum

A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil

A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Severely eroded spot (map symbol)

An area where, on the average, 75 percent or more of the original surface layer has been lost because of accelerated erosion. Not used in map units in which “severely eroded,” “very severely eroded,” or “gullied” is part of the map unit name.

Shale

Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion

The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short, steep slope (map symbol)

A narrow area of soil having slopes that are at least two slope classes steeper than the slope class of the surrounding map unit.

Shoulder

The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Shrink-swell

The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Shrub-coppice dune

A small, streamlined dune that forms around brush and clump vegetation.

Side slope (geomorphology)

A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica

A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio

The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt

As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone

An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

Similar soils

Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole (map symbol)

A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Site index

A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (pedogenic)

Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slide or slip (map symbol)

A prominent landform scar or ridge caused by fairly recent mass movement or descent of earthy material resulting from failure of earth or rock under shear stress along one or several surfaces.

Slope

The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope alluvium

Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill

The slow filling of ponds, resulting from restricted water transmission in the soil.

Slow water movement

Restricted downward movement of water through the soil. See Saturated hydraulic conductivity.

Sodic (alkali) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodic spot (map symbol)

An area where the surface layer has a sodium adsorption ratio that is at least 10 more than that of the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has a sodium adsorption ratio of 5 or less.

Sodicity

The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to Ca^{++} + Mg^{++}. The degrees of sodicity and their respective ratios are:

Slight: Less than 13:1

Moderate: 13-30:1

Strong: More than 30:1

Sodium adsorption ratio (SAR)

A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock

Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil

A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates

Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand: 2.0 to 1.0

Coarse sand: 1.0 to 0.5

Medium sand: 0.5 to 0.25

Fine sand: 0.25 to 0.10

Very fine sand: 0.10 to 0.05

Silt: 0.05 to 0.002

Clay: Less than 0.002

Solum

The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spoil area (map symbol)

A pile of earthy materials, either smoothed or uneven, resulting from human activity.

Stone line

In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stones

Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony

Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stony spot (map symbol)

A spot where 0.01 to 0.1 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surrounding soil has no surface stones.

Strath terrace

A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

Stream terrace

One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Stripcropping

Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil

The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are:

Platy: Flat and laminated

Prismatic: Vertically elongated and having flat tops

Columnar: Vertically elongated and having rounded tops

Angular blocky: Having faces that intersect at sharp angles (planes)

Subangular blocky: Having subrounded and planar faces (no sharp angles)

Granular: Small structural units with curved or very irregular faces

Structureless soil horizons are defined as follows:

Single grained: Entirely noncoherent (each grain by itself), as in loose sand

Massive: Occurring as a coherent mass

Stubble mulch

Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil

Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling

Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum

The part of the soil below the solum.

Subsurface layer

Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow

The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit

The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer

The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil

The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus

Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts

Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine

An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.

Terrace (conservation)

An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology)

A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes

Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.

Texture, soil

The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer

Otherwise suitable soil material that is too thin for the specified use.

Till

Dominantly unsorted and nonstratified drift, generally unconsolidated and deposited directly by a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders; rock fragments of various lithologies are embedded within a finer matrix that can range from clay to sandy loam.

Till plain

An extensive area of level to gently undulating soils underlain predominantly by till and bounded at the distal end by subordinate recessional or end moraines.

Tilth, soil

The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope

The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil

The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements

Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread

The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Tuff

A generic term for any consolidated or cemented deposit that is 50 percent or more volcanic ash.

Upland

An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill

The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variegation

Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve

A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very stony spot (map symbol)

A spot where 0.1 to 3.0 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surface of the surrounding soil is covered by less than 0.01 percent stones.

Water bars

Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering

All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth's surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded

Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wet spot (map symbol)

A somewhat poorly drained to very poorly drained area that is at least two drainage classes wetter than the named soils in the surrounding map unit.

Wilting point (or permanent wilting point)

The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow

The uprooting and tipping over of trees by the wind.

Appendix H.

Official Soil Series Descriptions

LOCATION DRIVER CA

Established Series
Rev. MV/JFR/JJJ/ET
02/2003

DRIVER SERIES

The Driver series consists of deep, well drained soils formed in alluvium derived dominantly from granitic rock. Driver soils are formed on alluvial terraces of 0 to 2 percent slopes. Mean annual precipitation is about 7 inches, and the mean annual temperature is about 64 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, thermic Durinodic Xeric Haplargids

TYPICAL PEDON: Driver coarse sandy loam, on a slope of less than 1 percent at an elevation of 450 feet, under cotton. (Colors are for dry soil unless otherwise noted. When described on 3/7/79 the soil was moist throughout).

Ap--0 to 16 inches; yellowish brown (10YR 5/4) coarse sandy loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few very fine interstitial pores; 10 percent pebbles; slightly effervescent, disseminated lime; slightly alkaline (pH 7.8); clear smooth boundary. (13 to 16 inches thick)

Bt1--16 to 23 inches; yellowish brown (10YR 5/6) loam, dark yellowish brown (10YR 3/6) moist; weak medium angular blocky structure; hard, friable, slightly sticky and plastic; few fine and very fine roots; few very fine interstitial and few very fine tubular pores; common thin clay films on ped faces and in pores; 5 percent pebbles; violently effervescent, lime segregated in common medium sized soft masses; moderately alkaline (pH 8.0); clear smooth boundary. (5 to 10 inches thick)

Bt2--23 to 27 inches; yellowish brown (10YR 5/6) loam, dark yellowish brown (10YR 4/6) moist; weak medium angular blocky structures; hard, firm, slightly sticky and plastic; few fine and very fine roots; common very fine tubular pores; common thin and few moderately thick clay films on ped faces and lining pores; 5 percent pebbles; violently effervescent, lime disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary. (4 to 13 inches thick)

Bq--27 to 37 inches; brown (7.5YR 5/4) coarse sandy loam, dark yellowish brown (10YR 3/6) moist; massive; very hard, firm, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; 10 percent pebbles; brittle and weakly cemented; slightly effervescent, lime disseminated; moderately alkaline (pH 8.0); abrupt smooth boundary. (10 to 18 inches thick)

2C--37 to 44 inches; yellowish brown (10YR 5/6) loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; 2 percent pebbles; moderately alkaline (pH 8.0); abrupt smooth boundary. (7 to 15 inches thick)

3C--44 to 65 inches; pale brown (10YR 6/3) loamy coarse sand, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; common very fine interstitial pores; 15 percent pebbles; slightly effervescent, disseminated lime; moderately alkaline (pH 8.0). (18 to 23 inches thick)

TYPE LOCATION: Kern County, California; 30 feet NE of the SE corner of section 33, T.27S., R.26E.; about 1/8 mile NE of Merced Avenue and Highway 99.

RANGE IN CHARACTERISTICS: Thickness of solum is 22 to 35 inches. The soil from a depth of 9 to 23 inches is assumed to be dry in all parts from April 15th until January 15th and is continuously moist in some part for less than 90 consecutive days. Gravel content is 0 to 15 percent.

The A horizon has dry color of 10YR 6/4, 6/3, 5/4 or 5/3 and moist color of 10YR 5/3, 4/4, 4/3 or 3/4. It is sandy loam, coarse sandy loam or sandy clay loam. Clay content is 8 to 25 percent. The B2t horizon has dry color of 10YR 5/4, 5/6, 6/4; 7.5YR 5/4 or 5/6 and moist color of 10YR 3/6, 4/4, 4/6; or 7.5YR 4/4. The texture is loam, or clay loam. Clay content is 20 to 35 percent. The clay increase from the A to the Bt horizon is 5 to 20 percent. In some pedons the lower part of the Bt horizon is weakly cemented with silica.

The upper part of the C horizon has dry color of 7.5YR 5/4; 10YR 5/6 or 6/4 and moist color of 10YR 4/3, or 4/4. It is weakly cemented with silica but when crushed it is sandy loam or coarse sandy loam. The structure is moderately subangular blocky or structureless.

The lower part of the C horizon has dry color of 10YR 5/4, 5/6, 6/3 or 6/4 and moist color of 10YR 4/3 or 4/4. It is commonly stratified with textures of loam, sandy loam, coarse sandy loam or loam coarse sand. There are 2 to 15 percent gravel in this horizon. Clay content is 5 to 20 percent throughout the C horizon.

COMPETING SERIES: These are the Aladshi, Caudle, Nyala, Unsel, and Vigus series in other families. All these soils have a mesic soil temperature regime.

GEOGRAPHIC SETTING: Driver soils are on alluvial terraces with slopes of 0 to 2 percent. The soils formed in alluvium derived from granitic rock. Elevation is 400 to 525 feet. The climate is arid with hot dry summers and cool somewhat moist winters. Ground fog occurs in winter. The mean annual precipitation is about 7 inches. Mean January temperature is 48 degrees F.; the mean July temperature is 84 degrees F.; the mean annual temperature is 64 degrees F. Frost-free season is 250 to 300 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Wasco and Delano soils. Wasco soils lack Csi and a B horizon and are coarse-loamy. Delano soils lack a silica cemented Csi horizon.

DRAINAGE AND PERMEABILITY: Well drained; very slow runoff; moderate permeability in the subsoil and moderately slow in the weakly cemented substratum.

USE AND VEGETATION: Driver soils are used for irrigated crops such as cotton and alfalfa.

DISTRIBUTION AND EXTENT: Northwestern Kern. The soils are not extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Davis, California

SERIES ESTABLISHED: Kern County, Northwestern part, California, 1982.

REMARKS: This soil was originally mapped as Exeter, but the moisture regime did not fit that series. Also, the silica cementation is too weak to qualify as a duripan. Statement by Dr. Parson.

Series reclassified on September, 1994. Competing series not reviewed at that time.

The activity class was added to the classification in February of 2003. Competing series were not checked at that time. - ET

National Cooperative Soil Survey
U.S.A.

LOCATION WASCO CA

Established Series
Rev. KKC/ARW/CAF/KDA
05/2003

WASCO SERIES

The Wasco series consists of very deep, well drained soils on recent alluvial fans and flood plains. These soils formed in mixed alluvium derived mainly from igneous and/or sedimentary rock sources. Slope is 0 to 5 percent slopes. The mean annual precipitation is about 6 inches and the mean annual temperature is about 64 degrees F.

TAXONOMIC CLASS: Coarse-loamy, mixed, superactive, nonacid, thermic Typic Torriorthents

TYPICAL PEDON: Wasco sandy loam, cultivated. (Colors are for dry soil unless otherwise stated.)

Ap1--0 to 9 inches; brown (10YR 5/3) sandy loam, dark gray (10YR 4/1) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; slightly acid (pH 6.4); abrupt smooth boundary.

Ap2--9 to 15 inches; yellowish brown (10YR 5/4) sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few very fine tubular and many very fine interstitial pores; neutral (pH 6.6); abrupt smooth boundary. (Combined thickness of the A horizon ranges from 9 to 40 inches)

C1--15 to 32 inches; brown (10YR 5/3) sandy loam, dark gray (10YR 4/1) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; common very fine tubular and many very fine interstitial pores; neutral (pH 7.2); abrupt smooth boundary. (14 to 21 inches thick)

C2--32 to 65 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; common very fine tubular and many very fine interstitial pores; slightly effervescent, carbonates disseminated; moderately alkaline (pH 8.2).

TYPE LOCATION: Kern County, California; about 3.5 miles southeast of the community of Wasco; approximately 300 feet east and 2,550 feet south of the northwest corner of section 32, T. 27 S., R. 25 E., MDB&M; Latitude 35 degrees, 32 minutes, 11 seconds north and Longitude 119 degrees, 18 minutes, 41 seconds west; USGS Wasco Topographic Quadrangle, NAD 27.

RANGE IN CHARACTERISTICS: The soil between the depths of 8 and 24 inches is dry in all parts from mid-April until mid-January and is continuously moist in some parts for 60 to 90 consecutive days in the winter. Mean annual soil temperature is 62 degrees to 67 degrees F. The soil temperature is never below 47 degrees F. in the San Joaquin Valley. Some pedons have disseminated carbonates at depths below 16 to 40 inches. Rock fragment content is 0 to 15 percent. Rock fragments are less than 0.5 inch in diameter. Organic matter is less than 1 percent in the upper part of the profile and decreases regularly with increasing depth. Organic matter content is less than 0.2 percent below 49 inches depth.

The A horizon has color of 10YR 5/2, 5/3, 5/4, 6/2, 6/3, 6/4; 2.5Y 5/2 or 6/2. Moist color is 10YR 3/3, 4/2, 4/3, 5/2; 2.5Y 4/2 or 5/2. Texture is sandy loam or fine sandy loam. Reaction is slightly acid to moderately alkaline.

The C horizon has color of 10YR 5/3, 5/4, 6/3, 6/4, 7/2; 2.5Y 5/2, 5/4, 6/2, 7/2 or 7/4. Moist color is 10YR 3/3, 4/2, 4/3, 5/3; 2.5Y 4/2, 4/4, 5/2, 5/4 or 6/2. Texture is coarse sandy loam, sandy loam or fine sandy loam. Some pedons have thick stratification below a depth of 40 inches with texture of loamy sand to silt loam. Distinct thin stratification is not present. Reaction is neutral to moderately alkaline.

COMPETING SERIES: These are the Cantua and Uxo series. Cantua soils (MLRA 15), on uplands, are 40 to 60 inches deep to a paralithic contact of soft, calcareous sandstone. Uxo soils (MLRA 30), on alluvial fans and fan aprons, are moist for 10 to 20 days cumulative between July and October following convection storms, have gravel content in the A horizon of 40 to 75 percent and have Btk horizons.

GEOGRAPHIC SETTING: Wasco soils are on recent alluvial fans and flood plains. Slope is 0 to 5 percent. These soils formed in mixed alluvium derived dominantly from igneous and/or sedimentary rock sources. Elevation is 225 to 1,000 feet in the southern part of San Joaquin Valley and cool phases occur at elevations as high as 3,700 feet in the Mojave Desert. The climate is arid to semiarid with hot, dry summers and cool, somewhat moist winters. Mean annual precipitation is 4 to 7 inches. Mean January temperature is 44 degrees to 47 degrees F.; mean July temperature is 80 degrees to 85 degrees F.; mean annual temperature is 59 degrees to 62 degrees F. in the Mojave Desert and 62 degrees to 65 degrees F. in the San Joaquin Valley. Frost-free season is 250 to 300 days in the San Joaquin Valley and 210 to 250 days in the Mojave Desert.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Milham and Panoche series. Milham soils, on fan remnants, alluvial fans, plains and low terraces, have an argillic horizon that has a fine-loamy particle-size control section. Panoche soils, on alluvial fans and plains, have a fine-loamy particle-size control section.

DRAINAGE AND PERMEABILITY: Well drained; negligible or very low runoff; moderately rapid permeability.

USE AND VEGETATION: Used for growing field, forage and row crops. Some areas are used for livestock grazing, wildlife habitat, recreation and homesites. Native vegetation is Atriplex spp., annual grasses and forbs.

DISTRIBUTION AND EXTENT: Mainly in the southern part of the San Joaquin Valley and to a lessor extent in the Mojave Desert. The series is of large extent. MLRA 17, 30.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Davis, California

SERIES ESTABLISHED: San Bernardino County, California, Mojave River Area, 1978.

REMARKS: The Wasco soils were formerly mapped as Hesperia series. Hesperia soils are now recognized as having a torric bordering on a xeric moisture regime. The cool phases at the higher elevations and shorter FFS should be a new series with near mesic soil temperature.

National Cooperative Soil Survey
U.S.A.

Appendix I.

Soil Analysis Data

Report No: 03-020-017

A & L WESTERN AGRICULTURAL LABORATORIES, INC.

1311 Woodland Avenue, Suite 1 • Modesto, California 95351 • (209) 529-4080

Account No: 4820-D

Send to: Cascade Earth Science
PO Box 11295
Bakersfield, CA 95389

Date Sampled: 01/03/2003
Date Received: 01/20/2003
Date Reported: 01/21/2003

ANALYSIS REPORT

Lab No.	Sample Id	Dry Weight (g)
57974	Pit N 0-4 BD	171.78
57975	Pit 4-15 BD	218.21
57976	Pit 15-32 BD	225.38
57977	Pit 32-48 BD	234.34
57978	Pit N 48-60 BD	232.55

A & L Western Agricultural Laboratories, Inc.

Mike Buttress, CPAg

A & L WESTERN AGRICULTURAL LABORATORIES, IN

1311 Woodland Avenue, Suite 1 • Modesto, California 95351 • (209) 529-4080

Report No: 03-020-017

Account No: 4820-D

Send to: Cascade Earth Science
PO Box 11295
Bakersfield, CA 95389

Date Sampled: 01/03/2003
Date Received: 01/20/2003
Date Reported: 02/11/2003

WATER HOLDING CAPACITY ANALYSIS REPORT

Method Code: MSA Part 1 (1965) pp 273-278

Lab No.	Sample Id	Saturation %	1/5 Bar %	1/3 Bar %	3/5 Bar %	15 Bar %
57974	Pit N 0-4 BD	23.90	17.48	14.79	12.24	6.13
57975	Pit 4-15 BD	22.81	17.44	16.83	12.25	5.72
57976	Pit 15-32 BD	16.16	11.24	10.62	7.33	3.41
57977	Pit 32-48 BD	16.66	10.72	11.76	7.46	3.41
57978	Pit N 48-60 BD	22.76	22.11	22.33	15.67	6.85

A & L Western Agricultural Laboratories, Inc.

MButtress

Mike Buttress, CPAg

EPORT NUMBER
03-020-016

A & L WESTERN AGRICULTURAL LABORATORIES

1311 Woodland Ave. • Ste. #1 • Modesto, CA 95351 • (209) 529-4080 • FAX (209) 529-4736

Client No: 4820-D

GROWER: THE GARLIC COMPANY

SEND TO: CASCADE EARTH SCIENCES
7150 SUPRA DRIVE
ALBANY, OR 97321

SUBMITTED BY: ELI HAMM

ATE OF REPORT 02/07/2003 PAGE 1

SOIL ANALYSIS REPORT

(SEE EXPLANATION ON BACK)

SAMPLE NUMBER	LAB NUMBER	ORGANIC MATTER % RATE	ORGANIC MATTER ENR lbs/A	PHOSPHORUS P1 (Weak Bray) ppm-P RATE	PHOSPHORUS NaHCO3-P (Olsen Method) ppm-P RATE	POTASSIUM K ppm-K RATE	MAGNESIUM Mg ppm-Mg RATE	CALCIUM Ca ppm-Ca RATE	SODIUM Na ppm-Na RATE	pH SOIL pH	pH BUFFER INDEX	HYDROGEN H meq/100g	Cation Exchange Capacity C.E.C. meq/100g	% K	% Mg	% Ca	% H	% Na
W012	57953	1.2L	53	31H	23M	258H	110L	1858H	59L	6.2	6.8	1.5	12.6	5.2	7.2	73.5	12.0	2.0
W-24	57954	0.4L	38	23 *	19H	233M	142L	2850VH	52L	7.5		0.0	16.2	3.7	7.2	87.7	0.0	1.4
W-36	57955	0.3VL	36	14 *	9M	184M	157L	3152VH	60L	7.9		0.0	17.8	2.6	7.3	88.6	0.0	1.5
W-60	57956	0.5L	39	13 *	9M	204M	187L	2828VH	156M	8.1		0.0	16.8	3.1	9.1	83.8	0.0	4.0
W012	57957	1.0L	49	27H	18H	250M	106L	2247VH	59L	7.2		0.0	13.0	4.9	6.7	86.4	0.0	2.0

PERCENT CATION SATURATION (COMPUTED)

* Weak Bray unreliable at M or H excess lime or pH > 7.5

SAMPLE NUMBER	NITROGEN NO_3-N ppm-NO_3-N RATE	SULFUR SO_4-S PPM-S RATE	ZINC Zn ppm-Zn RATE	MANGANESE Mn ppm-Mn RATE	IRON Fe ppm-Fe RATE	COPPER Cu ppm-Cu RATE	BORON B ppm-B RATE	EXCESS LIME RATE	SOLUBLE SALTS mmhos/cm RATE	CHLORIDE Cl ppm-Cl RATE		% SAND	% SILT	% CLAY	SOIL TEXTURE
W012	30H	202VH	1.7M	2L	6L	0.6L	1.0M	L	1.7M						
W-24	11L	37VH	0.3VL	1VL	1VL	0.2VL	0.5L	H	0.9M						
W-36	5L	51VH	0.2VL	1VL	1VL	0.2VL	0.4L	H	0.8M						
W-60	4VL	40VH	0.1VL	1VL	1VL	0.1VL	0.5L	H	0.7M						
W012	23M	78VH	1.2M	1VL	1VL	0.4L	0.7M	L	1.1M						

PARTICLE SIZE ANALYSIS

This report applies only to the sample(s) tested. Samples are retained a maximum of thirty days after testing.

A & L WESTERN AGRICULTURAL LABORATORIES

BY MIKE BUTTRESS, CPAg

* CODE TO RATING: VERY LOW (VL), LOW (L), MEDIUM (M), HIGH (H), VERY (VH), AND NONE (N)

**** MULTIPLY THE RESULTS IN ppm BY 4.6 TO CONVERT TO LBS. PER ACRE P_2O_5

EPORT NUMBER
03-020-016

A & L WESTERN AGRICULTURAL LABORATORIES

1311 Woodland Ave. • Ste. #1 • Modesto, CA 95351 • (209) 529-4080 • FAX (209) 529-4736

Client No: 4820-D

GROWER: THE GARLIC COMPANY

SEND TO:
CASCADE EARTH SCIENCES
7150 SUPRA DRIVE
ALBANY, OR 97321

SUBMITTED BY: ELI HAMM

ATE OF REPORT 02/07/2003 PAGE 2

SOIL ANALYSIS REPORT

(SEE EXPLANATION ON BACK)

SAMPLE NUMBER	LAB NUMBER	ORGANIC MATTER % RATE	ORGANIC MATTER ENR lbs/A	PHOSPHORUS P (Weak Bray) ppm-P RATE	PHOSPHORUS NaHCO3-P (Olsen Method) ppm-P RATE	POTASSIUM K ppm-K RATE	MAGNESIUM Mg ppm-Mg RATE	CALCIUM Ca ppm-Ca RATE	SODIUM Na ppm-Na RATE	pH SOIL pH	pH BUFFER INDEX	HYDROGEN H meq/100g	Cation Exchange Capacity C.E.C. meq/100g	PERCENT CATION SATURATION (COMPUTED) % K	% Mg	% Ca	% H	% Na
W-24	57958	0.4L	38	15 *	7L	193M	135L	3137VH	53L	7.7		0.0	17.5	2.8	6.4	89.5	0.0	1.3
W-36	57959	0.3VL	35	12 *	6L	141M	100VL	3108VH	46L	8.0		0.0	16.9	2.1	4.9	91.8	0.0	1.2
W-60	57960	0.3VL	35	18 *	3VL	126M	88VL	2693VH	38L	7.9		0.0	14.5	2.2	3.9	92.8	0.0	1.1
E012	57961	0.8L	47	20M	14H	220M	104L	2234VH	63L	6.8		0.4	13.2	4.2	6.4	84.2	3.0	2.1
E-24	57962	0.6L	42	15 *	10M	136M	102L	2913VH	46L	7.8		0.0	15.9	2.2	5.3	91.3	0.0	1.3

* Weak Bray unreliable at M or H excess lime or pH > 7.5

SAMPLE NUMBER	NITROGEN NO3-N ppm-NO3-N RATE	SULFUR SO4-S PPM-S RATE	ZINC Zn ppm-Zn RATE	MANGANESE Mn ppm-Mn RATE	IRON Fe ppm-Fe RATE	COPPER Cu ppm-Cu RATE	BORON B ppm-B RATE	EXCESS LIME RATE	SOLUBLE SALTS mmhos/cm RATE	CHLORIDE Cl ppm-Cl RATE		PARTICLE SIZE ANALYSIS % SAND	% SILT	% CLAY	SOIL TEXTURE
W-24	13M	35H	0.2VL	1VL	1VL	0.3VL	0.4L	L	0.2VL						
W-36	5L	13M	0.2VL	1VL	1VL	0.2VL	0.3VL	H	0.5L						
W-60	2VL	20M	0.1VL	1VL	1VL	0.1VL	0.4L	M	0.4L						
E012	23M	177VH	1.8M	1VL	2VL	0.6L	0.9M	L	2.0M						
E-24	10L	23M	0.3VL	1VL	1VL	0.3VL	0.4L	H	0.8M						

A & L WESTERN AGRICULTURAL LABORATORIES

BY MIKE BUTTRESS, CPAg

* CODE TO RATING: VERY LOW (VL), LOW (L), MEDIUM (M), HIGH (H), VERY (VH), AND NONE (N).

**** MULTIPLY THE RESULTS IN ppm BY 4.6 TO CONVERT TO LBS. PER ACRE P2O5

EPORT NUMBER
)3-020-016

A & L WESTERN AGRICULTURAL LABORATORIES

1311 Woodland Ave. • Ste. #1 • Modesto, CA 95351 • (209) 529-4080 • FAX (209) 529-4736

Client No: 4820-D

GROWER: THE GARLIC COMPANY

END
O: CASCADE EARTH SCIENCES
7150 SUPRA DRIVE
ALBANY, OR 97321

SUBMITTED BY: ELI HAMM

ATE OF REPORT 02/07/2003 PAGE 3

SOIL ANALYSIS REPORT

(SEE EXPLANATION ON BACK)

SAMPLE NUMBER	LAB NUMBER	ORGANIC MATTER RATE	ORGANIC MATTER ENR lbs/A	PHOSPHORUS P (Weak Bray) ppm-P RATE	PHOSPHORUS NaHCO3-P (Olsen Method) ppm-P RATE	POTASSIUM K ppm-K RATE	MAGNESIUM Mg ppm-Mg RATE	CALCIUM Ca ppm-Ca RATE	SODIUM Na ppm-Na RATE	pH SOIL pH	pH BUFFER INDEX	HYDROGEN H meq/100g	Cation Exchange Capacity C.E.C. meq/100g	% K	% Mg	% Ca	% H	% Na
E-36	57963	0.6L	42	2 *	8M	139M	108L	3218VH	53L	8.1		0.0	17.5	2.0	5.1	91.6	0.0	1.3
E-60	57964	0.6L	41	1 *	6L	145L	129L	3428VH	59L	8.2		0.0	18.8	2.0	5.6	91.0	0.0	1.4
E012	57965	1.1L	52	38H	30VH	318M	150L	3638VH	53L	6.9		0.3	20.7	3.9	5.9	87.5	1.5	1.1
E-24	57966	1.0L	50	20 *	17H	212M	104L	2795VH	37L	7.6		0.0	15.5	3.5	5.5	90.0	0.0	1.0
E-36	57967	0.4L	38	21 *	6L	184M	101L	2992VH	40L	7.9		0.0	16.4	2.9	5.1	91.0	0.0	1.1

PERCENT CATION SATURATION (COMPUTED)

* Weak Bray unreliable at M or H excess lime or pH > 7.5

SAMPLE NUMBER	NITROGEN NO_3-N ppm-NO_3-N RATE	SULFUR SO_4-S ppm-S RATE	ZINC Zn ppm-Zn RATE	MANGANESE Mn ppm-Mn RATE	IRON Fe ppm-Fe RATE	COPPER Cu ppm-Cu RATE	BORON B ppm-B RATE	EXCESS LIME RATE	SOLUBLE SALTS mmhos/cm RATE	CHLORIDE Cl ppm-Cl RATE		PARTICLE SIZE ANALYSIS % SAND	% SILT	% CLAY	SOIL TEXTURE
E-36	3VL	1VL	0.1VL	1VL	1VL	0.2VL	0.4L	H	0.5L						
E-60	3VL	14M	0.1VL	1VL	1VL	0.2VL	0.5L	H	0.4L						
E012	46VH	228VH	5.0H	2L	2VL	1.4H	0.7M	L	2.8H						
E-24	10L	33H	0.9L	1VL	1VL	0.3VL	0.3VL	M	0.7M						
E-36	4VL	12M	0.3VL	1VL	1VL	0.3VL	0.4L	H	0.5L						

This report applies only to the sample(s) tested. Samples are retained a maximum of thirty days after testing.

A & L WESTERN AGRICULTURAL LABORATORIES

BY MIKE BUTTRESS, CPAg

* CODE TO RATING: VERY LOW (VL), LOW (L), MEDIUM (M), HIGH (H), VERY (VH), AND NONE (N).

**** MULTIPLY THE RESULTS IN ppm BY 4.6 TO CONVERT TO LBS. PER ACRE P_2O_5

EPORT NUMBER
)3-020-016

A & L WESTERN AGRICULTURAL LABORATORIES
1311 Woodland Ave. • Ste. #1 • Modesto, CA 95351 • (209) 529-4080 • FAX (209) 529-4736

Client No: 4820-D

GROWER: THE GARLIC COMPANY

SEND TO: CASCADE EARTH SCIENCES
7150 SUPRA DRIVE
ALBANY, OR 97321

SUBMITTED BY: ELI HAMM

ATE OF REPORT 02/07/2003 PAGE 4

SOIL ANALYSIS REPORT
(SEE EXPLANATION ON BACK)

SAMPLE NUMBER	LAB NUMBER	ORGANIC MATTER % RATE	ORGANIC MATTER ENR lbs/A	PHOSPHORUS P1 (Weak Bray) ppm-P RATE	PHOSPHORUS NaHCO3-P (Olsen Method) ppm-P RATE	POTASSIUM K ppm-K RATE	MAGNESIUM Mg ppm-Mg RATE	CALCIUM Ca ppm-Ca RATE	SODIUM Na ppm-Na RATE	pH SOIL pH	pH BUFFER INDEX	HYDROGEN H meq/100g	Cation Exchange Capacity C.E.C. meq/100g	% K	% Mg	% Ca	% H	% Na
E-60	57968	0.4L	39	15 *	4L	194M	118L	3343VH	41VL	8.0		0.0	18.3	2.7	5.3	91.0	0.0	1.0

(Percent columns: PERCENT CATION SATURATION (COMPUTED))

* Weak Bray unreliable at M or H excess lime or pH > 7.5

SAMPLE NUMBER	NITROGEN NO_3-N ppm-NO_3-N RATE	SULFUR SO_4-S PPM-S RATE	ZINC Zn ppm-Zn RATE	MANGANESE Mn ppm-Mn RATE	IRON Fe ppm-Fe RATE	COPPER Cu ppm-Cu RATE	BORON B ppm-B RATE	EXCESS LIME RATE	SOLUBLE SALTS mmhos/cm RATE	CHLORIDE Cl ppm-Cl RATE		% SAND	% SILT	% CLAY	SOIL TEXTURE
E-60	3VL	3VL	0.2VL	1VL	1VL	0.2VL	0.5L	H	0.4L						

(% SAND, % SILT, % CLAY, SOIL TEXTURE: PARTICLE SIZE ANALYSIS)

This report applies only to the sample(s) tested. Samples are retained a maximum of thirty days after testing.

A & L WESTERN AGRICULTURAL LABORATORIES

BY MIKE BUTTRESS, CPAg

* CODE TO RATING: VERY LOW (VL), LOW (L), MEDIUM (M), HIGH (H), VERY (VH), AND NONE (N).

**** MULTIPLY THE RESULTS IN ppm BY 4.6 TO CONVERT TO LBS. PER ACRE P_2O_5

03-020-016

A & L WESTERN AGRICULTURAL LABORATORIES

1311 Woodland Ave. • Ste. #1 • Modesto, CA 95351 • (209) 529-4080 • FAX (209) 529-4736

Client No: 4820-D

REPORT NUMBER

CASCADE EARTH SCIENCES
7150 SUPRA DRIVE
ALBANY, OR 97321

Grower: THE GARLIC COMPANY

Submitted by: ELI HAMM

Date: 02/07/2003

Soil Salinity Report

Sample Number	Lab Number	SAR	ESP	Na meq/L	Ca meq/L	Mg meq/L	pH	CO3 meq/L	HCO3 meq/L	E.C. dS/m	Cl meq/L	B ppm	Saturation %
NW012	57953	1.0	0.2	4.0	20.2	4.4	6.2	0.0	1.2	1.7	1.4	0.4	25.8
NW-24	57954	0.7	< 0.1	1.8	10.7	1.3	7.5	0.0	2.6	0.9	1.0	0.1	25.2
NW-36	57955	0.9	< 0.1	1.9	7.4	1.0	7.9	0.0	2.0	0.8	0.5	0.1	25.7
NW-60	57956	2.6	2.5	4.6	5.4	0.8	8.1	0.0	2.0	0.7	0.8	0.2	27.1
SW012	57957	0.9	< 0.1	3.1	20.8	2.4	7.2	0.0	2.6	1.1	0.8	0.2	25.4
SW-24	57958	0.7	< 0.1	1.6	8.0	0.9	7.7	0.0	1.8	0.2	0.6	0.1	26.6
SW-36	57959	0.8	< 0.1	1.2	4.0	0.5	8.0	0.0	1.9	0.5	0.6	0.1	25.5

A & L WESTERN AGRICULTURAL LABORATORIES, INC.

MIKE BUTTRESS, CPAg

03-020-016

A & L WESTERN AGRICULTURAL LABORATORIES

1311 Woodland Ave. • Ste. #1 • Modesto, CA 95351 • (209) 529-4080 • FAX (209) 529-4736

Client No: 4820-D

REPORT NUMBER

CASCADE EARTH SCIENCES
7150 SUPRA DRIVE
ALBANY, OR 97321

Grower: THE GARLIC COMPANY

Submitted by: ELI HAMM

Date: 02/07/2003

Soil Salinity Report

Sample Number	Lab Number	SAR	ESP	Na meq/L	Ca meq/L	Mg meq/L	pH	CO3 meq/L	HCO3 meq/L	E.C. dS/m	Cl meq/L	B ppm	Saturation %
SW-60	57960	0.9	< 0.1	1.2	3.6	0.3	7.9	0.0	2.0	0.4	0.5	0.1	22.0
SE012	57961	0.9	< 0.1	3.6	28.1	3.2	6.8	0.0	2.3	2.0	1.1	0.2	24.0
SE-24	57962	0.9	< 0.1	1.6	6.1	0.7	7.8	0.0	2.7	0.8	0.6	0.1	26.3
SE-36	57963	0.9	0.1	1.3	3.3	0.4	8.1	0.0	2.0	0.5	0.8	0.1	28.7
SE-60	57964	1.0	0.2	1.1	2.3	0.4	8.2	0.0	1.7	0.4	0.8	0.1	31.8
NE012	57965	0.6	< 0.1	2.8	36.5	4.7	6.9	0.0	3.3	2.8	1.5	0.2	27.5
NE-24	57966	0.7	< 0.1	1.4	7.6	0.9	7.6	0.0	2.8	0.7	0.8	0.1	24.2

A & L WESTERN AGRICULTURAL LABORATORIES, INC.

MIKE BUTTRESS, CPAg

03-020-016

REPORT NUMBER

A & L WESTERN AGRICULTURAL LABORATORIES

1311 Woodland Ave. • Ste. #1 • Modesto, CA 95351 • (209) 529-4080 • FAX (209) 529-4736

Client No: 4820-D

CASCADE EARTH SCIENCES
7150 SUPRA DRIVE
ALBANY, OR 97321

Grower: THE GARLIC COMPANY

Submitted by: ELI HAMM

Date: 02/07/2003

Soil Salinity Report

Sample Number	Lab Number	SAR	ESP	Na meq/L	Ca meq/L	Mg meq/L	pH	CO3 meq/L	HCO3 meq/L	E.C. dS/m	Cl meq/L	B ppm	Saturation %
NE-36	57967	0.7	< 0.1	1.0	3.2	0.4	7.9	0.0	2.6	0.5	0.6	0.1	28.7
NE-60	57968	0.8	< 0.1	0.9	2.6	0.3	8.0	0.0	2.1	0.4	0.3	0.1	27.8

A & L WESTERN AGRICULTURAL LABORATORIES, INC.

MIKE BUTTRESS, CPAg

Report No: 03-020-016

A & L WESTERN AGRICULTURAL LABORATORIES, INC.

1311 Woodland Avenue, Suite 1 • Modesto, California 95351 • (209) 529-4080

Account No: 4820-D

Send to: CASCADE EARTH SCIENCES
7150 SUPRA DRIVE
ALBANY, OR 97321

Project: The Garlic Company

Submitted by: Eli Hamm

Date Received: 01/20/2003
Date Reported: 02/07/2003

ANALYSIS REPORT

Lab Number	Sample Id	C.E.C. meq/100g	TKN ppm	Ammonia Nitrogen ppm
57953	NW 0-12	8.2	776	15
57954	NW 12-24	8.1	399	10
57955	NW 24-36	8.3	397	9
57956	NW 36-60	8.7	309	12
57957	SW 0-12	7.3	555	11
57958	SW 12-24	8.3	387	11
57959	SW 24-36	7.4	314	10
57960	SW 36-60	5.7	317	9
57961	SE 0-12	6.8	629	9
57962	SE 12-24	8.0	304	12
57963	SE 24-36	6.7	231	15
57964	SE 36-60	8.2	229	9
57965	NE 0-12	6.7	786	7
57966	NE 12-24	6.2	237	10
57967	NE 24-36	6.5	382	9
57968	NE 36-60	7.0	200	9

FEB 10 2003

A & L Western Agricultural Laboratories

MButtress

Mike Buttress, CPAg MB

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A & L WESTERN AGRICULTURAL LABORATORIES, INC.

Report No: 03-020-016 1311 Woodland Avenue, Suite 1 • Modesto, California 95351 • (209) 529-4080

Account No: 4820-D

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ANALYSIS REPORT

Lab Number	Sample Id	C.E.C. meq/100g	TKN ppm	Ammonia Nitrogen ppm
57953	NW 0-12	8.2	776	15
57954	NW 12-24	8.1	399	10
57955	NW 24-36	8.3	397	9
57956	NW 36-60	8.7	309	12
57957	SW 0-12	7.3	555	11
57958	SW 12-24	8.3	367	11
57959	SW 24-36	7.4	314	10
57960	SW 36-60	5.7	317	9
57961	SE 0-12	6.8	629	9
57962	SE 12-24	8.0	304	12
57963	SE 24-36	6.7	231	15
57964	SE 36-60	8.2	229	9
57965	NE 0-12	6.7	786	7
57966	NE 12-24	6.2	237	10
57967	NE 24-36	6.5	382	9
57968	NE 36-60	7.0	200	9

FEB 10 2003

A & L Western Agricultural Laboratories

Mike Buttress, CPAg

3-020-016

A & L WESTERN AGRICULTURAL LABORATORIES

1311 Woodland Ave. • Ste. #1 • Modesto, CA 95351 • (209) 529-4080 • FAX (209) 529-4736

Client No: 4820-D

ORT NUMBER

CASCADE EARTH SCIENCES
7150 SUPRA DRIVE
ALBANY, OR 97321

Grower: THE GARLIC COMPANY

Submitted by: ELI HAMM

Date: 02/07/2003

FEB 10 2003

Soil Salinity Report

Sample Number	Lab Number	SAR	ESP	Na meq/L	Ca meq/L	Mg meq/L	pH	CO3 meq/L	HCO3 meq/L	E.C. dS/m	Cl meq/L	B ppm	Saturation %
NE-36	57967	0.7	< 0.1	1.0	3.2	0.4	7.9	0.0	2.6	0.5	0.6	0.1	26.7
NE-60	57968	0.8	< 0.1	0.9	2.6	0.3	8.0	0.0	2.1	0.4	0.3	0.1	27.8

A & L WESTERN AGRICULTURAL LABORATORIES, INC.

MIKE BUTTRESS, CPAg

A & L WESTE

Report No: 03-020-016 1311 Woodland A

Send to: CASCADE EARTH SCIENCES
7150 SUPRA DRIVE
ALBANY, OR 97321

Lab Number	Sample Id
57953	NW 0-12
57954	NW 12-24
57955	NW 24-36
57956	NW 36-60
57957	SW 0-12
57958	SW 12-24
57959	SW 24-36
57960	SW 36-60
57961	SE 0-12
57962	SE 12-24
57963	SE 24-36
57964	SE 36-60
57965	NE 0-12
57966	NE 12-24
57967	NE 24-36
57968	NE 36-60

A & L Western Agricultural Laboratories

Mike Buttress, CPAg

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enue, Suite 1 • Modesto, California 95351 • (209) 529-4080

Account No: 4820-D

Project: The Garlic Company

Submitted by: Eli Hamm

Date Received: 01/20/2003
Date Reported: 02/07/2003

ANALYSIS REPORT

C.E.C. meq/100g	TKN ppm	Ammonia Nitrogen ppm
8.2	776	15
6.1	399	10
6.3	397	9
8.7	309	12
7.3	555	11
8.3	387	11
7.4	314	10
5.7	317	9
6.8	629	9
8.0	304	12
6.7	231	15
8.2	229	9
6.7	786	7
6.2	237	10
6.5	362	9
7.0	200	9

FEB 1 0 2003

03-020-016

REPORT NUMBER

A & L
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CASCADE EA
7150 SUPRA
ALBANY, OR

Sample Number	Lab Number	SAR
NW012	57953	1.0
NW-24	57954	0.7
NW-36	57955	0.9
NW-60	57956	2.6
SW012	57957	0.9
SW-24	57958	0.7
SW-36	57959	0.8

ANACHEM LABORATORIES
Established 1948
130 Penn Street · El Segundo, California 90245.3907 · voice 310.322.4993 · fax 310.322.6681

FGL ENVIRONMEMTAL
853 Corporation St et
Santa Paula, CA 93 1

ATTN: Laura De Anda

DATE	December 12, 2002
LAB NO.	A86755 pg.1
CUST P.O.	VI242441
SAMPLE (S)	SOIL
RECEIVED	11-26-02
SAMPLE NO:	72840
E.L.A.P.CERTIFICATE	1164

PROJECT NO: VI242441

SAMPLE: SOIL SAMPLES 09

SAMPLED: BY CLIENT

SAMPLE I.D.	CONSTITUENT	CONCENTRATION	METHOD EPA	DLR
09 WSS-3 4-6'	Total Organic Carbon	4270 mg/Kg	9060	100 mg/Kg

N. Krishnan, Ph.D.
Laboratory Director

ANACHEM LABORATORIES

Established 1948

130 Penn Street · El Segundo, California 90245.3907 · voice 310.322.4993 · fax 310.322.6681

FGL ENVIRONMEMTAL
853 Corporation Street
Santa Paula, CA 93061

ATTN: Laura De Anda

DATE	December 12, 2002
LAB NO.	A86755 pg.2
CUST P.O.	VI242441
SAMPLE (S)	SOIL
RECEIVED	11-26-02
SAMPLE NO:	72840
E.L.A.P.CERTIFICATE	1164

PROJECT NO: VI242441

SAMPLE: SOIL SAMPLES 09

SAMPLED: BY CLIENT

QA/QC DATA:

MS	MSD	RPD	LCS	METHOD BLANK
95.5%	95.0	0.5	102 %	<50 mg/Kg

N. Krishnan, Ph.D.
Laboratory Director

Report Date:	8/18/2016		
Report No:	S48566-2		
Client:	Cascade Earth Sciences, Visalia		
Sampler:			
Project:	***TGC-Reporting***		
Field:	***NP***		
P.N.:	2016210026		
Crop:			
Sampling Date:	08/16/2016		

Kuo Testing Labs, Inc.
337 South 1st
Othello, Washington 99344
(509) 488-0112; Fax (509) 488-0118
Email: info@kuotestinglabs.com
Web site: www.kuotestinglabs.com

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SOIL ANALYSIS REPORT

Lab #	**Depth** Ft.	**Field ID**	**NO3 -N** #/A	**NO3 -N** ppm	**NH4 -N** #/A	**NH4 -N** ppm	**TKN** %	**pH** (1:1)	**CEC** Meg /100g	**Organic Matter** Walkley Black %	**EC of** Sat'n Extract mmho/cm
7152	0-0.5	***NP***	86	*21.6*	*25*	*6.2*	*0.065*	7.9	11.7	1.90	3.59
7153	0.5-2.0		56	*14.0*	*13*	*3.3*	*0.034*	8.3	12.1	0.65	3.07
7154	2-4		25	*6.2*	*11*	*2.7*	*0.030*	8.7	14.5	0.28	9.35
7155	4-6		13	*3.3*	*10*	*2.6*	*0.159*	9.0	7.9	0.23	1.68

Report Date:	8/18/2016	
Report No:	S48566-1	
Client:	Cascade Earth Sciences, Visalia	
Sampler:		
Project:	***TGC-Reporting***	
Field:	***BL***	
P.N.:	2016210026	
Crop:		
Sampling Date:	08/16/2016	

Kuo Testing Labs, Inc.
337 South 1st
Othello, Washington 99344
(509) 488-0112; Fax (509) 488-0118
Email: info@kuotestinglabs.com
Web site: www.kuotestinglabs.com

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SOIL ANALYSIS REPORT

Lab #	Depth Ft.	Field ID	NO3 -N #/A	NO3 -N ppm	NH4 -N #/A	NH4 -N ppm	TKN %	pH (1:1)	CEC Meg /100g	Organic Matter Walkley Black %	EC of Sat'n Extract mmho/cm
7148	0-0.5	***BL***	234	*58.5*	*91*	*22.8*	0.047	7.4	11.3	0.80	4.22
7149	0.5-2.0		92	*22.9*	*17*	*4.4*	0.041	8.0	9.5	0.36	2.15
7150	2-4		30	*7.5*	*10*	*2.6*	0.038	8.7	11.7	0.19	1.66
7151	4-6		18	*4.4*	*9*	*2.2*	0.117	9.0	10.1	0.28	1.23

Report Date:	8/18/2016
Report No:	S48566-3
Client:	Cascade Earth Sciences, Visalia
Sampler:	
Project:	***TGC-Reporting***
Field:	***PP***
P.N.:	2016210026
Crop:	
Sampling Date:	08/16/2016

Kuo Testing Labs, Inc.
337 South 1st
Othello, Washington 99344
(509) 488-0112; Fax (509) 488-0118
Email: info@kuotestinglabs.com
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SOIL ANALYSIS REPORT

Lab #	Depth Ft.	Field ID	NO3 -N #/A	NO3 -N ppm	NH4 -N #/A	NH4 -N ppm	TKN %	pH (1:1)	CEC Meg /100g	Organic Matter Walkley Black %	EC of Sat'n Extract mmho/cm
7156	0-0.5	***PP***	31	*7.6*	*27*	*6.7*	*0.068*	7.9	13.7	2.63	3.71
7157	0.5-2.0		20	*5.1*	*26*	*6.5*	*0.040*	8.0	10.8	0.70	2.75
7158	2-4		22	*5.5*	*30*	*7.4*	*0.031*	8.4	9.8	0.18	2.14
7159	4-6		16	*4.1*	*19*	*4.9*	*0.124*	8.9	7.1	0.16	1.48

Report Date:	8/18/2016
Report No:	S48566-4
Client:	Cascade Earth Sciences, Visalia
Sampler:	
Project:	***TGC-Reporting***
Field:	***SP***
P.N.:	2016210026
Crop:	
Sampling Date:	08/16/2016

Kuo Testing Labs, Inc.
337 South 1st
Othello, Washington 99344
(509) 488-0112; Fax (509) 488-0118
Email: info@kuotestinglabs.com
Web site: www.kuotestinglabs.com

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SOIL ANALYSIS REPORT

Lab #	**Depth** Ft.	**Field ID**	**NO3 -N** #/A	**NO3 -N** ppm	**NH4 -N** #/A	**NH4 -N** ppm	**TKN** %	**pH** (1:1)	**CEC** Meg /100g	**Organic Matter** Walkley Black %	**EC of** Sat'n Extract mmho/cm
7160	0-0.5	***SP***	141	*35.3*	*25*	*6.3*	*0.060*	7.4	11.3	1.59	4.43
7161	0.5-2.0		55	*13.6*	*16*	*4.0*	*0.032*	8.2	11.4	0.54	2.81
7162	2-4		27	*6.8*	*20*	*5.0*	*0.038*	8.6	9.0	0.24	2.01
7163	4-6		33	*8.2*	*19*	*4.7*	*0.040*	8.8	8.8	0.22	2.39

Appendix J.

Addendum to the Updated Anti-Degradation Analysis

A valmont COMPANY
Conserving Resources. Improving Life

TECHNICAL MEMORANDUM

CPSS
Certified Professional Soil Scientist
DANIEL J. BURGARD
3243 Exp. 12-31-14

DATE: November 4, 2014

TO: Mr. John Layous – The Garlic Company

FROM: Daniel J. Burgard, CPSS – Cascade Earth Sciences
REVIEWED BY: Daniel Bruner, CHG – Cascade Earth Sciences

SUBJECT: Addendum to the Updated Anti-Degradation Analysis, The Garlic Company, Shafter, CA

In support of a Report of Waste Discharge (ROWD) submitted by The Garlic Company (TGC) September 20, 2013, Cascade Earth Sciences (CES) prepared an Updated Anti-Degradation Analysis (Analysis) and submitted it to the Central Valley Regional Water Quality Control Board (Regional Board) on June 21, 2014. The evaluation in the Analysis concluded that the use of process water as a part of the irrigation water supply to the proposed 99-acre site for land treatment provided no more groundwater quality degradation than irrigation with groundwater from the irrigation well on-site. Initial comments from the Regional Board indicated concern that the simple C-mix model used in the Analysis showed that the groundwater electrical conductivity (EC) would exceed the upper limit 1,600 µmhos/cm for the MUN beneficial use and process water use at the 99-acre site may not be approvable under the requirements of the Tulare Lake Basin Plan.

The results in the Analysis were similar for the fresh groundwater alone and the fresh water augmented with TGC process wastewater. The mixing analysis indicated that the 1,600 µmhos/cm limit could be exceeded, under the assumption that the EC is 1,500 µmhos/cm in the single fresh water well at the 99-acre site and the maximum irrigation rates would be applied to meet the leaching requirements each year.

This addendum provides additional information to further investigate effects of the assumptions pertaining to the EC of the ambient local groundwater. The groundwater EC at the 99-acre site was 1,950 µmhos/cm in 1998 and the EC less than one mile north at the TGC water supply well averages approximately 2,400 µmhos/cm. Recharge from the nearby North Kern Water Storage District (NKWSD) spreading grounds may be influencing the groundwater quality beneath the 99-acre site. In addition, the sensitivity of the potential effect on groundwater quality needs to be investigated by controlling the deep percolation to a lesser amount within the leaching requirement.

The purpose of this Addendum is to provide additional perspective on the potential changes to groundwater quality as a result of allowing TGC process water to be reused at the 99-acre site:

1. The Addendum investigates the ambient groundwater conditions by reviewing historical groundwater EC concentrations in the local area surrounding the 99-acre site. The results

provide a more complete perspective of the groundwater quality and potential to negatively impact beneficial uses.

2. The Addendum provides a review and recalculation of the water balances to determine if deep percolation of salts and the potential effect on groundwater quality could be controlled by fresh water irrigation management

Historical Groundwater Quality Review

CES has completed a detailed review of the historical background groundwater quality data as it pertains to the EC in the vicinity of the new 99-acre Site (Site). This study was conducted to augment our Analysis (dated June 24, 2014) with respect to the groundwater EC. The Analysis stated that the lower EC at the Site was likely due to the recharge of the aquifer with surface water, which has a lower salinity than groundwater, from the Calloway and Friant-Kern Canals and the NKWSD Rosedale Spreading Grounds (Spreading Grounds). The Calloway Canal is located adjacent to the southwest boundary of the Site. The Friant-Kern Canal bisects the Site at its northeast end and the Rosedale Spreading Grounds are located approximately 0.62 miles to the west of the Site (Figure 1).

EC data from wells surrounding the Site was analyzed to determine if there is a direct correlation to operation of the Spreading Grounds. The groundwater data and well locations are previously published data obtained from the NKWSD (Appendix A). As indicated in a previously submitted CES report, the groundwater in the area moves in a northwesterly direction, away from the Spreading Grounds.

The Spreading Grounds receive water only when there is a surplus. The Spreading Grounds did not receive water between March 1999 and November 2004 with the exception of November 2002, where 206 ac-ft. was applied. The EC concentrations for 2003 are plotted on a vicinity map in Figure 2, and represent conditions 4 years after the Spreading Grounds were last operated. Water was applied to the Spreading Grounds in December 2004 and continued, with the exception of every August, until February, 2007. The total volume of water applied during this time interval was approximately 109,200 ac-ft. EC measurements conducted in 2009 exhibited a noticeable decrease after the 2004 to 2007 water applications to the Spreading Grounds (Figure 3) compared to the EC measurements in 2003. Water application to the Spreading Grounds has been minimal from February 2007 to current date with the exception of 2011 when 65,203 ac-ft. of water was applied. Consequently, the EC measurements conducted in 2013, about 2 years after the last application of the Spreading Grounds, exhibited higher readings than 2009 (Figure 4). The 2013 EC readings were similar to readings in 2003.

Well # 99-0-012, the closest well to the Site, is located approximately 800 ft. west of the Site and approximately 1,900 ft. east of the Spreading Grounds (Figures 1-4). This well is not up gradient from the Spreading Grounds, however, it appears to be directly affected by groundwater mounding when increased volumes of water are added to the aquifer from the Spreading Grounds. The EC measurement in 2003, when water was not applied to the Spreading Grounds for several years, was 1590 µmhos/cm. The EC measurement in 2009, after the substantial aquifer recharge from 2004 to

2007, decreased to 810 µmhos/cm. EC measurements in this and all wells surrounding the Site have been continually rising since 2009. The rising EC readings correspond with the 2-year hiatus of water applications at the Spreading Grounds. All wells located to the southeast and east of the Site exhibited the same fluctuation but to a lesser degree.

In conclusion, the recharge of the groundwater beneath the Spreading Grounds appears to have a direct influence on the EC of the groundwater beneath the Site. Historical and recent EC data from the NKWSD coupled with EC data collected from the irrigation well detailed in our Anti-Degradation Analysis have affirmed that EC at the Site is artificially lowered by the aquifer recharge of lower salinity surface water at the Spreading Grounds. Ambient EC levels at the Site would be consistently greater than 1,500 µmhos/cm, measured in January and March 2014, without the influence of the Spreading Grounds. Therefore, potential change in groundwater EC projected for land treatment activities would not affect current beneficial uses of the local groundwater and would be mitigated by future recharge, if available.

Effect of Reducing Irrigation Rates

CES has reviewed and recalculated the water balances compiled in our Analysis dated June 24, 2013 for TGC's new 99-acre Site. The following review and recalculation of the water balances was conducted to determine if deep percolation of salts could be controlled by fresh water irrigation management and the potential effect on groundwater quality.

Previously, the Analysis predicted how much salt would be leached from the soil if the irrigation is managed to meet the leaching requirement each year. Simulations were conducted for the current condition of irrigation with fresh water alone, and then contrasted with results of irrigating the maximum proposed flow of process water from TGC along with fresh water. The simulated salt applications to the site were 15,160 lb/ac for fresh water alone compared to a maximum of 20,010 lb/ac with the process water. The salt balances indicated that either scenario would leave 89-93% of the salt in the soil after crop harvest. A simple groundwater mixing model, Cmix, was used to predict changes in the electrical conductivity (EC) of the groundwater in response to the irrigation management scenarios. Predictions were computed as ranges to show the range of uncertainties in aquifer parameter inputs for gradient and transmissivity. The model predicted that the EC in groundwater could increase from a background level of 1,500 µmhos/cm to approximately 1,700 to 1,900 µmhos/cm under fresh water alone and 1,700 to 2,100 µmhos/cm with process water.

The water balance calculations were re-run to determine if deep percolation of salts could be controlled by fresh water irrigation management while maintaining available water in the soil profile to optimize crop yield. The example water balances are summarized in Table 1 and the detailed monthly water balances are provided for reference in Appendix B. The recalculation predicted salt balance loads ranging from 13,000 lb/ac for fresh water alone to 16,890 lb/ac for the maximum process water flow which would leave 88-92% of the salt in the soil after crop harvest (Table 2). The groundwater EC levels were predicted using the same aquifer inputs, which indicated that the EC would increase by approximately 0 to 100 µmhos/cm under fresh water alone or could increase by 0 to 200 µmhos/cm with process water. The maximum predicted EC's were computed assuming a 100-year rainfall event coupled with the minimum groundwater flow rate (Table 3).

This analysis concludes that deep percolation of salts can be controlled through fresh water irrigation management. The groundwater EC would likely not change, or increase up to 200 µmhos/cm. The models predict that irrigation rates can be controlled to reduce salt leaching and control the potential impact from the TGC process wastewater.

Summary

The Updated Anti-Degradation Analysis submitted to the Regional Board on June 24, 2014 provided a limited perspective of the worst case potential to impact groundwater quality from one monitoring point and one irrigation management approach. The Addendum provided a review of historical groundwater quality data in the region and determined that the NKWSD Spreading Grounds has influenced the water quality beneath the TGC 99-acre site. In the absence of active recharge at the Spreading Grounds, the EC will eventually increase back to prior levels or if recharge is resumed, it has potential to mitigate changes in groundwater EC. In addition, if the irrigation scheduling is managed to control the salts leaching to a moderate level, the effect on groundwater is substantially less than if the full leaching requirement is met on an annual basis.

Should you have any questions or require any additional information, please contact Michael Sowers at (559) 972-9282.

MSS/ccm

Att: Table 1. Water Balance Summary
Table 2. Example Salt Balances
Table 3. Projected Future Groundwater Cmix EC and FDS Concentrations
Figure 1. Site Location Map
Figure 2. 2003 Conductivity Concentration Map
Figure 3. 2009 Conductivity Concentration Map
Figure 4. 2013 Conductivity Concentration Map
App A. NKWSD Water Quality Data
App B. Calculated Water Balances
cc: Mike Sowers- Cascade Earth Sciences
PN: 2014210010-002
Doc: 2014210010 TGC Salt Balance Addendum

TABLES

Table 1. Water Balance Summary
Table 2. Example Salt Balances
Table 3. Projected Future Groundwater Cmix and FDS Concentrations

Table 1. Water Balance Summary - Reduced Deep Percolation

Scenario	Precipitation	Process Wastewater	Fresh Water	Average Combined EC [1]	Average Combined FDS [2]	Projected Leaching Fraction [3]		Leaching Requirement [4]	
	MG			µmhos/cm	mg/L	inches	%	%	MG
Irrigation Water 99-Acre Site									
Average Rainfall	16.9	0.0	171	1,400	800	1.4	2.0%	12.9%	24.3
100-Year Rainfall	36.6	0.0	158	1,200	700	3.6	4.9%	11.4%	22.1
2012 Flow and 99-Acre Site									
Average Rainfall	16.9	19.8	157	1,500	900	2.1	2.9%	14.5%	28.1
100-Year Rainfall	36.6	19.8	138	1,400	800	2.9	4.0%	12.9%	25.1
Maximum Future Flow and 99-Acre Site									
Average Rainfall	16.9	55.0	123	1,800	1,000	1.9	2.6%	17.4%	33.8
100-Year Rainfall	36.6	55.0	119	1,600	900	5.8	7.4%	15.6%	32.8

NOTES:

Precipitation, process wastewater, fresh water, leaching fraction, and leaching requirement are from the annual water balances computed on a monthly basis to minimize deep percolation through fresh water irrigation management. They are modified from those originally reported in the Report of Waste Discharge Technical Report dated September 20, 2013 (CES, 2013) and the Updated Anti-Degradation Analysis dated June 24, 2014 (CES, 2014)

Abbreviations: % = percent, EC = electrical conductivity, FDS = fixed dissolved solids, inches = inches per acre, MG = million gallons, mg/L = milligrams per liter, µmhos/cm = micromhos per centimeter.

1 Average combined EC is flow-weighted EC of total applied precipitation (assumed 50 µmhos/cm), process wastewater, and fresh irrigation water from the well at the 99-acre site.

2 Average combined FDS is the flow weighted average FDS of precipitation (assumed 32 mg/L), process wastewater, and fresh irrigation water from the well at the 99-acre site.

3 The leaching fraction (inches) is the amount of deep percolation to pass through the root zone and is set to match leaching requirement for this example. The percentage is the ratio of inches deep percolation to total water applied. Actual leaching fraction may be less and is dependent on irrigation scheduling and method.

4 The leaching requirement is computed using the formula from Ayers and Westcot (1985) with 3 µmhos/cm as the target soil ECe. The percentage is the ratio of inches deep percolation to total water applied in order to maintain the target soil ECe. MG = inches (leaching fraction) x acres x 0.027154 MG per acre-inch.

Table 2. Example Salts Balances - Average Year Precipitation, Reduced Deep Percolation

Crop	Acres	Salts Load [1]			Salts Removal			Net Salts Load [3]	
		Process Wastewater	Fresh Water	Total Salts	Crop Ash	Crop Yield [2]	Total Removal		
		lb/ac			%	tons per acre	lb/ac	lb/ac	%
Fresh Water Only									
Wheat-Sudangrass	98.95	0	13,004	13,000	8%	8.5	1,360	11,640	90%
Alfalfa	98.95	0	13,004	13,000	10%	8.0	1,600	11,400	88%
2013 Flow									
Wheat-Sudangrass	98.95	2,723	11,944	14,670	8%	8.5	1,360	13,310	91%
Alfalfa	98.95	2,723	11,944	14,670	10%	8.0	1,600	13,070	89%
Maximum Future Flow									
Wheat-Sudangrass	98.95	7,573	9,314	16,890	8%	8.5	1,360	15,530	92%
Alfalfa	98.95	7,573	9,314	16,890	10%	8.0	1,600	15,290	91%

NOTES:

Worst case salts balance comparison with greatest process wastewater salts load and lowest fresh water salts load because of the high rainfall.

Abbreviations: % = percent, tons = US tons (2,000 pounds), lb/ac = pounds per acre.

1 Estimated based on the average process wastewater fixed dissolved solids from 2012 and fresh water fixed dissolved solids from 2014.

2 Estimates of crop uptake for a wheat-sudangrass rotation, with 4 cuttings per year, estimating 8.5 tons per acre of dry matter yield. Alfalfa assumes up to 6 cuttings per year and a yield of 8 tons per acre. Estimated salts removal is based on the approximate ash content of the wheat, sudangrass, and alfalfa hay based on experience.

3 Total salts load minus total salts removal. This is the amount of salts that would be expected to remain in the soil.

Table 3. Projected Future Groundwater (Cmix) Electrical Conductivity and Fixed Dissolved Solids Concentrations

Scenario	Total Percolate [1]	Cp		Qp	Cgw		Qgw		Cmix low flow [2]		Cmix high flow [2]	
		EC	FDS	Average Percolate Flow	EC	FDS	Groundwater Flow		EC	FDS	EC	FDS
	MG	µmhos/cm	mg/L	MGD	µmhos/cm	mg/L	MGD		µmhos/cm	mg/L	µmhos/cm	mg/L
Fresh Irrigation Water - 99-Acre Site												
Average Rainfall	3.8	9,730	6,209	0.0104	1,500	900	1.4	4.0	1,600	900	1,500	910
100 Year Rainfall	9.6	9,241	6,147	0.0263	1,500	900	1.4	4.0	1,600	1,000	1,600	930
2012 Flow and 99-Acre Site												
Average Rainfall	5.6	9,397	6,215	0.0154	1,500	900	1.4	4.0	1,600	1,000	1,500	920
100 Year Rainfall	7.8	9,669	6,202	0.0215	1,500	900	1.4	4.0	1,600	1,000	1,500	930
Maximum Future Flow and 99-Acre Site												
Average Rainfall	5.1	9,537	5,762	0.0139	1,500	900	1.4	4.0	1,600	900	1,500	920
100 Year Rainfall	15.5	9,290	5,773	0.0426	1,500	900	1.4	4.0	1,700	1,000	1,600	950

NOTES:

Calculated future groundwater concentrations using the Cmix method that computes the results of mixing of percolate with groundwater.

Cmix = [(Cp x Qp) +(Cgw x Qgw)] / (Qp + Qgw),

Where:

Cmix = concentration in groundwater following mixing of percolate (future groundwater)

Cp = average concentration in deep percolation; average combined (precipitation, process water, and fresh water) ÷ leaching fraction

Qp = flow rate of percolate = total annual deep percolation at leaching requirement averaged across 365 days

Cgw = concentration in groundwater from irrigation well; average of two samples in 2014

Qgw = flow rate of groundwater (Transmissivity (T) x site width x groundwater gradient); 1.4 to 4.0 MGD

T = 160,000 to 460,000 gpd/ft, site width = 2,700 ft, gradient = 0.00322

Abbreviations: EC = electrical conductivity, FDS = fixed dissolved solids, mg/L = milligrams per liter, MG = million gallons, MGD = million gallons per day, µmhos/cm = micromhos per centimeter.

1 Total Percolate is the annual total deep percolation from irrigation leaching fraction.

2 Cmix low flow and Cmix high flow represent potential future long term groundwater concentrations at the potential range of groundwater flow beneath the 99-acre site.

FIGURES

Figure 1. Site Location Map
Figure 2. 2003 Conductivity Concentration Map
Figure 3. 2009 Conductivity Concentration Map
Figure 4. 2013 Conductivity Concentration Map

0 2500'

1" = 2500'

(SCALE AND LOCATIONS ARE APPROXIMATE)

EXPLANATION:

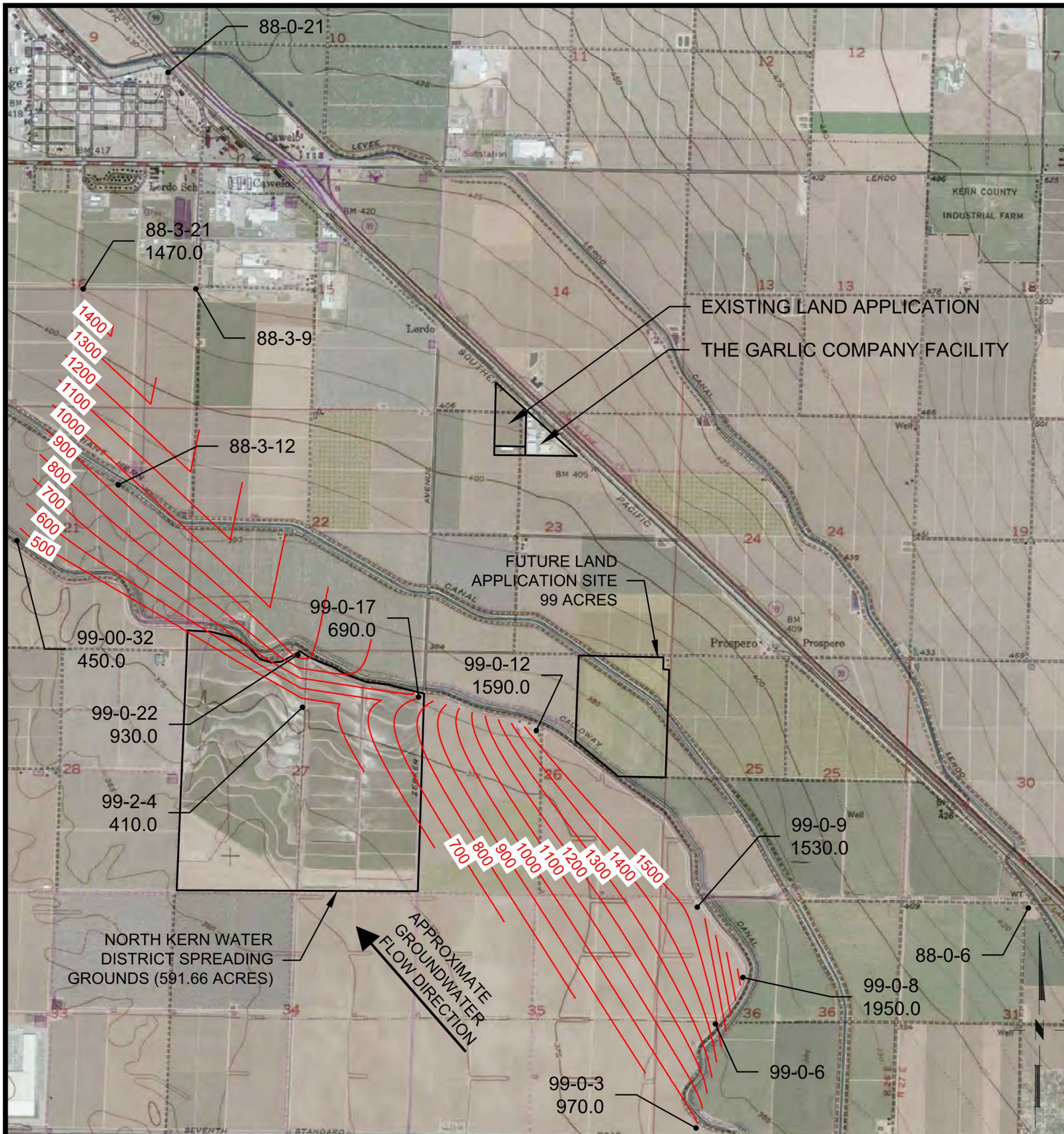
99-2-4 WELL LOCATION AND IDENTIFICATION

(SOURCE: ©2013 National Geographic Society, i-cubed, ESRI, DigitalGlobe, GeoEye, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community)

Figure 1. North Kern Water Well Locations

PROJECT NUMBER: 2014210010 DATE: 10/15/14	Background Electrical Conductivity Report
DWG NO: 2014210010 F1.dwg DWG BY: 6RKB PROJECT MANAGER: 13LCW	The Garlic Company 18602 Zerker Road Bakersfield, CA 93314
REVISED:	CES CASCADE EARTH SCIENCES A Valmont Industries Company

S:\[Working Drafting]\2014210010 The Garlic Company\DWGs\2014210010 F1.dwg October 15, 2014 RKB



0 2500'

1" = 2500'

(SCALE AND LOCATIONS ARE APPROXIMATE)

EXPLANATION:

99-2-4
410.0

WELL LOCATION AND IDENTIFICATION
CONDUCTIVITY IN UMHOS/CM

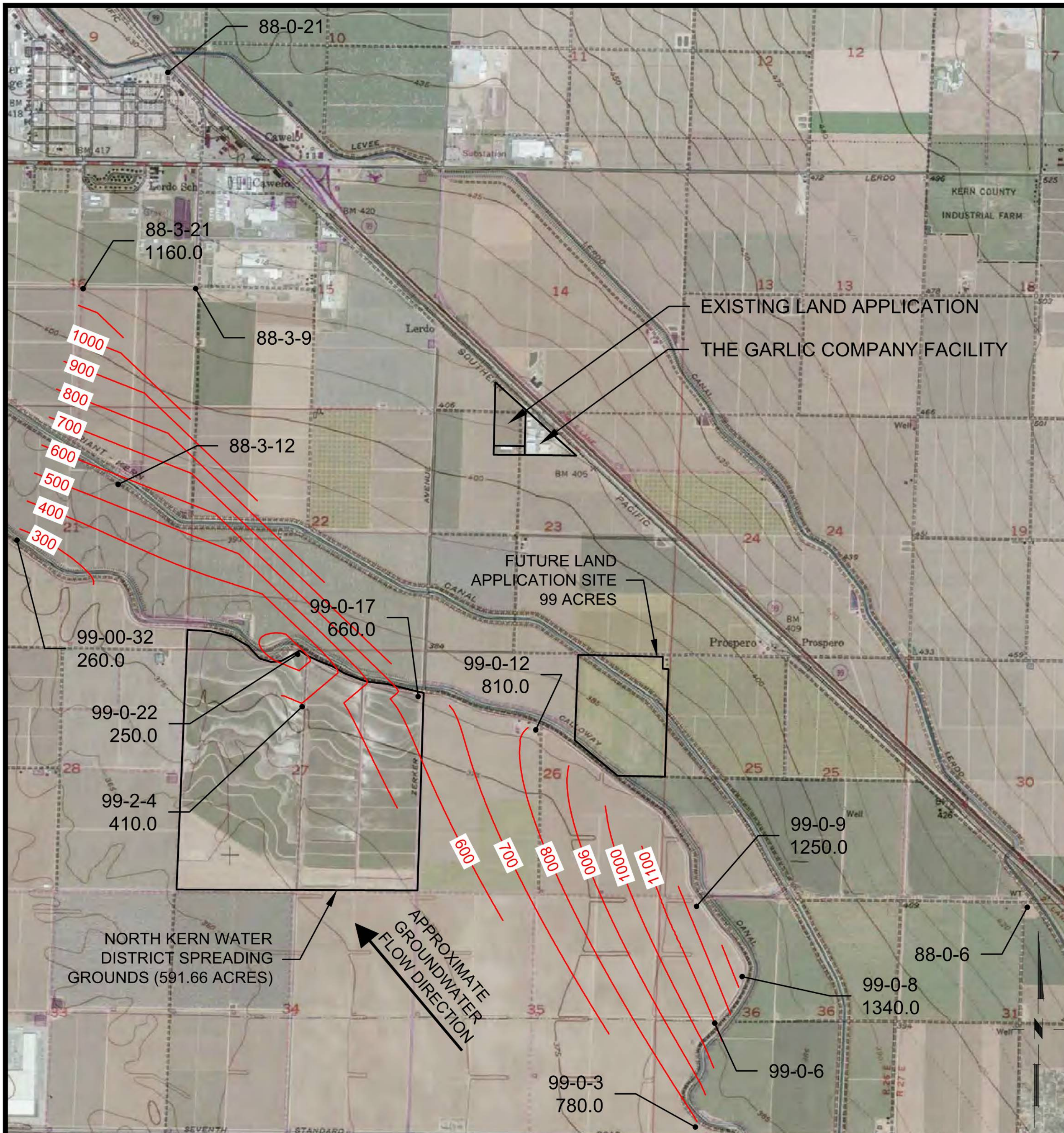
100 — CONDUCTIVITY CONCENTRATION CONTOUR 100 UMHOS/CM INTERVAL

(SOURCE: ©2013 National Geographic Society, i-cubed, ESRI, DigitalGlobe, GeoEye, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community)

Figure 2. Conductivity Concentrations Map - 2003

PROJECT NUMBER: 2014210010	Background Electrical Conductivity Report
DATE: 10/15/14	
DWG NO: 2014210010 F2 2003COND.dwg	The Garlic Company 18602 Zerker Road Bakersfield, CA 93314
DWG BY: 6RKB / PROJECT MANAGER: 13LCW	
REVISED:	CES CASCADE EARTH SCIENCES A Valmont Industries Company

S:\[Working Drafting]\2014210010 The Garlic Company\DWGs\2014210010 F2 2003COND.dwg October 15, 2014 RKB



0 2500'

1" = 2500'

(SCALE AND LOCATIONS ARE APPROXIMATE)

Figure 3. Conductivity Concentrations Map - 2009

EXPLANATION:

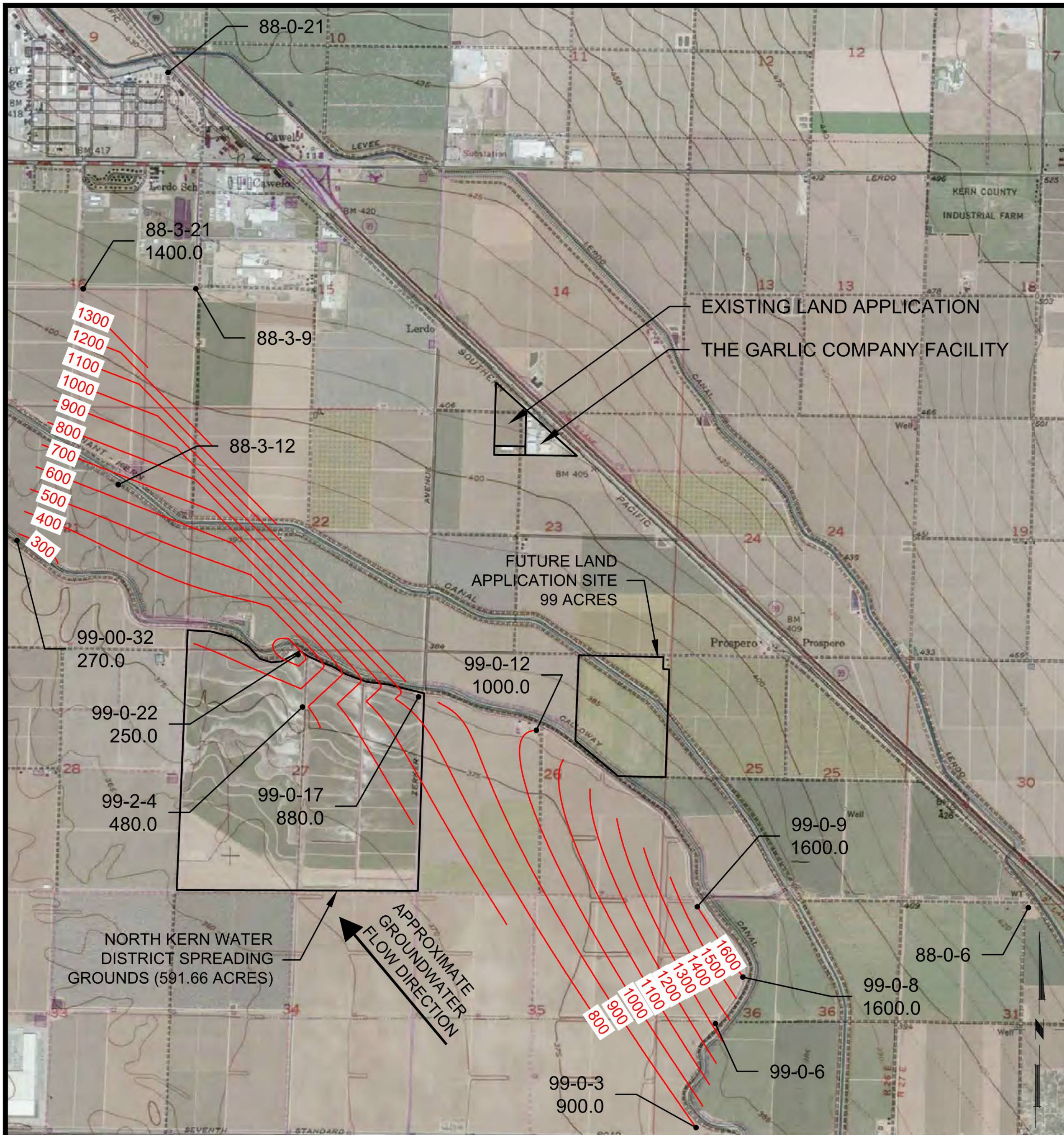
99-2-4
410.0 — WELL LOCATION AND IDENTIFICATION CONDUCTIVITY IN UMHOS/CM

100 — CONDUCTIVITY CONCENTRATION CONTOUR 100 UMHOS/CM INTERVAL

(SOURCE: ©2013 National Geographic Society, i-cubed, ESRI, DigitalGlobe, GeoEye, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community)

PROJECT NUMBER: 2014210010	Background Electrical Conductivity Report
DATE: 10/15/14	
DWG NO: 2014210010 F3 2009COND.dwg	The Garlic Company 18602 Zerker Road Bakersfield, CA 93314
DWG BY: 6RKB / PROJECT MANAGER: 13LCW	
REVISED:	CES CASCADE EARTH SCIENCES A Valmont Industries Company

S:\[Working Drafting]\2014210010 The Garlic Company\DWGs\2014210010 F3 2009COND.dwg October 15, 2014 RKB



0 2500'

1" = 2500'

(SCALE AND LOCATIONS ARE APPROXIMATE)

EXPLANATION:

99-2-4
410.0
WELL LOCATION AND IDENTIFICATION
CONDUCTIVITY IN UMHOS/CM

100
CONDUCTIVITY CONCENTRATION CONTOUR 100 UMHOS/CM INTERVAL

(SOURCE: ©2013 National Geographic Society, i-cubed, ESRI, DigitalGlobe, GeoEye, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community)

Figure 4. Conductivity Concentrations Map - 2013

PROJECT NUMBER: 2014210010	Background Electrical Conductivity Report
DATE: 10/15/14	
DWG NO: 2014210010 F4 2013COND.dwg	The Garlic Company 18602 Zerker Road Bakersfield, CA 93314
DWG BY: 6RKB / PROJECT MANAGER: 13LCW	
REVISED:	CES CASCADE EARTH SCIENCES A Valmont Industries Company

S:\[Working Drafting]\2014210010 The Garlic Company\DWGs\2014210010 F4 2013COND.dwg October 15, 2014 RKB

APPENDICES

Appendix A. **NKWSD Water Quality Data**
Appendix B. **Calculated Water Balances**

Appendix A.

NKWSD Water Quality Data

Appendix A1. Fresh Water Only Water Balance - Average Year Precipitation

Soil Unit: Wasco

Field: Land Application Site | **Acres:** 98.95 | **Avail. Water Cap. (in.):** 4.8

Crop: Wheat-Sudangrass/Alfalfa | **Min. Soil Depth (in):** 60 | **Initial Avail. Water (in.):** 4.1

Month	ppt [1]	Process	Gross Water Applied [2]		Net Water Applied [3]			ET [4]		Avail. Water [5]	Surplus [6]
			Process	Fresh	Process	Fresh	Total	Potential	Estimate		
	inches	MG	inches								
Nov	0.6	0.0	0.0	1.7	0.0	1.4	2.0	2.1	1.9	4.1	0.0
Dec	1.1	0.0	0.0	1.5	0.0	1.3	2.2	1.3	1.2	4.8	0.4
Jan	1.3	0.0	0.0	1.3	0.0	1.1	2.2	1.3	1.3	4.8	0.9
Feb	1.1	0.0	0.0	1.7	0.0	1.4	2.4	2.2	2.2	4.8	0.2
Mar	1.1	0.0	0.0	2.7	0.0	2.3	3.2	3.9	3.9	4.1	0.0
Apr	0.5	0.0	0.0	6.0	0.0	5.1	5.5	5.6	5.2	4.5	0.0
May	0.2	0.0	0.0	9.1	0.0	6.8	7.0	7.4	7.2	4.2	0.0
Jun	0.1	0.0	0.0	10.0	0.0	7.5	7.6	8.1	7.6	4.2	0.0
Jul	0.0	0.0	0.0	10.0	0.0	7.5	7.5	8.2	7.7	4.0	0.0
Aug	0.0	0.0	0.0	9.8	0.0	7.4	7.4	7.3	6.7	4.8	0.0
Sep	0.1	0.0	0.0	6.0	0.0	5.1	5.2	5.8	5.8	4.2	0.0
Oct	0.3	0.0	0.0	4.0	0.0	3.4	3.6	4.0	3.7	4.1	0.0
Total	**6.3**	**0.0**	**0.0**	**63.8**	**0.0**	**50.3**	**55.7**	**57.1**	**54.3**		**1.4**

Leaching Fraction [7]	2.0%
Leaching Requirement [8]	12.9%

NOTES:

1 Average precipitation (ppt) data was obtained from the CIMIS (http://www.cimis.ca.gov) for January 1983 to May 2012 from the Shafter station and for June 2012 to July 2013 from the Famoso Station #138.

2 Gross water applied is the total volume of process wastewater, stormwater, and fresh water discharge to the land application site from facility storage or source wells.

3 Net water applied are based on measured process (process wastewater + stormwater) and supplemental fresh water irrigation. Total includes net precipitation. Irrigation efficiency of 75% assumed for May to August and 85% for September to April has been applied to all irrigation and rainfall.

4 The potential evapotranspiration (ET) for wheat-sudangrass/alfalfa crop is reference ET data collected at the Shafter-USDA CIMIS station, Shafter, California. Estimated ET is estimated actual ET based on soil water content = Potential ET x square root(avail. water ÷ soil avail water capacity)

5 Plant available water in soil profile at month end. Initial available water is assumed to be at field capacity. Available water holding capacity calculated data in from Soil Survey of Kern County, Northwest Part (NRCS-SCS, 1988).

6 Estimated soil water balance. Surplus is water in excess of soil water holding capacity (deep percolation).

7 Leaching Fraction = % of gross water input estimated to percolate beyond root zone = Surplus / Precipitation + Gross Irrigation.

8 Leaching Requirement = Quantity of Surplus required to drain through the soil to leach sufficient soluble salts to maintain soil salinity (ECe) at 3.0 mmhos/cm. LR = ECiw / ECdw - ECiw. LR = leaching requirement, Eciw = weighted average EC of ppt, process, storm, and fresh water sources, ECdw = EC of drainage water = 5 x target soil Ece.

Appendix A2. Fresh Water Only Water Balance - 100 Year Precipitation

Soil Unit: Wasco

Field: Land Application Site **Acres:** 98.95 **Avail. Water Cap. (in.):** 4.8

Crop: Wheat-Sudangrass/Alfalfa **Min. Soil Depth (in):** 60 **Initial Avail. Water (in.):** 4.1

Month	ppt [1]	Process	Gross Water Applied [2]		Net Water Applied [3]			ET [4]		Avail. Water [5]	Surplus [6]
			Process	Fresh	Process	Fresh	Total	Potential	Estimate		
	inches	MG	inches								
Nov	0.6	0.0	0.0	2.8	0.0	2.4	2.9	2.1	1.9	4.8	0.3
Dec	0.7	0.0	0.0	1.2	0.0	1.0	1.6	1.3	1.3	4.8	0.4
Jan	1.1	0.0	0.0	1.0	0.0	0.9	1.9	1.3	1.3	4.8	0.6
Feb	5.1	0.0	0.0	0.0	0.0	0.0	4.6	2.2	2.2	4.8	2.4
Mar	2.8	0.0	0.0	0.8	0.0	0.7	3.2	3.9	3.9	4.1	0.0
Apr	0.6	0.0	0.0	6.3	0.0	5.4	5.9	5.6	5.1	4.8	0.0
May	1.6	0.0	0.0	7.0	0.0	5.3	6.7	7.4	7.4	4.0	0.0
Jun	0.7	0.0	0.0	10.0	0.0	7.5	8.1	8.1	7.4	4.7	0.0
Jul	0.0	0.0	0.0	10.0	0.0	7.5	7.5	8.2	8.2	4.1	0.0
Aug	0.0	0.0	0.0	9.8	0.0	7.4	7.4	7.3	6.7	4.7	0.0
Sep	0.1	0.0	0.0	6.0	0.0	5.1	5.2	5.8	5.7	4.2	0.0
Oct	0.4	0.0	0.0	3.8	0.0	3.2	3.6	4.0	3.7	4.1	0.0
Total	**13.6**	**0.0**	**0.0**	**58.7**	**0.0**	**46.2**	**58.5**	**57.1**	**54.9**		**3.6**

Leaching Fraction [7]	4.9%
Leaching Requirement [8]	11.4%

NOTES:

1 1998 was the greatest precipitation (ppt) year in 29 years (1983 to 2011). This year was selected to represent the 100 year-return period. This estimation is supported by data from the Arvin weather station 30 miles southeast of Shafter where 1998 had the greatest annual rainfall from 100 years of data.

2 Gross water applied is the total volume of process wastewater, stormwater, and fresh water discharge to the land application site from facility storage or source wells.

3 Net water applied are based on measured process (process wastewater + stormwater) and supplemental fresh water irrigation. Total includes net precipitation. Irrigation efficiency of 75% assumed for May to August and 85% for September to April has been applied to all irrigation and rainfall.

4 The potential evapotranspiration (ET) for wheat-sudangrass/alfalfa crop is reference ET data collected at the Shafter-USDA CIMIS station, Shafter, California. Estimated ET is estimated actual ET based on soil water content = Potential ET x square root(avail. water ÷ soil avail water capacity)

5 Plant available water in soil profile at month end. Initial available water is assumed to be at field capacity. Available water holding capacity calculated data in from Soil Survey of Kern County, Northwest Part (NRCS-SCS, 1988).

6 Estimated soil water balance. Surplus is water in excess of soil water holding capacity (deep percolation).

7 Leaching Fraction = % of gross water input estimated to percolate beyond root zone = Surplus / Precipitation + Gross Irrigation.

8 Leaching Requirement = Quantity of Surplus required to drain through the soil to leach sufficient soluble salts to maintain soil salinity (ECe) at 3.0 mmhos/cm. LR = ECiw / ECdw - ECiw. LR = leaching requirement, Eciw = weighted average EC of ppt, process, storm, and fresh water sources, ECdw = EC of drainage water = 5 x target soil Ece.

Appendix A3. 2012 Process Wastewater Flow Water Balance - Average Year Precipitation

Soil Unit: Wasco

Field: Land Application Site | **Acres:** 98.95 | **Avail. Water Cap. (in.):** 4.8

Crop: Wheat-Sudangrass/Alfalfa | **Min. Soil Depth (in):** 60 | **Initial Avail. Water (in.):** 4.1

Month	ppt [1]	Process	Gross Water Applied [2]		Net Water Applied [3]			ET [4]		Avail. Water [5]	Surplus [6]
			Process	Fresh	Process	Fresh	Total	Potential	Estimate		
	inches	MG	inches								
Nov	0.6	1.7	0.6	2.4	0.5	2.0	3.1	2.1	1.9	4.8	0.5
Dec	1.1	1.6	0.6	0.5	0.5	0.4	1.9	1.3	1.3	4.8	0.6
Jan	1.3	1.6	0.6	0.7	0.5	0.6	2.2	1.3	1.3	4.8	0.9
Feb	1.1	0.8	0.3	0.9	0.3	0.8	2.0	2.2	2.2	4.6	0.0
Mar	1.1	1.4	0.5	3.0	0.5	2.6	4.0	3.9	3.9	4.8	0.0
Apr	0.5	1.8	0.7	5.0	0.6	4.3	5.3	5.6	5.6	4.5	0.0
May	0.2	1.3	0.5	9.4	0.4	7.1	7.5	7.4	7.2	4.8	0.0
Jun	0.1	1.2	0.5	10.0	0.3	7.5	7.9	8.1	8.1	4.6	0.0
Jul	0.0	2.0	0.7	10.0	0.6	7.5	8.1	8.2	8.1	4.6	0.0
Aug	0.0	2.1	0.8	8.0	0.6	6.0	6.6	7.3	7.1	4.1	0.0
Sep	0.1	2.5	0.9	5.5	0.8	4.7	5.5	5.8	5.4	4.3	0.0
Oct	0.3	1.8	0.7	3.2	0.6	2.7	3.5	4.0	3.8	4.1	0.0
Total	**6.3**	**19.8**	**7.4**	**58.6**	**6.0**	**46.1**	**57.8**	**57.1**	**55.7**		**2.1**

Leaching Fraction [7]	2.9%
Leaching Requirement [8]	14.5%

NOTES:

1 Average precipitation (ppt) data was obtained from the CIMIS (http://www.cimis.ca.gov) for January 1983 to May 2012 from the Shafter station and for June 2012 to July 2013 from the Famoso Station #138.

2 Gross water applied is the total volume of process wastewater, stormwater, and fresh water discharge to the land application site from facility storage or source wells.

3 Net water applied are based on measured process (process wastewater + stormwater) and supplemental fresh water irrigation. Total includes net precipitation. Irrigation efficiency of 75% assumed for May to August and 85% for September to April has been applied to all irrigation and rainfall.

4 The potential evapotranspiration (ET) for wheat-sudangrass/alfalfa crop is reference ET data collected at the Shafter-USDA CIMIS station, Shafter, California. Estimated ET is estimated actual ET based on soil water content = Potential ET x square root(avail. water ÷ soil avail water capacity)

5 Plant available water in soil profile at month end. Initial available water is assumed to be at field capacity. Available water holding capacity calculated data in from Soil Survey of Kern County, Northwest Part (NRCS-SCS, 1988).

6 Estimated soil water balance. Surplus is water in excess of soil water holding capacity (deep percolation).

7 Leaching Fraction = % of gross water input estimated to percolate beyond root zone = Surplus / Precipitation + Gross Irrigation.

8 Leaching Requirement = Quantity of Surplus required to drain through the soil to leach sufficient soluble salts to maintain soil salinity (ECe) at 3.0 mmhos/cm. LR = ECiw / ECdw - ECiw. LR = leaching requirement, Eciw = weighted average EC of ppt, process, storm, and fresh water sources, ECdw = EC of drainage water = 5 x target soil Ece.

Appendix A4. 2012 Process Wastewater Flow Water Balance - 100 Year Precipitation

Soil Unit: Wasco

Field: Land Application Site **Acres:** 98.95 **Avail. Water Cap. (in.):** 4.8

Crop: Wheat-Sudangrass/Alfalfa **Min. Soil Depth (in):** 60 **Initial Avail. Water (in.):** 4.1

Month	ppt [1]	Process	Gross Water Applied [2]		Net Water Applied [3]			ET [4]		Avail. Water [5]	Surplus [6]
			Process	Fresh	Process	Fresh	Total	Potential	Estimate		
	inches	MG	inches								
Nov	0.6	1.7	0.6	1.1	0.5	0.9	2.0	2.1	1.9	4.1	0.0
Dec	0.7	1.6	0.6	0.9	0.5	0.8	1.9	1.3	1.2	4.8	0.0
Jan	1.1	1.6	0.6	0.0	0.5	0.0	1.5	1.3	1.3	4.8	0.2
Feb	5.1	0.8	0.3	0.0	0.3	0.0	4.8	2.2	2.2	4.8	2.6
Mar	2.8	1.4	0.5	1.1	0.5	0.9	3.9	3.9	3.9	4.8	0.0
Apr	0.6	1.8	0.7	5.3	0.6	4.5	5.6	5.6	5.6	4.8	0.0
May	1.6	1.3	0.5	7.0	0.4	5.3	7.0	7.4	7.4	4.4	0.0
Jun	0.7	1.2	0.5	9.0	0.3	6.8	7.7	8.1	7.7	4.4	0.0
Jul	0.0	2.0	0.7	10.0	0.6	7.5	8.1	8.2	7.8	4.6	0.0
Aug	0.0	2.1	0.8	8.5	0.6	6.4	7.0	7.3	7.1	4.4	0.0
Sep	0.1	2.5	0.9	5.5	0.8	4.7	5.6	5.8	5.6	4.4	0.0
Oct	0.4	1.8	0.7	2.9	0.6	2.5	3.4	4.0	3.8	4.0	0.0
Total	**13.6**	**19.8**	**7.4**	**51.3**	**6.0**	**40.2**	**58.4**	**57.1**	**55.6**		**2.9**

Leaching Fraction [7]	4.0%
Leaching Requirement [8]	12.9%

NOTES:

1 1998 was the greatest precipitation (ppt) year in 29 years (1983 to 2011). This year was selected to represent the 100 year-return period. This estimation is supported by data from the Arvin weather station 30 miles southeast of Shafter where 1998 had the greatest annual rainfall from 100 years of data.

2 Gross water applied is the total volume of process wastewater, stormwater, and fresh water discharge to the land application site from facility storage or source wells.

3 Net water applied are based on measured process (process wastewater + stormwater) and supplemental fresh water irrigation. Total includes net precipitation. Irrigation efficiency of 75% assumed for May to August and 85% for September to April has been applied to all irrigation and rainfall.

4 The potential evapotranspiration (ET) for wheat-sudangrass/alfalfa crop is reference ET data collected at the Shafter-USDA CIMIS station, Shafter, California. Estimated ET is estimated actual ET based on soil water content = Potential ET x square root(avail. water ÷ soil avail water capacity)

5 Plant available water in soil profile at month end. Initial available water is assumed to be at field capacity. Available water holding capacity calculated data in from Soil Survey of Kern County, Northwest Part (NRCS-SCS, 1988).

6 Estimated soil water balance. Surplus is water in excess of soil water holding capacity (deep percolation).

7 Leaching Fraction = % of gross water input estimated to percolate beyond root zone = Surplus / Precipitation + Gross Irrigation.

8 Leaching Requirement = Quantity of Surplus required to drain through the soil to leach sufficient soluble salts to maintain soil salinity (ECe) at 3.0 mmhos/cm. LR = ECiw / ECdw - ECiw. LR = leaching requirement, Eciw = weighted average EC of ppt, process, storm, and fresh water sources, ECdw = EC of drainage water = 5 x target soil Ece.

Appendix A5. Design Maximum Process Wastewater Flow Water Balance - Average Year Precipitation

Soil Unit: Wasco

Field: Land Application Site | **Acres:** 98.95 | **Avail. Water Cap. (in.):** 4.8

Crop: Wheat-Sudangrass/Alfalfa | **Min. Soil Depth (in):** 60 | **Initial Avail. Water (in.):** 4.1

Month	ppt [1]	Process	Gross Water Applied [2]		Net Water Applied [3]			ET [4]		Avail. Water [5]	Surplus [6]
			Process	Fresh	Process	Fresh	Total	Potential	Estimate		
	inches	MG	inches								
Nov	0.6	4.5	1.7	0.0	1.4	0.0	1.9	2.1	1.9	4.1	0.0
Dec	1.1	4.7	1.7	0.0	1.5	0.0	2.4	1.3	1.2	4.8	0.5
Jan	1.3	4.7	1.7	0.0	1.5	0.0	2.5	1.3	1.3	4.8	1.3
Feb	1.1	4.3	1.6	0.0	1.4	0.0	2.3	2.2	2.2	4.8	0.1
Mar	1.1	4.7	1.7	1.5	1.5	1.3	3.7	3.9	3.9	4.6	0.0
Apr	0.5	4.5	1.7	4.0	1.4	3.4	5.2	5.6	5.4	4.4	0.0
May	0.2	4.7	1.7	8.0	1.3	6.0	7.4	7.4	7.1	4.7	0.0
Jun	0.1	4.5	1.7	9.0	1.3	6.8	8.1	8.1	8.0	4.8	0.0
Jul	0.0	4.7	1.7	9.0	1.3	6.8	8.1	8.2	8.2	4.7	0.0
Aug	0.0	4.7	1.7	7.5	1.3	5.6	7.0	7.3	7.2	4.5	0.0
Sep	0.1	4.5	1.7	4.5	1.4	3.8	5.3	5.8	5.6	4.2	0.0
Oct	0.3	4.7	1.7	2.2	1.5	1.9	3.6	4.0	3.7	4.1	0.0
Total	**6.3**	**55.0**	**20.5**	**45.7**	**16.7**	**35.5**	**57.6**	**57.1**	**55.7**		**1.9**

Leaching Fraction [7]	2.6%
Leaching Requirement [8]	17.4%

NOTES:

1 Average precipitation (ppt) data was obtained from the CIMIS (http://www.cimis.ca.gov) for January 1983 to May 2012 from the Shafter station and for June 2012 to July 2013 from the Famoso Station #138.

2 Gross water applied is the total volume of process wastewater, stormwater, and fresh water discharge to the land application site from facility storage or source wells.

3 Net water applied are based on measured process (process wastewater + stormwater) and supplemental fresh water irrigation. Total includes net precipitation. Irrigation efficiency of 75% assumed for May to August and 85% for September to April has been applied to all irrigation and rainfall.

4 The potential evapotranspiration (ET) for wheat-sudangrass/alfalfa crop is reference ET data collected at the Shafter-USDA CIMIS station, Shafter, California. Estimated ET is estimated actual ET based on soil water content = Potential ET x square root(avail. water ÷ soil avail water capacity)

5 Plant available water in soil profile at month end. Initial available water is assumed to be at field capacity. Available water holding capacity calculated data in from Soil Survey of Kern County, Northwest Part (NRCS-SCS, 1988).

6 Estimated soil water balance. Surplus is water in excess of soil water holding capacity (deep percolation).

7 Leaching Fraction = % of gross water input estimated to percolate beyond root zone = Surplus / Precipitation + Gross Irrigation.

8 Leaching Requirement = Quantity of Surplus required to drain through the soil to leach sufficient soluble salts to maintain soil salinity (ECe) at 3.0 mmhos/cm. LR = ECiw / ECdw - ECiw. LR = leaching requirement, Eciw = weighted average EC of ppt, process, storm, and fresh water sources, ECdw = EC of drainage water = 5 x target soil Ece.

Appendix A6. Design Maximum Process Wastewater Flow Water Balance - 100 Year Precipitation

Soil Unit: Wasco

Field: Land Application Site | **Acres:** 98.95 | **Avail. Water Cap. (in.):** 4.8

Crop: Wheat-Sudangrass/Alfalfa | **Min. Soil Depth (in):** 60 | **Initial Avail. Water (in.):** 4.1

Month	ppt [1]	Process	Gross Water Applied [2]		Net Water Applied [3]			ET [4]		Avail. Water [5]	Surplus [6]
			Process	Fresh	Process	Fresh	Total	Potential	Estimate		
	inches	MG	inches								
Nov	0.6	4.5	1.7	0.7	1.4	0.6	2.5	2.1	1.9	4.7	0.0
Dec	0.7	4.7	1.7	0.0	1.5	0.0	2.1	1.3	1.3	4.8	0.7
Jan	1.1	4.7	1.7	0.0	1.5	0.0	2.5	1.3	1.3	4.8	1.2
Feb	5.1	4.3	1.6	0.0	1.4	0.0	5.9	2.2	2.2	4.8	3.7
Mar	2.8	4.7	1.7	0.0	1.5	0.0	4.0	3.9	3.9	4.8	0.1
Apr	0.6	4.5	1.7	4.3	1.4	3.7	5.6	5.6	5.6	4.8	0.0
May	1.6	4.7	1.7	6.3	1.3	4.7	7.5	7.4	7.4	4.8	0.0
Jun	0.7	4.5	1.7	8.3	1.3	6.2	8.1	8.1	8.1	4.8	0.0
Jul	0.0	4.7	1.7	9.2	1.3	6.9	8.2	8.2	8.2	4.8	0.0
Aug	0.0	4.7	1.7	7.9	1.3	5.9	7.2	7.3	7.3	4.8	0.0
Sep	0.1	4.5	1.7	5.0	1.4	4.3	5.8	5.8	5.8	4.8	0.0
Oct	0.4	4.7	1.7	2.5	1.5	2.1	4.0	4.0	4.0	4.8	0.0
Total	**13.6**	**55.0**	**20.5**	**44.2**	**16.7**	**34.4**	**63.4**	**57.1**	**56.9**		**5.8**

Leaching Fraction [7]	7.4%
Leaching Requirement [8]	15.6%

NOTES:

1 1998 was the greatest precipitation (ppt) year in 29 years (1983 to 2011). This year was selected to represent the 100 year-return period. This estimation is supported by data from the Arvin weather station 30 miles southeast of Shafter where 1998 had the greatest annual rainfall from 100 years of data.

2 Gross water applied is the total volume of process wastewater, stormwater, and fresh water discharge to the land application site from facility storage or source wells.

3 Net water applied are based on measured process (process wastewater + stormwater) and supplemental fresh water irrigation. Total includes net precipitation. Irrigation efficiency of 75% assumed for May to August and 85% for September to April has been applied to all irrigation and rainfall.

4 The potential evapotranspiration (ET) for wheat-sudangrass/alfalfa crop is reference ET data collected at the Shafter-USDA CIMIS station, Shafter, California. Estimated ET is estimated actual ET based on soil water content = Potential ET x square root(avail. water ÷ soil avail water capacity)

5 Plant available water in soil profile at month end. Initial available water is assumed to be at field capacity. Available water holding capacity calculated data in from Soil Survey of Kern County, Northwest Part (NRCS-SCS, 1988).

6 Estimated soil water balance. Surplus is water in excess of soil water holding capacity (deep percolation).

7 Leaching Fraction = % of gross water input estimated to percolate beyond root zone = Surplus / Precipitation + Gross Irrigation.

8 Leaching Requirement = Quantity of Surplus required to drain through the soil to leach sufficient soluble salts to maintain soil salinity (ECe) at 3.0 mmhos/cm. LR = ECiw / ECdw - ECiw. LR = leaching requirement, Eciw = weighted average EC of ppt, process, storm, and fresh water sources, ECdw = EC of drainage water = 5 x target soil Ece.

Appendix B.

Calculated Water Balances

Well Number	Year	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	OH mg/l	CO3 mg/l	HCO3 mg/l	Cl mg/l	SO4 mg/l	NO3 mg/l	N mg/l	B mg/l	TDS mg/l	CaCO3 mg/l	SAR mg/l	ESP mg/l	Gyp mg/l	pH s.u.	EC µhmos/cm
8-00-006	02	260.00	0.63	110.00	3.50	0.00	0.00	21.00	360.00	330.00	33.00		0.13	1600.00	650.00	1.90	1.50	0.00	6.20	2260.00
8-00-006	04	330.00	0.44	70.00	3.20	0.00	0.00	0.00	20.00	260.00	550.00		0.12	1800.00	820.00	1.10	0.40	0.00	6.20	2390.00
8-00-006	9	140.00	0.23	170.00	2.40	0.00	0.00	22.00	240.00	430.00	19.00		0.10	1000.00	360.00	4.90	5.60	0.00	8.20	1330.00
8-00-006	12	180.00	0.05	240.00	1.80	0.00	2.60	15.00	280.00	490.00	22.00		0.10	1300.00	450.00	4.90	5.60	0.00	8.53	2100.00
8-00-006	13	220.00	0.33	300.00	3.00	0.00	0.00	16.00	350.00	620.00	41.00		0.10	1500.00	550.00	5.40	6.30	0.00	7.52	2300.00
8-00-009	9	120.00	0.08	190.00	2.50	0.00	15.00	9.70	260.00	360.00	8.70		0.10	1100.00	300.00	5.40	6.30	0.00	9.00	1340.00
8-00-009	12	130.00	0.05	230.00	1.80	0.00	9.70	11.00	300.00	380.00	6.00		0.10	1100.00	330.00	6.10	7.20	0.00	8.91	1900.00
8-00-009	13	210.00	0.06	380.00	3.50	0.00	0.52	16.00	470.00	550.00	14.00		0.10	1600.00	520.00	6.40	7.60	0.00	8.41	2500.00
8-03-009	77	189.00	1.20	290.00			0.00	24.40	354.70	531.00	48.30	10.90	0.15	1430.00	477.80		7.18	0.00	7.70	2500.00
8-03-009	81	240.00	2.00	285.00	5	0	0.00	43.00	393.00	660	56.70	12.8	0.10	1663.00		5.10	5.90	0	7.80	3000.00
8-03-009	90	384.00	3.60	292.00	2.90	0.00	0.00	54.60	384.00	900.00	75.30	17	0.00	2096.00	976.00	4.07	4.53	0	7.60	3100.00
8-03-009	91	252.00	2.40	320.00	2.60	0.00	0.00	28.70	376.00	735.00	58.00	13.1	0.00	1760.00	639.00	5.51	6.42	0	7.70	2900.00
8-03-009	92	280.00	1.90	370.00	2.90	0.00	0.00	33.00	430.00	780.00	65.00		0.11	1930.00	710.00	6.00	7.10		6.20	2760.00
8-03-009	94	300.00	1.90	340.00	3.00	0.00	0.00	41.00	420.00	770.00	81.00		0.00	2100.00	760.00	5.30	6.20		6.30	2940.00
8-03-009	02	19.00	0.20	36.00	1.20	0.00	0.00	120.00	7.80	18.00	2.20		0.15	160.00	48.00	2.30	2.10	776.00	7.00	2400.00
8-03-009	04	330.00	1.60	210.00	3.70	0.00	0.00	120.00	340.00	650.00	49.00		0.14	1600.00	830.00	3.20	3.30	0.00	6.50	2470.00
8-03-009	9	220.00	1.10	260.00	3.80	0.00	0.00	51.00	300.00	660.00	43.00		0.10	1500.00	560.00	5.20	6.00	2.30	7.70	1690.00
8-03-009	12	240.00	1.10	340.00	3.10	0.00	0.00	42.00	350.00	700.00	41.00		0.10	1600.00	600.00	5.90	6.90	0.00	7.59	2600.00
8-03-009	13	210.00	1.10	360.00	3.20	0.00	0.00	80.00	360.00	730.00	48.00		0.10	1700.00	530.00	7.30	8.70	0.00	7.78	2500.00
8-03-012	77	41.30	0.47	80.00			0.00	46.80	42.80	168.00	9.80	2.20	0.13	368.00	105.30		3.61	0.00	8.00	550.00
8-03-012	81	36.00	1.00	63.00	1	0	0.00	67.00	25.00	150	12.40	2.8	0.20	322.00		2.90	2.90	1.6	8.20	520.00
8-03-012	87	32.00	0.60	60.00	2	-0.1	-0.10	28.00	50.00		1.30	0.3	0.60	276.00		2.88	2.90	0.5	8.00	480.00
8-03-012	89	33.00	0.35	80.00	1.20	0.00	0.00	65.80	40.70	135.00	3.50	0.8	0.10	360.00	84.00	3.80	4.16	0	7.80	525.00
8-03-012	90	34.00	0.33	87.00	1.00	0.00	0.00	63.20	48.50	146.00	4.00	0.9	0.00	384.00	86.40	4.07	4.53	0	8.10	580.00
8-03-012	91	33.00	0.22	88.00	1.10	0.00	0.00	49.60	53.90	158.00	4.40	1	0.10	361.00	83.30	4.20	4.70	0	8.00	610.00
8-03-012	92	31.00	0.32	70.00	1.20	0.00	0.00	80.00	24.00	120.00	5.80		0.00	320.00	79.00	3.40	3.60		6.90	470.00
8-03-012	94	33.00	0.19	94.00	1.10	0.00	0.00	53.00	56.00	160.00	4.30		0.00	400.00	83.00	4.50	5.10		6.50	650.00
8-03-012	02	40.00	1.40	44.00	1.50	0.00	0.00	130.00	15.00	69.00	4.10		0.19	250.00	110.00	1.90	1.50	44.00	6.90	400.00
8-03-012	9	38.00	0.22	78.00	1.50	0.00	0.00	65.00	41.00	200.00	12.00		0.11	340.00	96.00	4.70	5.40	1607.00	8.20	490.00
8-03-012	12	38.00	0.05	71.00	0.50	0.00	0.00	71.00	43.00	97.00	2.80		0.10	320.00	94.00	3.30	3.50	386.00	7.89	540.00
8-03-012	13	26.00	0.15	53.00	1.10	0.00	0.00	76.00	35.00	75.00	3.60		0.12	250.00	66.00	3.20	3.30	559.00	8.27	420.00
8-03-021	77	181.00	1.60	220.00			0.00	37.30	246.00	512.00	38.10	8.60	0.17	1221.00	459.50		5.43	0.00	8.00	2100.00
8-03-021	81	210.00	2.00	240.00	4	0	0.00	56.00	301.00	630	51.80	11.7	0.10	1466.00		4.60	5.30	0	7.80	2200.00
8-03-021	87	266.00	2.00	211.00	3	-0.1	-0.10	103.00	239.00	670	31.00	7	0.30	1474.00		3.54	3.81	0	7.80	2000.00
8-03-021	89	233.00	2.20	199.00	2.50	0.00	0.00	52.80	212.00	600.00	47.80	10.8	0.00	1349.00	592.00	3.56	3.84	0	7.70	1925.00
8-03-021	90	200.00	2.00	215.00	2.20	0.00	0.00	54.60	205.00	600.00	44.30	10	0.00	1323.00	509.00	4.15	4.64	0	7.80	1890.00
8-03-021	91	194.00	1.60	209.00	2.20	0.00	0.00	42.60	201.00	595.00	40.70	9.2	0.00	1260.00	491.00	4.10	4.57	0	7.70	1890.00
8-03-021	92	170.00	1.40	240.00	2.30	0.00	0.00	46.00	200.00	570.00	43.00		3.50	1290.00	430.00	4.90	5.60		6.30	1850.00
8-03-021	94	200.00	1.90	210.00	2.60	0.00	0.00	49.00	180.00	600.00	51.00		0.00	1300.00	510.00	4.10	4.60		6.40	1930.00
8-03-021	02	150.00	0.97	160.00	2.50	0.00	0.00	43.00	140.00	460.00	30.00		0.10	1100.00	380.00	3.60	3.90	0.00	7.00	1500.00
8-03-021	03	200.00	1.10	120.00	2.50	0.00	0.00	48.00	130.00	510.00	42.00		0.10	1000.00	500.00	2.40	2.20	0.00	6.20	1470.00
8-03-021	04	200.00	1.10	120.00	2.50	0.00	0.00	48.00	130.00	510.00	42.00		0.10	1000.00	500.00	2.40	2.20	0.00	6.20	1470.00
8-03-021	9	110.00	0.75	170.00	2.70	0.00	0.00	37.00	150.00	440.00	29.00		0.10	990.00	270.00	5.50	6.40	155.00	7.90	1160.00
8-03-021	12	88.00	0.32	160.00	1.40	0.00	0.00	47.00	89.00	340.00	24.00		0.10	710.00	220.00	4.70	5.40	0.00	7.75	1200.00
8-03-021	13	95.00	0.57	210.00	2.20	0.00	0.00	46.00	160.00	410.00	32.00		0.10	880.00	240.00	6.20	7.30	0.00	8.00	1400.00
8-17-003	03	19.00	1.30	28.00	1.30	0.00	0.00	88.00	8.50	22.00	11.00		0.10	170.00	53.00	1.70	1.20	360.00	8.00	240.00

Well Number	Year	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	OH mg/l	CO3 mg/l	HCO3 mg/l	Cl mg/l	SO4 mg/l	NO3 mg/l	N mg/l	B mg/l	TDS mg/l	CaCO3 mg/l	SAR mg/l	ESP mg/l	Gyp mg/l	pH s.u.	EC µhmos/cm
9-00-003	77	76.00	0.71	97.00			4.30	66.70	72.60	218.00	19.90	4.50	0.18	525.00	193.10		2.67	0.00	8.20	780.00
9-00-003	81	112.00	1.60	125.00	3.8	0	0.00	136.00	120.00	253	35.40	8	0.10	719.00		3.20	3.40	0	7.70	1130.00
9-00-003	87	99.00	1.60	143.00	4	-0.1	-0.10	82.00	118.00	320	8.90	2	0.20	735.00		3.91	4.31	0	7.80	1140.00
9-00-003	89	71.00	0.74	1.00	2.00	0.00	0.00	90.10	86.70	200.00	12.80	2.9	0.22	566.00	181.00	3.33	3.52	0	7.90	840.00
9-00-003	90	65.00	0.68	112.00	2.00	0.00	0.00	92.70	84.60	204.00	14.20	3.2	0.18	575.00	165.00	3.79	4.15	0	8.00	860.00
9-00-003	91	70.00	0.63	109.00	2.10	0.00	0.00	84.30	91.50	201.00	16.80	3.8	0.22	533.00	177.00	3.56	3.84	0	7.80	860.00
9-00-003	92	67.00	0.69	110.00	2.20	0.00	0.00	99.00	88.00	200.00	18.00		0.22	560.00	170.00	3.80	4.20		7.00	820.00
9-00-003	02	20.00	0.60	37.00	1.10	0.00	0.00	130.00	9.00	16.00	2.60		0.16	160.00	52.00	2.20	1.90	652.00	7.00	260.00
9-00-003	03	76.00	0.88	120.00	2.60	0.00	0.00	110.00	96.00	210.00	18.00		0.35	580.00	190.00	3.80	4.20	0.00	7.10	970.00
9-00-003	04	100.00	1.80	120.00	2.90	0.00	0.00	190.00	120.00	160.00	44.00		0.48	700.00	260.00	3.40	3.60	0.00	6.50	1310.00
9-00-003	9	64.00	0.51	120.00	2.50	0.00	0.00	85.00	90.00	170.00	20.00		0.27	500.00	160.00	3.50	3.80	9.00	7.80	780.00
9-00-003	12	70.00	0.17	120.00	0.50	0.00	0.00	97.00	93.00	180.00	19.00		0.33	590.00	170.00	4.20	4.70	0.00	7.59	1000.00
9-00-003	13	55.00	0.42	100.00	2.60	0.00	0.00	79.00	98.00	180.00	17.00		0.24	550.00	140.00	4.50	5.10	151.00	7.51	900.00
9-00-006	77	120.00	0.53	90.00			0.00	44.20	72.90	201.00	8.90	2.00	0.20	460.00	157.30		3.61	0.00	7.90	700.00
9-00-006	81	98.00	3.00	96.00	3	0	0.00	49.00	94.00	290	20.80	4.7	0.10	629.00		2.60	2.60	0	7.30	970.00
9-00-006	87	99.00	0.60	52.00	3	-0.1	-0.10	48.00	47.00	250	8.40	1.9	0.50	485.00		1.43	0.85	0	8.00	950.00
9-00-006	89	76.00	0.48	111.00	1.70	0.00	0.00	52.00	93.50	262.00	8.40	1.9	0.11	605.00	202.00	3.40	3.62	0	7.80	890.00
9-00-006	90	77.00	0.58	114.00	1.40	0.00	0.00	53.70	80.40	265.00	8.90	2	0.00	601.00	195.00	3.55	3.82	0	7.90	930.00
9-00-006	91	83.00	0.48	114.00	1.50	0.00	0.00	43.50	107.00	264.00	8.80	2	0.11	601.00	209.00	3.43	3.66	0	8.00	950.00
9-00-006	92	74.00	0.44	140.00	1.50	0.00	0.00	48.00	110.00	270.00	8.40		0.10	650.00	190.00	4.30	4.80		6.50	920.00
9-00-006	03	87.00	1.00	110.00	3.50	0.00	0.00	120.00	100.00	210.00	18.00		0.10	650.00	220.00	3.30	3.50	0.00	7.20	960.00
9-00-008	77	170.00	0.77	154.00			0.00	22.50	139.80	514.00	19.90	4.50	0.18	1014.00	428.50		3.61	0.00	7.80	1370.00
9-00-008	81	210.00	1.00	157.00	4.5	0	0.00	34.00	182.00	510	22.20	5	0.10	1104.00		2.90	3.00	0	8.00	1710.00
9-00-008	87	97.00	1.30	120.00	5	-0.1	-0.10	34.00	71.00	365	20.00	4.5	0.45	697.00		3.31	3.51	0	7.50	1960.00
9-00-008	89	188.00	0.96	159.00	2.70	0.00	0.00	39.00	166.00	540.00	19.00	4.3	0.12	1115.00	474.00	3.18	3.32	0	7.60	1520.00
9-00-008	90	175.00	0.81	166.00	2.50	0.00	0.00	42.40	166.00	496.00	18.60	4.2	0.10	1067.00	441.00	3.44	3.67	0	7.90	1540.00
9-00-008	91	186.00	0.82	167.00	2.60	0.00	0.00	33.00	175.00	535.00	23.50	5.3	0.15	1110.00	468.00	3.36	3.56	0	7.80	1630.00
9-00-008	92	170.00	0.86	190.00	3.60	0.00	0.00	37.00	170.00	540.00	22.00		3.50	1180.00	430.00	4.00	4.40		6.40	1650.00
9-00-008	03	200.00	1.00	200.00	4.60	0.00	0.00	57.00	180.00	590.00	36.00		0.28	1500.00	510.00	3.90	4.30	0.00	7.10	1950.00
9-00-008	04	330.00	1.80	100.00	4.10	0.00	0.00	74.00	220.00	620.00	54.00		0.39	1300.00	830.00	1.60	1.10	0.00	6.30	1970.00
9-00-008	9	180.00	0.83	160.00	41.00	0.00	0.00	56.00	180.00	560.00	31.00		0.36	1200.00	450.00	4.20	4.70	0.00	7.80	1340.00
9-00-008	12	180.00	0.54	190.00	3.00	0.00	0.00	61.00	180.00	480.00	33.00		0.44	1100.00	440.00	4.00	4.40	0.00	7.66	1800.00
9-00-008	13	140.00	0.57	170.00	3.60	0.00	0.00	55.00	180.00	450.00	28.00		0.35	1100.00	350.00	4.70	5.40	0.00	7.52	1600.00
9-00-009	77	74.00	0.77	106.00			0.00	39.00	96.30	238.00	7.10	1.60	0.22	545.00	188.30		3.61	0.00	8.00	830.00
9-00-009	81	150.00	3.00	123.00	3	0	0.00	56.00	136.00	400	43.00	9.7	0.10	886.00		2.70	2.70	0	7.80	1330.00
9-00-009	87	97.00	0.90	214.00	4	-0.1	-0.10	165.00	126.00	380	11.50	2.6	0.55	917.00		5.94	7.00	5.6	7.80	1260.00
9-00-009	89	147.00	0.64	143.00	2.10	0.00	0.00	56.30	132.00	430.00	11.50	2.6	0.15	922.00	370.00	3.23	3.39	0	7.80	1300.00
9-00-009	90	122.00	0.54	153.00	2.00	0.00	0.00	56.30	125.00	408.00	10.60	2.4	0.12	877.00	307.00	3.80	4.16	0	7.80	1280.00
9-00-009	91	160.00	0.63	175.00	2.20	0.00	0.00	54.80	149.00	505.00	17.30	3.9	0.17	1040.00	402.00	3.80	4.16	0	7.50	1540.00
9-00-009	92	160.00	0.69	190.00	2.60	0.00	0.00	69.00	140.00	520.00	17.00		3.80	1120.00	400.00	4.40	4.60		6.90	1580.00
9-00-009	03	160.00	0.58	160.00	3.30	0.00	0.00	86.00	120.00	480.00	14.00		0.32	1100.00	400.00	3.50	3.80	0.00	7.20	1530.00
9-00-009	04	200.00	0.66	150.00	2.80	0.00	0.00	100.00	140.00	510.00	18.00		0.43	1100.00	500.00	2.90	2.90	0.00	6.30	1600.00
9-00-009	9	150.00	0.45	170.00	2.70	0.00	0.00	50.00	140.00	450.00	6.40		0.24	1000.00	380.00	3.40	3.60	0.00	7.80	1250.00
9-00-009	12	140.00	0.10	190.00	1.90	0.00	0.00	53.00	130.00	470.00	6.20		0.24	1000.00	340.00	4.40	5.00	0.00	7.66	1600.00
9-00-009	13	130.00	0.40	190.00	2.70	0.00	0.00	39.00	160.00	500.00	4.40		0.19	1000.00	330.00	5.00	5.80	0.00	7.39	1600.00
9-00-012	88	9.00	0.27	72.00			3.40	60.60	72.20	26.00	-0.40	-0.10	0.14	244.00	23.60	6.44	7.61	2.80	8.60	410.00
9-00-012	89	30.00	0.13	106.00	1.30	0.00	0.00	49.40	85.30	146.00	0.00	0	0.00	418.00	75.60	5.30	6.15	0	7.90	680.00
9-00-012	90	15.00	0.07	87.00	0.50	0.00	6.00	50.20	78.90	66.00	0.00	0	0.15	304.00	37.80	6.15	7.25	1.17	8.60	500.00
9-00-012	91	17.00	0.08	86.00	0.50	0.00	6.80	38.30	85.80	67.00	0.00	0	0.15	282.00	42.80	5.72	6.70	0	8.60	530.00
9-00-012	92	20.00	0.10	85.00	0.00	0.00	0.00	59.00	85.00	64.00	0.00		0.15	340.00	50.00	5.20	6.00		7.00	540.00
9-00-012	03	110.00	0.48	200.00	2.30	0.00	0.00	21.00	170.00	440.00	2.00		0.10	1100.00	280.00	5.30	6.20	0.00	6.60	1590.00
9-00-012	9	52.00	0.25	120.00	1.50	0.00	10.00	33.00	120.00	210.00	2.00		0.16	510.00	130.00	5.20	6.00	643.00	8.60	810.00
9-00-012	12	57.00	0.29	150.00	1.50	0.00	0.00	41.00	140.00	240.00	2.00		0.15	580.00	140.00	36.40	34.40	44774.00	8.26	980.00
9-00-012	13	51.00	0.20	130.00	1.60	0.00	0.00	30.00	130.00	240.00	2.00		0.12	590.00	130.00	5.80	6.80	413.00	7.32	1000.00

Well Number	Year	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	OH mg/l	CO3 mg/l	HCO3 mg/l	Cl mg/l	SO4 mg/l	NO3 mg/l	N mg/l	B mg/l	TDS mg/l	CaCO3 mg/l	SAR mg/l	ESP mg/l	Gyp mg/l	pH s.u.	EC µhmos/cm
9-00-017	87	23.00	0.16	105.00			4.30	42.40	64.80	148.00	3.50	0.80	0.12	392.00	58.20	5.99	7.04	0.00	8.70	610.00
9-00-017	89	27.00	0.08	1.02	1.10	0.00	0.00	26.80	84.60	144.00	1.30	0.3	0.13	387.00	67.90	5.38	6.26	0	7.40	650.00
9-00-017	90	24.00	0.09	100.00	0.70	0.00	0.00	54.60	70.80	132.00	0.90	0.2	0.14	383.00	60.40	5.60	6.54	0	7.60	620.00
9-00-017	91	22.00	0.08	93.00	0.70	0.00	2.60	43.50	71.60	118.00	1.30	0.3	0.13	331.00	55.30	5.44	6.34	0	8.30	580.00
9-00-017	92	26.00	0.09	100.00	0.00	0.00	0.00	50.00	74.00	130.00	1.50		0.12	380.00	65.00	5.40	6.30		6.60	600.00
9-00-017	03	34.00	0.13	110.00	1.60	0.00	0.00	40.00	66.00	180.00	2.40		0.11	470.00	85.00	5.00	5.80	646.00	7.40	690.00
9-00-017	04	69.00	0.23	110.00	1.70	0.00	0.00	25.00	100.00	230.00	15.00		0.10	640.00	170.00	3.70	4.00	0.00	6.00	980.00
9-00-017	9	33.00	0.12	100.00	1.40	0.00	0.00	32.00	83.00	180.00	2.00		0.12	470.00	83.00	5.40	6.30	897.00	8.00	660.00
9-00-017	12	52.00	0.15	150.00	1.30	0.00	0.00	26.00	130.00	260.00	4.80		0.10	580.00	130.00	5.10	5.90	222.00	7.67	970.00
9-00-017	13	37.00	0.15	120.00	1.80	0.00	0.00	27.00	100.00	210.00	2.00		0.10	540.00	93.00	6.00	7.10	566.00	7.28	880.00
9-00-018	12	11.00	0.05	64.00	0.50	0.00	0.73	41.00	32.00	77.00	3.10		0.10	230.00	28.00	6.70	7.90	1854.00	8.47	380.00
9-00-018	13	14.00	0.05	54.00	1.40	0.00	0.00	44.00	37.00	79.00	2.80		0.10	230.00	35.00	4.70	5.40	848.00	7.72	420.00
9-00-022	77	21.00	0.11	68.00			0.00	48.50	21.60	123.00	6.20	1.40	0.15	123.00	53.00		4.53	0.00	8.10	420.00
9-00-022	87	24.00	0.30	159.00	2	-0.1	-0.10	198.00	124.00	65	4.43	1	0.45	478.00		8.88	10.66	18.6	8.10	330.00
9-00-022	89	17.00	0.15	55.00	0.90	0.00	4.30	71.90	22.00	65.00	2.70	0.6	0.10	239.00	43.20	3.64	3.95	2.02	8.30	340.00
9-00-022	90	16.00	0.14	54.00	0.80	0.00	6.00	76.20	17.00	60.00	2.70	0.6	0.12	233.00	40.60	3.69	4.02	2.8	8.40	340.00
9-00-022	91	13.00	0.10	51.00	0.90	0.00	2.60	74.80	14.90	53.00	2.70	0.6	0.10	176.00	32.90	3.87	4.26	2.8	8.20	320.00
9-00-022	92	12.00	0.06	58.00	0.00	0.00	0.00	86.00	16.00	58.00	3.00		0.10	230.00	30.00	4.60	5.20		6.90	310.00
9-00-022	02	8.10	0.05	80.00	0.72	0.00	0.00	75.00	55.00	54.00	2.00		0.21	230.00	20.00	7.70	9.20	1654.00	7.20	400.00
9-00-022	03	120.00	6.50	62.00	3.70	0.00	0.00	80.00	100.00	180.00	77.00		0.10	750.00	320.00	1.50	0.90	0.00	7.30	930.00
9-00-022	04	16.00	0.58	42.00	0.83	0.00	0.00	120.00	11.00	18.00	4.10		0.13	60.00	42.00	2.80	2.80	922.00	6.50	260.00
9-00-022	9	11.00	0.32	42.00	2.00	0.00	1.10	76.00	11.00	31.00	3.70		0.14	180.00	30.00	3.50	3.80	1223.00	8.40	250.00
9-00-022	12	13.00	0.05	42.00	0.50	0.00	0.91	100.00	8.10	17.00	2.10		0.10	160.00	33.00	4.60	5.20	2072.00	8.31	270.00
9-00-022	13	9.00	0.11	34.00	1.30	0.00	1.80	110.00	8.80	22.00	2.70		0.13	140.00	23.00	5.30	6.20	2260.00	8.38	250.00
9-00-026	77	19.70	0.06	68.00			2.60	36.40	28.30	116.00	6.20	1.40	0.13	260.00	49.50		4.53	0.00	8.20	390.00
9-00-026	81	16.00	0.10	48.00	1	0	0.00	88.00	7.00	62	5.30	1.2	0.10	183.00		3.30	3.50	6	8.30	280.00
9-00-026	87	27.00	0.10	60.00	2	-0.1	-0.10	62.00	26.00	110	3.10	0.7	0.45	260.00		3.16	3.29	3.3	7.70	400.00
9-00-026	89	18.00	0.07	56.00	1.10	0.00	5.10	70.20	15.20	79.00	3.10	0.7	0.00	248.00	45.30	3.62	3.92	1.83	8.30	360.00
9-00-026	90	20.00	0.08	65.00	1.00	0.00	5.10	49.40	16.30	112.00	4.40	1	0.00	273.00	50.40	3.98	4.41	0	8.30	420.00
9-00-026	91	18.00	0.07	61.00	1.00	0.00	2.60	47.80	16.70	103.00	4.00	0.9	0.00	230.00	45.20	3.95	4.36	0	8.20	400.00
9-00-026	92	15.00	0.07	67.00	0.00	0.00	0.00	59.00	18.00	100.00	4.40		0.00	230.00	38.00	4.70	5.40		6.50	370.00
9-00-026	02	63.00	11.00	34.00	3.00	0.00	0.00	180.00	24.00	68.00	31.00		0.10	350.00	200.00	1.00	0.20	0.00	7.00	530.00
9-00-026	04	16.00	0.18	42.00	0.90	0.00	0.00	110.00	10.00	22.00	3.00		0.13	150.00	41.00	2.90	2.90	1035.00	6.50	250.00
9-00-026	9	11.00	0.09	36.00	0.89	0.00	3.30	58.00	12.00	34.00	3.80		0.11	170.00	28.00	3.30	3.50	1208.00	8.50	230.00
9-00-026	12	14.00	0.05	40.00	0.50	0.00	0.42	81.00	8.50	24.00	3.60		0.10	130.00	34.00	4.20	4.70	2024.00	8.33	250.00
9-00-026	13	8.90	0.08	29.00	1.30	0.00	2.00	78.00	11.00	27.00	2.70		0.10	140.00	23.00	4.40	5.00	1803.00	8.42	230.00
9-00-032	77	23.40	0.31	62.00			0.00	44.20	34.30	103.00	6.20	1.40	0.25	253.00	59.80		3.61	0.00	8.00	390.00
9-00-032	81	30.00	0.60	68.00	2	0	0.00	72.00	29.00	100	9.70	2.2	0.10	275.00		3.30	3.50	3.7	8.20	410.00
9-00-032	87	27.00	0.40	62.00	2	-0.1	-0.10	68.00	26.00	110	4.00	0.9	0.40	266.00		3.24	3.39	3.7	8.00	380.00
9-00-032	89	23.00	0.26	62.00	1.00	0.00	0.00	65.00	26.60	100.00	5.30	1.2	0.00	283.00	58.60	3.52	3.78	0	8.00	410.00
9-00-032	90	20.00	0.25	63.00	0.90	0.00	2.60	57.20	18.40	100.00	4.40	1	0.00	267.00	51.10	3.83	4.20	0.01	8.40	410.00
9-00-032	91	20.00	0.28	60.00	1.00	0.00	2.60	47.80	19.50	100.00	4.40	1	0.00	232.00	51.10	3.65	3.96	0	8.20	400.00
9-00-032	92	18.00	0.35	66.00	1.10	0.00	0.00	61.00	22.00	100.00	5.20		0.00	250.00	46.00	4.20	4.70		7.00	380.00
9-00-032	02	63.00	6.90	32.00	2.80	0.00	0.00	150.00	26.00	67.00	40.00		0.10	320.00	190.00	1.00	0.20	0.00	6.90	500.00
9-00-032	03	83.00	1.90	46.00	1.60	0.00	0.00	130.00	16.00	160.00	5.40		0.22	300.00	210.00	1.40	0.80	0.00	7.50	450.00
9-00-032	9	14.00	0.20	42.00	0.92	0.00	2.50	61.00	12.00	49.00	4.00		0.12	170.00	35.00	3.30	3.50	1165.00	8.50	260.00
9-00-032	12	13.00	0.05	44.00	0.50	0.00	2.80	70.00	9.30	38.00	3.30		0.11	150.00	32.00	4.60	5.20	1858.00	8.31	280.00
9-00-032	13	10.00	0.14	34.00	1.30	0.00	2.90	78.00	11.00	40.00	3.10		0.10	150.00	26.00	4.60	5.20	1616.00	8.40	270.00
9-02-004	91	5.00	0.02	75.00	0.40	0.00	8.60	48.70	67.00	31.00	0.00	0	0.00	211.00	12.60	9.21	11.00	3.6	8.60	400.00
9-02-004	92	5.50	0.00	82.00	0.00	0.00	0.00	73.00	67.00	36.00	0.00		0.20	250.00	14.00	9.60	11.40		7.70	400.00
9-02-004	02	58.00	8.20	30.00	2.50	0.00	0.00	150.00	24.00	55.00	37.00		0.10	310.00	180.00	1.00	0.20	0.00	7.00	470.00
9-02-004	03	6.90	0.05	80.00	0.50	0.00	4.10	64.00	60.00	45.00	2.00		0.24	250.00	17.00	8.30	9.90	1564.00	8.50	410.00
9-02-004	04	8.80	0.06	75.00	0.54	0.00	0.00	59.00	46.00	71.00	0.14		0.14	220.00	22.00	6.90	8.20	1441.00	7.30	400.00
9-02-004	9	6.50	0.05	85.00	0.60	0.00	13.00	49.00	74.00	35.00	2.00		0.25	260.00	16.00	9.20	11.00	1826.00	9.10	410.00
9-02-004	12	11.00	0.05	85.00	0.50	0.00	5.20	37.00	46.00	100.00	2.00		0.10	260.00	27.00	8.40	10.00	1960.00	8.86	460.00
9-02-004	13	6.10	0.05	70.00	1.10	0.00	0.86	84.00	75.00	50.00	2.00		0.21	220.00	15.00	11.70	13.80	2041.00	8.35	480.00

Attachment E

Original Negative Declaration

RECEIVED WITH FEE
RECEIPT # 15131076

FILED
KERN COUNTY

OCT 09 2014

MARY B. BEDARD
AUDITOR-CONTROLLER-COUNTY CLERK
BY JB DEPUTY

NOTICE OF DETERMINATION

TO: County Clerk, County of Kern
1116 Truxtun Avenue, 1st Floor
Bakersfield, California 93301

Mailed 10/9/2014
Office of Planning and Research
P.O. Box 3044
Sacramento, California 95812-3044

FROM: CITY OF SHAFTER
Community Development Dept.
336 Pacific Avenue
Shafter, California 93263

COPY

SUBJECT: Filing of Notice of Determination in Compliance with Section 21108 or 21152 of the Public Resources Code.

State Clearinghouse Number (If submitted to SCH): SCH 2013121002	Contact Person: Wayne Clausen Planning Director	Telephone Number: (661) 746-5002

Project Title: Garlic Company and Grimmway Enterprises Inc. Processing Facility Land Application Systems Project.

Project Location (Include County): City of Shafter, County of Kern.

Project Description: The Garlic Company washes, processes, and packages fresh garlic at 18602 Zerker Road, Bakersfield, California 93312, in the NW ¼, Section 23, Township 28 North, Range 26 East of the Mt. Diablo Meridian (APN: 091-130-22). The Garlic Company is developing a new process wastewater treatment system and moving the land treatment of process wastewater from the existing facility to Garlic Company property (99-acre land application site) a mile south in the NE ¼ of Section 26, Township 28 South, Range 26 East of the Mt. Diablo Meridian (APN: 091-220-03,04,05). Grimmway Enterprises Inc. washes carrots at its Premier Facility, 6301 South Zerker Road, Shafter, California 93263, in Section 15, Township 28 South, Range 26 East of the Mt. Diablo Meridian (APN: 091-090-18). Grimmway will move the wash water discharge location from the Minter Field evaporation ponds to the North Kern Water Storage District spreading grounds (591 acres) in Section 27, Township 28 North, Range 26 East of the Mt. Diablo Meridian (APN: 091-190-17). The spreading grounds are located one and a half miles south of the Premier Facility. Grimmway is also proposing to increase the discharge flow from 0.3 million gallons per day to 0.7 million gallons per day. Both the Garlic Company and Grimmway Enterprises Inc. will utilize the right-of-way of Zerker Road to install parallel HDPE lines for waste discharge delivery to their respective land application sites with installation above and over the Friant-Kern Canal (Bureau of Reclamation Facility) within City of Shafter right-of-way. The Garlic Company and Grimmway Enterprises Inc. will obtain waste discharge permits from the California Regional Water Quality Control Board for their new waste water land application systems.

This is to certify that the City of Shafter adopted a Negative Declaration for the subject project on October 7, 2014, and made the following determinations:

1. The project will not have a significant effect on the environment.
2. A Negative Declaration was prepared and adopted for the project pursuant to the provisions of CEQA.
3. Findings were made pursuant to the provisions of CEQA.
4. Mitigation measures were not made a condition of the approval for the project.
5. The location and custodian of the documents which comprise the record of proceedings for the project, including the subject Negative Declaration, are specified as follows:

   City of Shafter Community Development Department, City Hall, 336 Pacific Avenue, Shafter, California 93263

Notice of Environmental Document Posted by County Clerk on 10/09/14 and for 30 days thereafter, Pursuant to Section 21152(C), Public Resources Code

Date: 10/09/2014 **Signature:** Wayne Clausen

Date Received for Filing: 10/09/2014 **Title:** **Planning Director**

CEQA 3885

State of California—Natural Resources Agency
CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
2014 ENVIRONMENTAL FILING FEE CASH RECEIPT

RECEIPT# 15131076

STATE CLEARING HOUSE # *(If applicable)*

SEE INSTRUCTIONS ON REVERSE. TYPE OR PRINT CLEARLY

LEAD AGENCY CITY OF SHAFTER	DATE 10/09/2014
COUNTY/STATE AGENCY OF FILING Kern	DOCUMENT NUMBER 3885

PROJECT TITLE
GARLIC COMPANY AND GRIMMWAY ENTERPRISE INC. PROCESSING FACILITY LAND APPLICATION SYSTEMS

PROJECT APPLICANT NAME THE GARLIC COMPANY AND GRIMMWAY ENTERPRICES INC			PHONE NUMBER (661) 855-8530
PROJECT APPLICANT ADDRESS 18602 ZERKER RD	CITY BAKERSFIELD	STATE CA	ZIP CODE 93312

PROJECT APPLICANT *(Check appropriate box):*

- [x] Local Public Agency
- [ ] School District
- [ ] Other Special District
- [ ] State Agency
- [ ] Private Entity

CHECK APPLICABLE FEES:

[ ] Environmental Impact Report (EIR)	$3,029.75	$ 0.00
[x] Mitigated/Negative Declaration (MND)(ND)	$2,181.25	$ 2,181.25
[ ] Application Fee Water Diversion *(State Water Resources Control Board only)*	$850.00	$ 0.00
[ ] Projects Subject to Certified Regulatory Programs (CRP)	$1,030.25	$ 0.00
[x] County Administrative Fee	$50.00	$ 50.00
[ ] Project that is exempt from fees		
[ ] Notice of Exemption (attach)		
[ ] CDFW No Effect Determination (attach)		
[ ] Other ______		$

PAYMENT METHOD:

- [ ] Cash
- [ ] Credit
- [x] Check
- [ ] Other ______

TOTAL RECEIVED $ 2,231.25

SIGNATURE X J. Bojorquez	PRINTED NAME AND TITLE J. BOJORQUEZ OST

ORIGINAL - PROJECT APPLICANT   COPY - CDFW/ASB   COPY - LEAD AGENCY   COPY - COUNTY CLERK   FG 753 5a (Rev 12/13)

RESOLUTION NO. 2310

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SHAFTER ADOPTING A NEGATIVE DECLARATION FOR THE GARLIC COMPANY AND GRIMMWAY ENTERPRISES INC. PROCESSING FACILITY LAND APPLICATION SYSTEMS PROJECT IN COMPLIANCE WITH THE CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) AND STATE CEQA GUIDELINES

WHEREAS, the Garlic Company is upgrading its process wastewater system which involves installing a six (6) inch pipe within the right-of-way of Zerker Road and delivering the process wastewater to a new 99-acre land application site, with a lined 1.5 million gallon balanced reservoir, one mile south of the current Garlic Company land application site; and

WHEREAS, Grimmway Enterprises Inc. is upgrading its process wastewater system which involves installing an eight (8) inch pipe within the right-of-way of Zerker Road and delivering the process wastewater to the North Kern Water Storage District spreading grounds (591 acres) located one and a half miles south of its Shafter Premier Facility; and

WHEREAS, both the Garlic Company and Grimmway Enterprises Inc. will utilize the right-of-way of Zerker Road to install parallel HDPE lines for waste discharge delivery to their respective land application sites with installation above and over the Friant-Kern Canal (Bureau of Reclamation Facility) within City of Shafter right-of-way; and

WHEREAS, both the Garlic Company and Grimmway Enterprises Inc. are pursuing waste discharge permits from the California Regional Water Quality Control Board for their new waste water land application systems; and

WHEREAS, the Garlic Company and Grimmway Enterprises Inc. waste discharge technical reports, as provided in Attachment A(1) and Attachment A(2) of the Negative Declaration, adequately analyze the two waste water land application systems; and

WHEREAS, an Initial Study was prepared by the City of Shafter for the project and found the proposals would not have a potential significant impact on the environment; and

WHEREAS, pursuant to CEQA, the Negative Declaration was circulated for a 30-day public review and comment period from September 4, 2014, to October 3, 2014; and

WHEREAS, the Bureau of Reclamation and Friant Water Authority recommended (1) using the Bureau of Reclamation's guidelines for "Hazardous Material Carrier Requirements" for pipe crossings over the Friant-Kern Canal, (2) the pipe crossings must occur in a perpendicular fashion to the canal, and (3) approval for work on the Bureau of Reclamation's right-of-way must be obtained prior to initiating construction; and

WHEREAS, the guidelines for "Hazardous Material Carrier Requirements" for pipe crossings over the Friant-Kern Canal are incorporated into the project description of the Negative

Declaration, the pipe crossings will be in a perpendicular fashion to the canal, and authorization for work on the Friant-Kern Canal right-of-way is required for all construction activities because the Bureau of Reclamation owns the subject canal right-of-way; and

WHEREAS, the laws and regulations relating to the preparation of a Negative Declaration, as set forth in the California Environmental Quality Act, were adhered to and duly followed by City Staff and the City Council; and

WHEREAS, the proposed project would not result in a safety hazard or noise problem for persons using Minter Field or Meadows Field or for persons residing or working in the project area; and

WHEREAS, the City Council of the City of Shafter, at its meeting on October 7, 2014, studied and considered the Negative Declaration prepared for the Garlic Company and Grimmway Enterprises Inc. Processing Facility Land Application Systems Project; and

WHEREAS, no information or evidence was presented indicating the project would have potential significant impact on the environment.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Shafter, in a regularly scheduled meeting assembled on the 7th day of October, 2014, hereby adopts the Negative Declaration for the Garlic Company and Grimmway Enterprises Inc. Processing Facility Land Application Systems Project.

PASSED AND ADOPTED THIS 7th DAY OF OCTOBER, 2014.

Jon Johnston, Mayor

ATTEST:

Christine Wilson, City Clerk

CERTIFICATE OF GOVERNING BODY'S ACTION

STATE OF CALIFORNIA)
) ss.
COUNTY OF KERN)

I, Christine Wilson, City Clerk of the City of Shafter, California, DO HEREBY CERTIFY that the above Resolution 2310, a Resolution of the City Council of the City of Shafter, was duly passed and adopted at a Regular Meeting held on the 7th day of October, 2014, by the following vote:

AYES:	Florez, Johnston, and Prout.
NOES:	None.
ABSENT:	Alvarado, Colvard.
ABSTAINING:	None.

DATED: October 7, 2014

(SEAL)

Chr Wilson

City Clerk of the City of Shafter

COMMUNITY DEVELOPMENT DEPARTMENT

BUILDING · ENGINEERING · PLANNING · PUBLIC WORKS

336 Pacific Avenue
Shafter, CA 93263
(661) 746-5002
Fax: (661) 746-9125

NEGATIVE DECLARATION

The City of Shafter Planning Department has completed an initial study (attached) for the Garlic Company and Grimmway Enterprises Inc. Processing Facility Land Application Systems (Project) proposed in the City of Shafter. Pursuant to this evaluation, the City of Shafter Planning Department has determined that the proposed project, as described herein, would not have a significant effect on the environment. Therefore, a Negative Declaration has been prepared for the project. This determination has been made in accordance with the California Environmental Quality Act (CEQA) and the State CEQA Guidelines. A Negative Declaration for the Garlic Company proposal was circulated for public review and comment approximately ten (10) months ago (SCH 2013121002). No action was taken on the draft Negative Declaration. Comments submitted for the Garlic Company project required additional information [see Attachment A(1) in the Negative Declaration]. Grimmway Enterprises Inc. is proposing a new land application site for waste discharge from its Premier Facility. Both proposals will utilize the right-of-way of Zerker Road to install parallel HDPE lines for delivery to their respective land application sites. This Negative Declaration analyzes both proposals as one Project.

PROJECT: Garlic Company and Grimmway Enterprises Inc. Processing Facility Land Application Systems

COMMENT PERIOD BEGINS: September 4, 2014

COMMENT PERIOD ENDS: October 3, 2014

PUBLIC HEARING: October 7, 2014

MITIGATION MEASURES *(included in the proposed project to avoid potentially significant effects, if required)*:

None

Wayne Clausen
Signature

8/22/2014
Date

Wayne Clausen, Planning Director
Printed Name

INITIAL STUDY
ENVIRONMENTAL ANALYSIS

1. **Project:** Garlic Company and Grimmway Enterprises Inc. Processing Facility Land Application Systems

2. **Lead Agency:** City of Shafter Planning Department
336 Pacific Avenue
Shafter, California 93263

3. **Contact Person:** Wayne Clausen, Planning Director
336 Pacific Avenue
Shafter, California 93263
(661) 746-5002

4. **Project Location:** The Garlic Company washes, processes, and packages fresh garlic at 18602 Zerker Road, Bakersfield, California 93312, in the NW ¼, Section 23, Township 28 North, Range 26 East of the Mt. Diablo Meridian (APN: 091-130-22). The Garlic Company is proposing a new process wastewater treatment system and will move the land treatment of process wastewater from the existing facility to Garlic Company property (99-acre land application site) a mile south in the NE ¼ of Section 26, Township 28 South, Range 26 East of the Mt. Diablo Meridian (APN: 091-220-03,04,05).

Grimmway Enterprises Inc. washes carrots at the Premier Facility, 6301 South Zerker Road, Shafter, California 93263, in Section 15, Township 28 South, Range 26 East of the Mt. Diablo Meridian (APN: 091-090-18). Grimmway is proposing to move the wash water discharge location from Minter Field evaporation ponds to the North Kern Water Storage District spreading grounds (591 acres) in Section 27, Township 28 North, Range 26 East of the Mt. Diablo Meridian (APN: 091-190-17). The spreading grounds are located one and a half miles south of the Premier Facility. Grimmway is also proposing to increase the discharge flow from 0.3 million gallons per day to 0.7 million gallons per day.

Starting at the Garlic and Premier facilities, the companies will install parallel HDPE disposal lines in the right-of-way of Zerker Road south (and over the Friant-Kern Canal) to the Calloway Canal easement. From Zerker Road, the six (6) inch Garlic Company pipeline will be installed southeast along and within the northern boundary of the Calloway Canal easement to the 99-acre Garlic Company land application site. The pipeline will connect with a new 1.5 million gallon lined balancing reservoir on the 99 acre land application site. The eight (8) inch Grimmway pipeline will be installed westerly along and within the southerly boundary of the Calloway Canal easement for a distance of approximately 1,300 feet to the 591 acre North Kern Water Storage District spreading grounds.

5. **Project Sponsors' Name and Address:**

Mr. John Layous, Partner
The Garlic Company
18602 Zerker Road
Bakersfield, California 93312
(661) 393-4212 ext. 110

Ms. Patricia Poire
Grimmway Enterprises, Inc.
14141 DiGiorgio Road
Arvin, California 93203
(661) 855-8530

6. **General Plan Designation**: The Garlic Company and Grimmway Enterprises Inc. processing facility sites are designated for Industrial (I) land use. The Garlic Company 99-acre land application site is designated Specific Plan (SP) for the portion between the Friant-Kern Canal and Calloway Canal and Agriculture/Open Space (A/OS) for the portion north of the Friant-Kern Canal. The Grimmway Enterprises Inc. land application site is designated for Community Facilities (CF) land use.

7. **Zoning:** The Garlic Company and Grimmway Enterprises Inc. processing facility sites are zoned for Industrial (I) development. The Garlic Company 99-acre land application site is zoned Specific Plan (SP) for the portion between the Friant-Kern Canal and Calloway Canal and Agricultural (A) for the portion north of the Friant-Kern Canal. The Grimmway Enterprises Inc. land application site is zoned Community Facilities (CF).

8. **Description of Project** *(describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation.)*:

Garlic Company Processing Facility Land Application System

The Garlic Company washes, processes, and packages fresh garlic and vegetables within a 13-acre processing facility, which currently includes office buildings, a processing facility, cold storage unit, stormwater pond, and a main pond (Facility). The Garlic Company is in the advanced planning stage of upgrading the facility, which will include transporting the process wastewater to a new land application site to the south, owned by The Garlic Company, in the near future. A Technical Report for the Report of Waste Discharge describes how the processes will function upon completion of the facility upgrades (see Attachment A - CES, 2013). Processing of the garlic provides a method for the inspection and sorting of blemished or inferior (cull) garlic. It also processes peeled clove garlic into garlic puree, garlic juice, and pickled garlic. The current 16.8-acre land application system (Current Site) located to the west of the Facility consists of a big gun sprinkler irrigation field.

The Garlic Company utilizes an onsite water well as the source water for three processing lines (Puree, Pepper, or Peeling). From the processing lines, the process wastewater is sent through a Lycos filter before entering the Main Pond. From the main reservoir, the process wastewater is sent to the Current Site. As a result of the plant retrofit, source water will be delivered to one of seven processing lines before entering a process wastewater pump pit (8,000 gallons). The process wastewater will then move through a trash press, and a series of filtration screens before delivery to a Balancing Reservoir located on a new 99-acre land application site. From the Balancing Reservoir, the process wastewater will be applied to land area totaling up to 99 acres (99-acre land application site). The new 99-acre land application site consists of 98.95 acres has capacity to receive and effectively treat up to a proposed maximum flow of 55 million gallons per year.

The process wastewater will be delivered from the existing Garlic Company Facility to a new 1.5 million gallon lined balancing reservoir on the 99 acre land application site via a six (6) inch HDPE pipeline. The alignment for the six (6) inch pipeline is as follows: From the Garlic Company Facility, the 6 inch pipe will be installed north along and within the western edge of the Union Pacific railroad right-of-way to Zerker Road. The 6 inch pipe will then be installed south along and within either the eastern or western right-of-way of Zerker Road to the Friant-Kern Canal, i.e., the Bureau of Reclamation Facility. Prior to crossing the Friant-Kern Canal, the 6 inch pipe will be attached to the east or west side of the City of Shafter bridge that crosses the Friant-Kern Canal. The 6 inch pipe will be installed above and over the Bureau of Reclamation Facility within City of Shafter right-of-way. The installation of the 6 inch pipe will continue south along and within the right-of-way of Zerker Road to the Calloway Canal easement. The 6 inch pipe will then be installed easterly along and within the northerly boundary of the Calloway Canal easement to the portion of the 99 acre land application site that is located between the Friant-Kern Canal and Calloway Canal. The 6 inch pipe will connect with the 1.5 million gallon lined balancing reservoir located on the same site. An existing 12 inch pipe that provides irrigation water pumped from the northern portion of the site to the southern portion, over the Friant-Kern Canal, will be utilized to transport process wastewater from the balancing reservoir to the northern portion of the site. Sprinkler irrigation will be utilized to apply the process wastewater to the agricultural land.

Grimmway Enterprises Inc. Processing Facility Land Application System

Grimmway Enterprises Inc. washes carrots at the Premier Facility, 6301 South Zerker Road, Shafter, California 93263, in Section 15, Township 28 South, Range 26 East of the Mt. Diablo Meridian (APN: 091-090-18). Grimmway is proposing to move the wash water discharge location from Minter Field evaporation ponds to the North Kern Water Storage District spreading grounds (591 acres) in Section 27, Township 28 North, Range 26 East of the Mt. Diablo Meridian (APN: 091-190-17). The spreading grounds are located one and a half miles south of the Premier Facility. Grimmway is also proposing to increase the discharge flow from 0.3 million gallons per day to 0.7 million gallons per day.

Wash water at the Premier Facility is discharged to a series of seven unlined earthen ponds for settling. The pond capacities range from 0.24 million gallons to 2.23 million gallons. The total capacity of the seven ponds is 5.64 million gallons. The ponds for the Premier facility are designed to allow wash water to flow by gravity from pond to pond to allow settling to occur before the wash water is discharged off-site. No changes are proposed to the ponds with discharge to the North Kern Water Storage District spreading grounds. When in use, the ponds are operated at capacity with freeboard maintained at the elevation of the outflow pipe. The discharge pump will control the level in the final pond. Without interruption to operations, any of the ponds can be taken off line for silt removal.

The wash water discharge will be delivered from the existing Premier Facility to the North Kern Water Storage District spreading grounds via an eight (8) inch HDPE pipeline. The alignment for the eight (8) inch pipeline is as follows: From the Premier Facility, the 8 inch pipe will be installed south along and within either the eastern or western right-of-way of Zerker Road to the Friant-Kern Canal, i.e., the Bureau of Reclamation Facility. Prior to crossing the Friant-Kern Canal, the 8 inch pipe will be attached to the east or west side of the City of Shafter bridge that crosses the Friant-Kern Canal. The 8 inch pipe will be installed above and over the Bureau of Reclamation Facility within City of Shafter right-of-way. The installation of the 8 inch pipe will continue south along and within the right-of-way of Zerker Road to the Calloway Canal easement. The 8 inch pipe will then be installed westerly along and within the southerly boundary of the Calloway Canal easement for a distance of approximately 1,300 feet to the subject spreading grounds.

Both proposals will implement the Bureau of Reclamation's guidelines for "Hazardous Material Carrier Requirements" for pipe crossings over the Friant-Kern Canal. The guidelines are as follows:

Hazardous Material Carrier Requirements:

1. Pipelines carrying hazardous material or pollutants (e.g., oils, gasoline, sewage, contaminated waters, and nonpotable waters) should be designed for a reduced risk of failure in the portion within Reclamation's ROW. The design should require either:

   a. Designing the crossing pipeline with an additional 50 percent working pressure factor;

   or

   b. Using secondary containment (casing pipe) for all hazardous material pipelines.

2. To minimize the amount of any hazardous material entering the canal, Reclamation may require the installation of a block (gate) valve and or a check valve on each side of the canal between the ROW boundary and the embankment. When selecting the type of the valves, take into the account the flow direction and the terrain.

3. A final hazardous material spill contingency plan and an emergency response plan should be approved by Reclamation prior to start of construction.

4. A monitoring program and/or Supervisory Control and Data Acquisition System alarm may be required depending on the hazardous material transported. This applies to all "overcrossings" and "undercrossings" when the hydraulic grade line is within 60 inches of the canal liner or when local geology would promote this requirement.

9. **Environmental setting** *(briefly describe the existing onsite conditions and surrounding land uses)*:

The facilities, the proposed pipeline alignment, 99-acre land application site, and North Kern Water Storage District spreading grounds are surrounded by intensive agriculture. Commercial/industrial and agricultural properties are located near the properties, but no residential properties are located within one half mile of the project site (see attached project maps).

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages:

☐ Aesthetics	☐ Agricultural Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology / Soils
☐ Hazards & Hazardous Materials	☐ Hydrology / Water Quality	☐ Land Use / Planning
☐ Mineral Resources	☐ Noise	☐ Population / Housing
☐ Public Services	☐ Recreation	☐ Transportation / Traffic
☐ Utilities / Service Systems	☐ Mandatory Findings of Significance	

ENVIRONMENTAL DETERMINATION:

On the basis of this initial evaluation:

■ I find that the proposed project **could** not have a significant effect on the environment, and a **negative declaration** will be prepared.

☐ I find that although the proposed project **could** have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A **mitigated negative declaration** will be prepared.

☐ I find that the proposed project **may** have a significant effect on the environment, and an **environmental impact report** is required.

☐ I find that the proposed project **may** have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect has been (1) adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) addressed by mitigation measures based on the earlier analysis as described on the attached sheets. An **environmental impact report** is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project **could** have a significant effect on the environment, because all potentially significant effects have been (1) analyzed adequately in an earlier **environmental impact report or negative declaration** pursuant to applicable legal standards, and (2) avoided or mitigated pursuant to that earlier **environmental impact report or negative declaration**, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Wayne Clausen
Signature

8/22/2014
Date

Wayne Clausen, Planning Director
Printed name

Environmental Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact

I. AESTHETICS: Would the project;

a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	■
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcrops, and historic buildings within a state scenic highway?	☐	☐	☐	■
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	■
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	■

RESPONSE: No portion of the Project will have an impact on aesthetics. The proposals are consistent with the existing structures at the Garlic and Grimmway facilities. No structure is being proposed above the Industrial Zone 50 foot height restriction. The proposed pipelines will be installed underground. The new balanced reservoir will be consistent with the existing agricultural land use at the 99 acre land application site. No changes are proposed to the North Kern Water Storage District spreading grounds. The project will neither create new nor degrade any existing features or vistas. Therefore, no adverse impacts to area aesthetics will occur as result of the project.

II. AGRICULTURE RESOURCES:

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project;

a) Convert prime farmland, unique farmland, or farmland of statewide importance (farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	■
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	■
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of farmland to non-agricultural use?	☐	☐	☐	■

RESPONSE: The proposal will continue to facilitate agricultural resources and agricultural production at the Garlic facility and new 99 acre land application site. The application of process wastewater for agricultural production, new pipeline, and new 1.5 million gallon lined balance reservoir for delivering the process waste water will maintain agricultural production on the 99 acre land application site. The proposal does not remove the project site's agricultural production. Grimmway will be discharging to an existing groundwater recharge facility. Therefore, the Project will have no impacts to agricultural resources.

III. AIR QUALITY:

Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project;

a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	■	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	■	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	■
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	■
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	■

RESPONSE: The San Joaquin Valley Air Pollution Control District (District), which is comprised of San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare Counties and the valley portion of Kern County, has jurisdiction over most air quality matters in the San Joaquin Valley Air Basin. The criteria pollutant attainment status for the San Joaquin Valley Air Basin is as follows:

Air Quality Requirement									
Federal Ozone	State Ozone	Federal PM_{10}	State PM_{10}	Federal $PM_{2.5}$	State $PM_{2.5}$	Federal CO	State CO	Federal NO_2	State NO_2
N	N	A	N	N	N	A	A	A	A
A = Attainment					N = Nonattainment				

The San Joaquin Valley Air Pollution Control District (District) encourages local jurisdictions to design developments in ways to reduce air pollution emissions. The proposed Project would not violate the air quality thresholds set forth on page 26, Table 4-I (Ozone Precursor Emissions Thresholds for Project Operations ROG 10 tons/year, NOx 10 tons) of the San Joaquin Valley Unified Air Pollution Control District's "Guide for Assessing and Mitigating Air Quality Impacts." The Project would only generate a very small amount of ROG and NOx. These amounts are considerably less than what is considered not significant by the Air District. The "Road Construction Linear Emissions Model," from the Sacramento Metropolitan Air Quality Management District was utilized to estimate emission levels for ROG, NOx, and PM10 as a result of the Project. Separate model runs were performed for Garlic and Grimmway even though there is duplication for most of the pipeline construction. When the results of both model runs are added together, the Air District's standards are not exceeded. The results of the modeling, Attachment B, determined that the Project will not exceed the significance thresholds established by the Air District. It should be noted that the model that was used is designed to calculate road construction emissions and includes emission calculations for paving. No permanent paving is proposed for the project. Therefore, the actual paving component of the project represents less than 1-percent of the emissions estimate calculated for Paving. Therefore, no adverse or additional impacts to air quality will occur as a result of this project.

There is no evidence that this Project will create any pollutant "hot spot" that would expose sensitive receptors to substantial pollution receptors. There is no evidence the Project would create objectionable odors. The Project is not on the list of those land uses generally regarded as the type to have site odor problems (see Table 4-2, San Joaquin Valley Unified Air Pollution Control District "Guide for Assessing and Mitigating Air Quality Impacts" for a list of facilities). The proposed installation activities on the site are required to meet all of the Air District's Regulation VIII prohibitions. No conflicts or violations of air quality standards are associated with the application of process wastewater by means of irrigation or surface percolation. The use of available process wastewater allows for continual cropping schedule and reduces the potential for periods of fallow or bare soil which should reduce the potential for wind erosion and dust emissions.

The process wastewater being applied to field crops comes from washing and processing produce, contains no substantial pollutants concentrations, and creates no objectionable odors (Attachment A - CES Garlic 2013, 2014b and CES Grimmway 2014a).

<u>IV. BIOLOGICAL RESOURCES</u>: Would the project;

Environmental Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	■	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☐	☐	■
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	■
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with an established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	■
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	■
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	■

RESPONSE: There are no designated conservation areas, state or federal preserve lands, listed critical habitat, natural areas, or natural wetlands present within or near the Project site. There are no areas of undisturbed natural lands existing on, adjacent to, or near the project sites. The parallel pipelines will be installed within a highly maintained, vegetation free, right-of-way or canal easement area that is regularly utilized for vehicular access. The existing Garlic and Grimmway facility sites, subject Zerker Road pipeline alignment, Calloway Canal easement, Garlic 99 acre land application site and Grimmway land application site are surrounded by, and adjacent to, land under intensive agricultural cultivation. The northern and southern boundary of the Calloway Canal easement is a highly maintained flat dirt road utilized by cultivators and North Kern Water Storage District for access to the Calloway Canal and adjacent intensive agricultural activities. No portion of the Calloway Canal bank or embankment toe will be utilized or impacted by the installation of the pipelines.

Development within the project area currently consists of intensive agriculture and industrial operations. The certified Environmental Impact Report (EIR) for the City of Shafter's 2005 General Plan Update addressed sensitive species that may occur within the project area. Figure 4.4.1 of the EIR (see Attachment C) identifies the Garlic and Grimmway facilities as developed and the land application sites as agriculture and developed. It also indicates that the plant species, San Joaquin woolythreads (Lembertia congdonii) was identified within Section 15 by the California Department of Fish and Game Natural Diversity Database. The EIR information mapped Section 15 as a potential location for the species since no specific location was identified. The plant siting was reported in the early 1900's and

Item	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact

due to the level of disturbance from agricultural and industrial operations in the same area for the last 100 years, it is anticipated that the species has been extirpated from the area. Therefore, no adverse effects to species or habitat will occur as a result of this project.

V. CULTURAL RESOURCES: Would the project;

Item	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	■
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☐	■
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	■
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	■

RESPONSE: No historical or archaeological resources are known to exist within or immediately adjacent to the Project area. The Project area was evaluated for cultural resources and historic sites as part of the review prepared for the certified EIR for the City of Shafter 2005 General Plan Update. A Cultural Resource Assessment was prepared for the EIR by LSA Associates, Inc. in January 2005 and included two cultural resource records searches prepared by the Southern San Joaquin Valley Information Center. No archaeological or historical resources were identified on or near the Garlic and Grimmway facilities, pipeline alignment, or land application sites (see Attachment D & E). By law, if human remains are encountered during public or private construction activity, State Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the Kern County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. The Kern County Coroner must be notified within 24 hours. If the Kern County Coroner determines that the burial is not historic, but prehistoric, the Native American Heritage Commission (NAHC) must be contacted to determine the most likely descent (MLD) for this area. The MLD may become involved with the disposition of the burial following scientific analysis. Therefore, the project will not have any adverse effect on cultural resources.

VI. GEOLOGY AND SOILS: Would the project;

Item	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? (refer to Division of Mines & Geology Special Publication No.42)	☐	☐	☐	■
ii. Strong seismic ground shaking?	☐	☐	☐	■
iii. Seismic-related ground failure, including liquefaction?	☐	☐	☐	■
iv. Landslides?	☐	☐	☐	■
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	■
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	■
d) Be located on expansive soil, as defined in the city's most recently adopted Uniform Building Code, creating substantial risks to life or property?	☐	☐	☐	■
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	■

RESPONSE: The Project site, as is all of the southern San Joaquin Valley, is considered to be seismically active. No known earthquake faults have been identified within the Project area and the site is not located within an Alquist-Priolo Earthquake Fault Zone. The Project area is subject to severe ground shaking and possible surface readjustment in the event of a maximum magnitude earthquake, however, the project does not include the construction of habitable structures of any kind. Soils on the Project site are identified as Wasco-Driver sandy loam and are not known to be unstable or expansive. There is no identified potential for liquefaction, landslides, or subsidence in the area of construction.

No risk to people or structures is associated with seismic-related activity and the application of process wastewater by means of irrigation or surface percolation. The Project encompasses 99 acres of stable and relatively flat (0-2 percent) farmland and 591 acres of percolation-spreading grounds. Soils are well-suited to year-round crop rotations, which reduce erosion or loss of top soil. The sites have no soil limitations with regard to the application of process wastewater by means of irrigation or percolation. Therefore, no impacts to soil or geologic features are expected to occur as a result of this project.

Environmental Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
VII. GREENHOUSE GAS EMISSIONS. Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	■	☐
b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emission of greenhouse gases?	☐	☐	■	☐

RESPONSE: The "Road Construction Linear Emissions Model" from the Sacramento Metropolitan Air Quality Management District was utilized to estimate the Project's emission level for CO_2 (Attachment B). Separate model runs were performed for Garlic and Grimmway even though there is duplication for most of the pipeline construction. Adding the results together, the total is 367 tons for the two month construction period. The Intergovernmental Panel on Climate Change (IPCC) estimates that the CO_2 equivalent generated by California in 2011 was 448.71 million tonnes or metric tons (see IPCC summaries from www.arb.ca.gov in Attachment B - 2 pages). The IPCC is the leading body for the assessment of climate change, established by the United Nations Environment Program and the World Meteorological Organization. The inventory and forecasting for greenhouse gas (GHG) emissions in the California Air Resources Board's 2008 Climate Change Scoping Plan supports the 2011 IPPC estimates. The 2008 Climate Change Scoping Plan also indicates that GHG emissions will increase to 596.41 million tonnes by 2020. The issue for GHG emissions is climate change. Climate change is a global issue. Therefore, GHG emissions are a cumulative problem and can only be evaluated as such. The amount of CO_2 that would be generated by the project is so small in relation to the California CO_2 equivalent estimates for 2011 and 2020 that it's not possible for the contribution of the project to be cumulatively considerable. Therefore, the impact is less than significant. The project will also not conflict with any elements of the California Air Resources Board's 2008 Climate Change Scoping Plan.

Environmental Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
<u>VII. HAZARDS AND HAZARDOUS MATERIALS</u>: Would the project;				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	■
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous material into the environment?	☐	☐	☐	■
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	■
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	■
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	■
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	■
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	■
h) Expose people or structures to a significant risk of loss, injury or death involving wild land fires, including where wild lands are adjacent to urbanized areas or where residences are intermixed with wild lands?	☐	☐	☐	■

RESPONSE: The proposed Project will not require the use or transport of any hazardous materials. The Project sites are not on the State's list of hazardous material sites. No hazardous materials or emissions are associated with the application of process wastewater to crops, farmland, and the spreading grounds [see Attachment A(1) and Attachment A(2)]. The subject facilities are located approximately one and two miles southeast of Minter Air Field, respectively. The subject land application sites are located approximately 2 and 3 miles southeast of Minter Air Field, respectively. There is no aspect of the proposed Project that would expose people at the project site to a safety hazard from Minter Air Field. The project will not interfere with any emergency response plans for the area and the site is not located in an area subject to wild land fires.

Environmental Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
<u>VIII. HYDROLOGY AND WATER QUALITY</u>: Would the project;				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	■
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	■
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial	☐	☐	☐	■

Environmental Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
erosion or siltation on- or off-site?				
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	■
e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	■
f) Otherwise, substantially degrade water quality?	☐	☐	☐	■
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	■
h) Place within a 100-year flood hazard area, structures which would impede or redirect flood flows?	☐	☐	☐	■
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	■
j) Inundation by seiche, tsunami, or mud flow?	☐	☐	☐	■

RESPONSE: No water quality will be adversely affected by implementation of this Project beyond that normal to the extensive agriculture in the surrounding area [see responses to Regional Board comments in Attachment A (1) under CES 2014b and anti-degradation analysis in Attachment A(1) under CES 2014b and Attachment A(2)]. No surface drainage, or intermittent streams or swales flow through the Project's existing facilities or land application sites. The Garlic 99-acre land application site is bisected by the Friant-Kern Canal. No new structures or other changes to surface drainage which could alter surface flow are associated with this project. The existing Garlic Company facility is graded to channel all stormwater to the 0.467 million gallon stormwater pond. Stormwater is not co-mingled with any surface water features [Attachment A(1)]. Source water to the facilities is supplied by water wells located on the subject facility sites. Process wastewater quality and quantity will continue to be monitored for constituents and flow as described in the water balances designed for both facilities [see Attachment A(1) and Attachment A(2)]. No changes are proposed to Grimmway's seven unlined earthen settling ponds with discharge to North Kern Water Storage District's spreading grounds. Therefore, no impacts to hydrology or water quality are expected as a result of this project.

IX. LAND USE AND PLANNING: Would the project;

a) Physically divide an established community?	☐	☐	☐	■
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	■
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	■

RESPONSE: No physical changes or altered land use are associated with application of process wastewater as proposed by the Project. Therefore, no impacts to land use or planning are expected as a result of this project.

X. MINERAL RESOURCES: Would the project;

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	■
b) Result in the loss of availability of a locally-important mineral resource recovery site that is delineated in a local general plan, specific plan or other land use plan?	☐	☐	☐	■

RESPONSE: No losses of known or potentially known mineral resources are associated with the application of process wastewater as proposed by the Project. Therefore, no impacts to mineral resources will result.

XI. NOISE: Would the project result in;

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	■
b) Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels?	☐	☐	☐	■
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	■
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	■
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	■

Environmental Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	■

RESPONSE: No increases in ambient noise or levels of vibration are associated with the implementation of this Project. Therefore, no noise related impacts are expected as a result of process wastewater application by means of irrigation to existing agricultural fields.

XII. POPULATION AND HOUSING: Would the project;

a) Induce substantial population growth in an area, either directly (e.g., by proposing new homes & businesses) or indirectly (e.g., through extension of roads or other infrastructure)?	☐	☐	☐	■
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	■
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	■

RESPONSE: The project will not induce substantial population growth. There are no existing residential structures on the project site. No changes in population or housing will be associated with the application of process wastewater as proposed by the Project. Use of the process wastewater improves the reliability of the water supply to sustain agriculture on existing farmland.
Therefore, no negative impacts to existing population and housing are expected as a result of this Project.

XIII. PUBLIC SERVICES:

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services;

i. Fire protection?	☐	☐	☐	■
ii. Police protection?	☐	☐	☐	■
iii. Schools?	☐	☐	☐	■
iv. Parks?	☐	☐	☐	■
v. Other public facilities?	☐	☐	☐	■

RESPONSE: No new or altered government facilities are associated with the application of process wastewater to the subject land application sites. The Project requires little if any public service. The Project will have no adverse effect on public services.

XIV. RECREATION: Would the project:

a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	■
b) Does the Project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	■

RESPONSE: The Project does not require any use of recreational facilities.

XV. TRANSPORTATION/TRAFFIC: Would the project;

a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☐	☐	■
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☐	■
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	■
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	■
e) Result in inadequate emergency access?	☐	☐	☐	■

Environmental Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
f) Result in inadequate parking capacity?	☐	☐	☐	■
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	■

RESPONSE: No changes to local traffic patterns or needs for public transportation are associated with the application of process wastewater to the subject land application sites. All activities required by this Project will remain onsite with no substantial increase in parking or changes to traffic. The construction of the Project will involve trenching and installation of two parallel pipelines along Zerker Road. There will be no permanent above-ground structures related to the pipelines that would interfere with traffic or transportation. The Project will neither increase nor decrease the farm traffic related to farming on existing agricultural fields [see Attachment A(1) and Attachment A(2)]. Therefore, no negative impacts to transportation or traffic are expected as a result of this project.

XVI. UTILITIES AND SERVICE SYSTEMS: Would the project;

Environmental Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	■
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	■
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	■
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	■
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	■
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	■
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	■

RESPONSE: No additional city wastewater treatment will be required by implementation of this Project. No new or expanded stormwater discharge facilities will be required as the two existing facilities maintain a separate stormwater collection pond on-site, engineered using 100-year return data to provide sufficient capacity. Solid waste generated by the facilities consists of silt removed during washing and cull solids. Silt is removed from settling ponds and returned as top soil and vegetable solids are removed daily and used as livestock feed. No additional solid waste will be generated by the application of process wastewater to the subject land application sites [see Attachment A(1) and Attachment A(2)]. Therefore, no negative impacts to utilities and service systems are expected as a result of this project.

XVII. MANDATORY FINDINGS OF SIGNIFICANCE:

Environmental Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☐	■
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☐	■
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	■

RESPONSE: There is no sensitive species habitat, no record of sensitive species, wetlands, or historical resources within, adjacent to, or near the Project sites. No physical changes in the form of either additions or disruptions are associated with the application of process wastewater to the subject land application sites. Use of the process wastewater improves the reliability of the water supply to sustain agriculture on existing farmland. Based on the results of the Initial Study, and the nature of the Project, it has been determined that the Project will not degrade the quality of the environment, substantially reduce any habitat, or impact sensitive or listed species, or eliminate important examples of the major periods of California history or prehistory. The proposal has no impacts that would be defined as individually limited but cumulatively considerable and the proposal would not cause substantial adverse impacts on human beings, either directly or indirectly. Therefore, no negative impacts of significance are expected as a result of the Project.

REFERENCE LIST

1. CES, 2013. Technical Report for the Report of Waste Discharge – The Garlic Company, Shafter, California. Cascade Earth Sciences, Visalia, California. September 2013.

2 CES, 2014a. Draft Technical Report for the Report of Waste Discharge Grimmway Enterprises Inc. Premier Facility, Shafter, California. Cascade Earth Sciences, Visalia, California. April 2014.

3 CES, 2014b. Response to Draft Negative Declaration Comments and Updated Anti-Degradation Analysis. The Garlic Company, Shafter, California. Cascade Earth Sciences, Visalia, California. June 24, 2014.

4. City of Shafter, "2005 General Plan Update" June 2005.

5. City of Shafter, "2005 General Plan Update Certified EIR", June 2005.

6. City of Shafter Municipal Code, Title 17, "Zoning Ordinance".

7. Sacramento Metropolitan Air Quality Management District Roadway Construction Emissions Model, Version 7.1.4, "Garlic Company Waste Discharge Pipeline and Ponds", (http://airquality.org/ceqa/index.shtml#models).

8. Sacramento Metropolitan Air Quality Management District Roadway Construction Emissions Model, Version 7.1.5.1, "Grimmway Waste Disposal Lines", (http://airquality.org/ceqa/index.shtml#models).

9. Intergovernmental Panel on Climate Change (IPCC) 2011 CO_2 equivalent estimates from www.arb.ca.gov

10. San Joaquin Valley Air Pollution Control District, "Guide for Assessing and Mitigating Air Quality Impacts," January 10, 2002 revision.

City of Shafter
Reviewing Agencies Checklist

_ Burlington Northern & Santa Fe Railroad
_ Cal State University Bakersfield
_ Cemetery District No. 1
_ City of Bakersfield Planning Department
_ City of Wasco
_ Farmers Home Administration
_ Federal Aviation Administration
X Friant Water Authority
_ Kern Community College District
_ Kern Council of Governments
_ Kern County Administrative Officer
_ Kern County Ag Commissioner
_ Kern County Airport District
_ Kern County Assessor's Office
_ Kern County Auditor-Controller
_ Kern County Board of Supervisors
_ Kern County Community Development
_ Kern County Department of Planning
_ Kern County Department of Public Works
_ Kern County Fire Department
_ Kern County Fire Department, Shafter Station
_ Kern County Environmental Health Services
_ Kern County Local Agency Formation Commission
_ Kern County Sheriff's Department
_ Kern County Treasurer & Tax Collector
_ Kern County Waste Management
_ Kern County Water Agency
_ Kern Economic Development Corp.
_ Kern High School District
X Kern Mosquito & Vector Control District
_ Kern Superintendent of Schools
X Minter Field Airport District
X North Kern Water Storage District
_ North of the River Sanitary District No. 1
_ Oxy Resources
_ Pacific Gas and Electric Company
_ Richland School District
_ Rio Bravo-Greeley Union School District
_ Rosedale Union School District
_ SBC/Pacific Bell
_ Shafter Chamber of Commerce
_ Shafter Historical Society
_ Shafter Recreation and Park District
_ Shafter-Wasco Irrigation District
X SJV Unified Air Pollution Control District
_ Southern California Gas Company
_ State Air Resources Board
_ State Board of Equalization
X State Clearinghouse (Office of Planning & Research)
_ State Dept of Conservation, ________________ Division
X State Dept of Fish and Game
_ State Dept of Food and Agriculture
_ State Dept of Health Services
_ State Dept of Parks and Recreation
_ State Dept of Real Estate
X State Dept of Transportation, Division 6
_ State Energy Commission
_ State Mine and Geology Board
_ State Office of Historic Preservation
_ State Public Utilities Commission
X State Regional Water Quality Control Board
X State Water Resources Control Board
_ State Waste Management Board
X Union Pacific Railroad
X U.S. Bureau of Reclamation
_ U.S. Dept of Commerce, Economic Development
_ U.S. Dept of Treasury, Customs Bureau
_ U.S. Environmental Protection Agency
_ Warner Cable/Bright House Networks
_ Other

Public Review Period

Starting Date: September 4, 2014 Ending Date: October 3, 2014

Signature [signature] Date: August 27, 2014

For SCH Use Only:
Date Received at SCH
Date Review Starts
Date to Agencies
Date to SCH
Clearance Date
Notes:

In-City Agencies:
____ City Services Department
____ Administrative Services
____ Shafter Police Department
____ Community Development Agency

Project: Garlic / Grimmway Processing Facility
Land Application Systems Project

Wayne Clausen

From: Eric R. Quinley <equinley@friantwater.org>
Sent: Thursday, September 18, 2014 9:39 AM
To: Wayne Clausen
Cc: Rain Emerson; 'CARTER, SHERYL'; Gary McCulloch
Subject: RE: City of Shafter - Garlic Com and Grimmway Inc, Facility

Wayne,

Consistent with previous communication on the subject project, Reclamation and Friant will work with the project proponents on Friant-Kern Canal right-of-way interaction so long as the pipeline(s) cross the canal in a perpendicular fashion, do not run parallel with the canal, and conform to the Reclamation crossing guidelines (previously provided).

Thank you,
Eric

Eric R. Quinley
Director of Operations and Maintenance
Friant Water Authority

854 N. Harvard Ave.
Lindsay, CA 93247
equinley@friantwater.org
Phone (559) 562-6305
Fax (559) 562-3496

From: Wayne Clausen [mailto:wclausen@shafter.com]
Sent: Thursday, September 18, 2014 9:29 AM
To: 'CARTER, SHERYL'
Cc: Rain Emerson; Eric R. Quinley
Subject: RE: City of Shafter - Garlic Com and Grimmway Inc, Facility

Hi Sheryl:

Your comment will be presented to the Shafter City Council at hearing on October 7th.

Thanks,

Wayne Clausen, Planning Director
City of Shafter Planning Department
336 Pacific Avenue
Shafter, California 93263
(661) 746-5002
(661) 746- 9125 fax
wclausen@shafter.com

From: CARTER, SHERYL [mailto:scarter@usbr.gov]
Sent: Wednesday, September 17, 2014 2:52 PM
To: Wayne Clausen

EXHIBIT D

Cc: Rain Emerson; Eric Quinley
Subject: Fwd: City of Shafter - Garlic Com and Grimmway Inc, Facility

Mr. Clausen,

Reclamation has an additional comment to your subject Negative Declaration.

Comment: Any new construction on Reclamation's right-of-way will require the approval of Reclamation and the Friant Water Authority.

RECLAMATION

Sheryl Carter
Chief, Land Resource Management Division
Drainage Management
South-Central California Area Office
1243 N Street
Fresno, California 93721
(559) 487-5299
(559) 779-9612 (Cellular)

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