MONSOON CONSULTANTS

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June 06, 2019

Wild Coast Farms
Attn: Adam Kirchner
2198 Los Osos Valley Road
Los Osos, CA 93402

Re: **DRAFT: WATER MANAGEMENT PLAN FOR WILD COAST FARMS CANNABIS CULTIVATION OPERATION (Revised July 21, 2020)**

Dear Mr. Kirchner,

At your request, Monsoon Consultants (Monsoon) has prepared this Water Management Plan for the proposed Wild Coast Farms Cannabis Cultivation Farm (Wild Coast). The subject property includes approximately 13.65 acres, upon which the cannabis cultivation farm will be operated. The property is owned by Adam Kirchner and is located off 2198 Los Osos Valley Road, east of the town of Los Osos, in San Luis Obispo County (County) (APN 067-011-057). The subject parcel is adjacent to APN 067-011-021, which contains approximately 60.24 acres. These two properties are collectively considered a single legal parcel, based on information provided by the County. For the purposes of this plan, the historic water usage for both properties was considered in establishing the baseline usage. A Project Location Map and Los Osos Groundwater Basin Map are included as Attachments A and B in this report.

PROJECT DESCRIPTION

The owner of Wild Coast plans to grow cannabis in a greenhouse for year-round cultivation, climate control, and controlled exposure to sunlight. Each plant will be grown in 5-gallon pots. The pots contain an organic potting soil blend formulated to retain as much moisture as possible, reducing watering needs. The plants are delivered an exact amount of a proprietary blend of cannabis specific nutrients with each

watering. The plants are watered with an automated drip system when needed. The fully automated drip system, utilizing 1 gallon per hour (GPH) drip low flow emitters from DRAMM, uses just enough water to soak the root zone and shuts off just before any runoff occurs. This slow soak occurs in the irrigation system early in the morning or late in the evening to reduce as much evaporation during the middle of the day as possible. This allows more water and food to soak in and become available to the plant.

The proposed cannabis cultivation farm will cover approximately 36,000 square feet and will be supplied with water from a single existing on-site well. The cultivation area will be divided into 22,000 square feet of flowering plants and 12,600 square feet of nursery plants. When the proposed operation is fully operational, between flowering and nursery, the farm will house approximately 18,400 potted plants. This will add an additional 15,000 plants to the 3,400 existing plants, for a total crop of 18,400 plants. The existing well will provide water for the entire property including the cannabis cultivation and a small existing residential unit with two occupants. In the event of a power or pump failure, water will be supplied to the crops from storage tanks that can store up to 20,000 gallons. An additional 10,000 gallons will be stored on the site for property fire protection and to satisfy building code requirements. These storage tanks will be strategically located throughout the cannabis cultivation operation premises and the property.

REGULATORY REQUIREMENTS

This Water Management Plan was developed to comply with the requirements of the County of San Luis Obispo Department of Planning & Building (SLO County), and in response to a letter from the county, dated January 14th, 2019. A copy of this letter is included as Attachment C. The requirements set forth in the subject letter include, among other items, that the applicant for cannabis cultivation permit provide the following.

- *A detailed plan that includes the proposed water supply, proposed conservation measures, and any water offset requirements. Your project is located within the Los Osos Groundwater Basin. The Cannabis Ordinance, Section 22.40.050 D 5 requires the applicant to provide an estimate of water demand prepared by a licensed professional engineer or other expert on water demand as approved by the County's Planning Director, and a detailed description of how the new water demand will be offset. For each project cannabis component/activity please provide a water use estimate from a "licensed professional engineer" or "other expert". Also have the "expert" identify if and how offsets can be provided onsite.*

The information requested in the subject letter is summarized below:

HISTORIC WATER USAGE

Historic water usage on the two parcels that collectively comprise the subject parcel was estimated based on information provided to Monsoon by the managers of each property. With regard to the 60.24-acre parcel (APN 062-011-021), it is understood that Dohi Farms has been actively farming the property since year 2000. On a normal rain year two crops are grown on each acre. Romaine, green cabbage, broccoli and cilantro are currently grown on this property. The average annual amount of irrigation water supplied is estimated to be 121 acre-feet.

With regard to the 13.65-acre parcel (APN 0667-011-057), the water usage was estimated for the years following the 2016 purchase of the property by the current property owner. Prior to 2016, the previous owner's land usage was primarily cover crop with a small portion of land dedicated to a personal vegetable garden. From January 2016 to April 2018, for the purpose of cannabis cultivation, the owners reportedly used approximately 430 gallons per day (GPD) or 0.32 Acre-feet (AFY). After April 2018, water use increased to approximately 545 GPD or 0.61 AFY. The increase in water usage was the result of a transition from growing *Cannabis sativa* to *Cannabis indica*. Before April 2018, the property contained 33 large *Cannabis sativa* plants. In April 2018, Wild Coast switched to growing an estimated 3,400 of the smaller *Cannabis indica* plants using pots on approximately 5,000 square feet of land. Cannabis water usage from 2016 to the present are summarized in Tables 1 and 2 below.

Table 1. January 2016-April 2018 Water Usage for Wild Coast Farms Cannabis Sativa Cultivation

2016-April 2018 WATER USAGE FOR WILD COAST FARMS CANNABIS SATIVA CULTIVATION	
	Per Year
number of waterings	145
gallons used per plant	3,192
gallons used per 33 Plants	105,329
ACRE-FEET	0.32
*based on water needs of the plants	

Table 2. April 2018- Present Water Usage for Wild Coast Farms Cannabis Indica Cultivation

Post April 2018 WATER DEMAND FOR WEST COAST FARMS CANNABIS CULTIVATION	
	Per Year
number of waterings	145
gallons used per plant	58
gallons used per 3400 Plants	197,744
ACRE-FEET	0.61
*based on 1 gal/hr water rate per Plant	

In addition to growing cannabis, Wild Coast allocated part of the land for sheep grazing (2016-2018). Sheep grazing occurred on approximately 1 acre of land and demanded water usage of approximately 630 GPD or 0.71 AFY. The associated water usage for this operation is summarized in Table 3 below. The remainder of the land is composed of unirrigated cover crop. A location map which depicts the areas dedicated to these operations is presented in Attachment A.

Table 3. 2016-2018 Water Usage for Wild Coast Farms Sheep Grazing Practices

2016-2018 WATER USAGE FOR WILD COAST FARMS SHEEP GRAZING	
	Per Year
number of watering	64
gallon uses	230,400
acre-feet	0.71
*based on 3 GPH water rate/ emitter @ 3 Hrs of irrigation per week	

In addition to the historical water use described above, the on-site residential domestic water use was considered. Based on discussions with the property owner, Monsoon estimated that the historical total residential domestic usage is approximately 120 gallons per person per day. Based on the water summarized above, Monsoon estimates that the historical (Pre-Project) water usage on the subject property is approximately 1.92 AFY. A summary of the historical water usage, by category, is presented in Table 4.

Table 4. Historical Water Usage for Wild Coast Farms

HISTORICAL WATER DEMAND USAGE FOR WILD COAST FARMS CANNABIS CULTIVATION		
	GPD	**AFY**
Indica Cultivation	545	0.61
Sheep Grazing	630	0.71
Erosion Control	295	0.33
Domestic Use	240	0.27
Total Usage	1710	1.92

The combined historic water usage for the subject parcels is estimated to be 127.92 acre-feet.

FUTURE WATER USAGE

The future cannabis cultivation water usage on the Wild Coast property can be broken down into four categories.

- Indoor cultivation
- Nursery
- Processing
- Miscellaneous cannabis activities proposed onsite

Under the proposed expansion, approximately 12,000 plants will be incorporated into the flowering greenhouse, with a daily average water usage of 0.20 gallon/ day per plant, which equates to 2400 GPD or 2.69 AFY. Approximately 6400 plants will be incorporated into the nursery facility where the amount of water used during watering is 0.20 gallon/ plant and the average watering frequency is less than in the greenhouse. The nursery water usage is estimated to be 704 GPD or 0.79 AFY. In addition to the irrigation requirements of the plants, there will also be a relatively small volume of water used for the processing of cannabis and minor clean-up. The volume of water that is estimated for this use is approximately 10 GPD or 0.01 AFY. Lastly, additional general water uses for the cannabis facility including bathroom use and spraying down of hoops twice a year, are estimated to be 10 GPD or 0.01 AFY. A summary of the total estimated water usage for the proposed cannabis cultivation operation is presented in Table 5.

Table 5. Future Greenhouse Cannabis Population

ESTIMATED INDIVIDUALIZED CANNABIS PROCESSES WATER USAGE FOR WILD COAST FARMS CANNABIS CULTIVATION				
	Indoor Cultivation	Nursery	Processing	Other
Number of Plants	12,000	6,400	18,400	18,400
GPD	2400	704	10	10
GPY	876,000	256,960	3650	3650
AFY	2.69	0.79	0.01	0.01
Total Estimated Cannabis Water Usage				**3.50**

The estimated water use for cannabis crops on Wild Coast was compared to published estimates of water use on cannabis farms (Reference Jain Irrigation Article in Appendix D). Based on estimates from Jain Irrigation and the California Department of Fish and Wildlife, the water demand per plant can vary from 0.17 GPD to 6 GPD. This discrepancy is based on several factors including plant species, humidity, lighting, and temperature. Jain Irrigation estimates the daily watering demand within a greenhouse with temperatures between 70 and 80 degrees, an ET value of 0.18, and two 10-hour lighting cycles, to be 0.36 inches of water per day. Based on this estimation, assuming that each plant is within a 5-gallon pot with a diameter of 11 7/8 inches, the average water demand for a plant at Wild Coast would be 0.17 GPD. This estimate is close to the gallons per plant per day that is estimated by Wild Coast.

Based on information provided by the managers of Dohi Farms, there are no plans to increase (or decrease) the amount of annual irrigation water to be applied on the 60.24-acre parcel (APN 067-011-021) in the future. Therefore, the future water usage for the combined properties is estimated to be 124.5 acre-feet.

REQUIRED OFFSET

Based on the results of our analysis, Monsoon determined that the future water usage at the Wild Coast property is approximately 4.48 AFY (3.5 AFY from Cannabis operations, 0.71 AFY from Sheep Grazing, and 0.27 AFY from Domestic Use). Under the existing County regulations, Wild Coast will need to provide a 1:1 offset for any cannabis cultivation or operation, which accounts for an annual 3.50 AFY of water usage. The water usage by Dohi Farms on the adjacent parcel will remain unchanged and not require any additional offset.

WATER SUPPLY

Each of the two parcels which are the subject of this report are served by separate irrigation wells. The sole source of water that is supplied to the Wild Coast Operations comes from an existing well which is located on the southern property line of parcel APN 067-0011-021. A Project Location Map, with the supply well graphically depicted, is included in Appendix A. A water quality analysis of the source water was conducted by BSK Associates. The sampling plan included the collection of one 24-hour composite sample and multiple grab samples. The samples were tested for various organic and inorganic constituents. The results of the groundwater quality testing are presented in Attachment E. Based on the sampling results, the groundwater to be utilized by Wild Coast is suitable for cannabis irrigation.

A well pump test was performed by Pro-H_20 Drilling and Pump Company. The pump was operated over a 4-hour period to evaluate pumping capacity and associated drawdown. The results of the pump test are presented in Attachment F. The static water level within the well is 28 feet below ground surface. Under pumping conditions, the well-produced approximately 24 GPM with a drawdown of 8 feet. With an average demand of 3,126 GPD, the pump would only need to run for 2.22 hours at 23.5 GPM to meet the daily demand. Based on our review of the well pump testing results, it is our opinion that the well will supply sufficient water to meet cannabis operation and residential use.

The sole source of water that supplies the Dohi Farms row crop farming operation comes from an existing well which is also located on the southern property line of parcel APN 067-0011-021. The location of this well is graphically depicted the Location Map (Appendix A).

WATER OFFSET STRATEGIES

Effective on December 31, 2017, the County of San Luis Obispo Board of Supervisors adopted Ordinance No. 3358, which is a permanent cannabis ordinance regulating commercial and personal cannabis cultivation in unincorporated areas of the county. The ordinance sets parameters for the number of permits to be issued for cannabis sites, the location and operation of cannabis sites, and the allowable water usage for cultivation.

Cannabis cultivation and nursery sites located in the Los Osos Groundwater Basin must offset their projected water use at a 1:1 ratio. Offsets can be achieved in the Los Osos Groundwater Basin area by:

- Retrofitting plumbing fixtures (toilets, showerheads, clothes washers, and faucet aerators) within the same groundwater basin; and/or

- Removing existing crops on-site.
- Other means of approved 1:1 offset

Based on water offset strategies that are acceptable in the Los Osos Groundwater Basin, Monsoon looked at viable offset alternatives. Monsoon evaluated replacing Wild Coast existing toilet and shower head on the property with modern water efficient fixtures. Mr. Kirchner's current washing machine is listed as an energy star water efficient washing machine, therefore it was not included in the offset proposal. A summary of the allowable water credits associated with the replacement of toilets and shower heads is summarized in Attachment G. Table 6 identified retrofit offset associated with plumbing fixtures.

Table 6. WILD COAST FARMS RETROFIT OFFSET

WILD COAST FARMS PLUMBING FIXTURES							
Item	total amount	Current Rate	Proposed Rate	Single Credit -Gallons Saved/Day	Total Credit - Gallons Saved/Day	Total Credit - Gallons Saved/Week	Total Credit - Gallons Saved/Year
toilets	1	(3.5 gallons/ flush)	(0.8 gallons/ flush)	30	30	210	10,920
showers	1	(2.5 gallons/ minute)	(1.0 gallons/ minute)	11	11	77	4,004
Acre-Feet/Year							0.046

Based on a meeting with Jan Dileo and Kylie Hensley of SLO County, sheep grazing was identified as a possible means of offset method. Table 3 identifies number of acre-feet of offset that can be associated with sheep grazing based on amount currently used as a water demand.

Monsoon and Mr. Kirchner looked at Reverse Osmosis (RO) permeate pumps as a mean for offset. Most homes in the Los Osos Basin contain general RO systems to reduce TDS for drinking water, dishwasher, and ice maker. Typical RO system waste eight to ten gallons per gallon of product water produced. An efficient and cost-effective way of reducing amount of waste to produce product water is to install a permeate pump into an existing undercounter RO system. The permeate pump uses the wasted energy of the RO reject water pressure to drive the product water into the storage tank against the back pressure of the air bladder. This enables the product water to be made against little to no backpressure. The storage tank is filled 2 to 4 times faster with the permeate pump and this shuts off the RO reject sooner, saving water. For a graphic representation of an in-home system with and without permeate pumps for a RO system, refer to attachment H. The permeate pump can be retrofitted in most in-home RO systems. In a study conducted by Van Newenhizen and Associates, Inc *efficiency in current point of use water treatment*

systems (2011), it was confirmed that inputting a permeate pump can reduce the wastewater stream by nearly 80%. A copy of the study is attached in Attachment I.

Mr. Kirchner tested a RO system in Los Osos, using the APEC RO-90 System without a permeate pump and with Aquatec ERP 1000 Model permeate pump. The RO system is a 3-year old unit with 10-month-old filter, using municipal water at 54 PSI. The RO water was sampled at 4, 8, and 16 ounces. To determine pump efficiency, consecutive product water and brine water volumes were measured. This was done with and without the pump attached.

The RO system drain line was detached to measure the brine water volumes. The countertop RO faucet was dispensed to measure the product water volumes. When product water is dispensed at the RO faucet, the pressure in the product water tank decreases. This pressure decrease causes the RO system to begin filling the tank and thus discharge brine water to the drain line. There is a small variability in the exact pressure at which the tank begins refilling. Thus, product water samples can be taken without a corresponding refill of the tank. This can result in a zero-value measurement of brine production for certain samples. If multiple uniform product water samples and corresponding brine water measurements are taken consecutively, the data can then be averaged to determine true product to brine ratio. The results indicated, on average, the RO system without a permeate pump, produced a 10:1 ratio of waste to product water. The permeate pump produced a 4.5:1 ratio of waste to product water. The results confirm the study conducted by Newenhizen and Associates, INC in 2011. Table 7 and 8 detail the study conducted by Mr. Kirchner.

Table 7. RO System Without Permeate Pump

RO System Without Permeate Pump															
	Brine Effluent (Oz)														
Sample Size (Oz)	**Sample #**	1	2	3	4	5	6	7	8	9	10	11	12	13	Avg.
4		0	0	132	0	11	32	12	78	58	114	0	0	184	47.8
8		97	68	0	150	0	128	100	72	82	114				81.1
16		152	134	158	162										151.5
* system wastes, on average, 10x the amount to produce desired product															

Table 8. RO System with Permeate Pump

RO System with AQUATEC ERP 1000 Permeate Pump												
	Brine Effluent (Oz)											
Sample Size (Oz)	**Sample #**	1	2	3	4	5	6	7	8	9	10	Avg.
4		0	22	2	40	0	28	0	38	32	17	17.9
8		44	17	48	32	40	12	64	14	12	60	34.3
16		88	42	80	78							72
* system wastes, on average, 4.5x the amount to produce desired product												

The average number of residents per household in Los Osos is 2.45 people. It can be safely assumed, the average daily amount of RO water used for dishwasher is 4 gallons, 1 gallon for drinking water, and 1 gallon for ice making. If a household consumes a total of 6 gallons per day of RO water, it would take 60 gallons of wastewater to produce it. With the permeate pump, it would only take 27. This saves a household 33 gallons per day. To meet offset requirements, it will require approximately 95 permeate pump to be installed in homes within Los Osos Groundwater Basin to meet SLO County offset requirements. Table 9 summarizes details below.

Table 9. Permeate Pump Water Saving

Permeate Pump Offset		
	Without Permeate Pump	With Permeate Pump
Product water/day (gal)	6	
wasted water/day (gal) 1 system	60	27
wasted water/day (gal) - 95 systems	5700	2565
Total water saved/ day (gal) 95 systems		3135

CONCLUSION

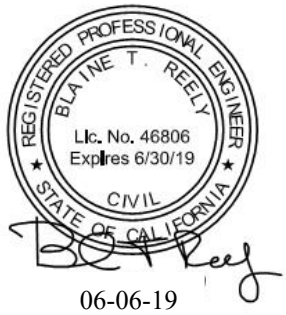
Based on the results of our analysis, Monsoon recommends that Wild Coast install permeate pumps to existing RO systems within the Los Osos Groundwater Basin as a mean for offset strategies. Monsoon recommends that Wild Coast place 100 permeate pumps within the Los Osos Groundwater Basin. A summary of proposed offset can be seen below.

Table 10. Wild Coast Farms Offset Proposal

WILD COAST FARMS OFFSET PROPOSAL		
	Proposed Cannabis Water Usage (AC-FT/YR)	Offset (AC-FT/YR)
18,400 Plants	3.50	
Permeate Pumps		3.85
Total	3.50	3.85
Offset Remaining		0.00

This requirement meets the needs of water offset required by SLO County. If you have any questions or require additional information, please do not hesitate to contact me.

Sincerely,



06-06-19

Blaine T. Reely, PhD, PE

Attachments:

ATTACHMENT A: Project Location Map
ATTACHMENT B: Los Osos Groundwater Basin Map
ATTACHMENT C: County of SLO Information Hold Letter
ATTACHMENT D: Jain Irrigation Article: Water Demands for Cannabis
ATTACHMENT E: Groundwater Test Results
ATTACHMENT F: Pump Test Results
ATTACHMENT G: Title 19: Los Osos Retrofit Credit Table
ATTACHMENT H: RO System + Permeate Pumps (W/ or W/ out Hydraulic Shut Off Valve)
ATTACHMENT I: Efficiency Study on In-House/ Water System

ATTACHMENT A: PROJECT LOCATION MAP

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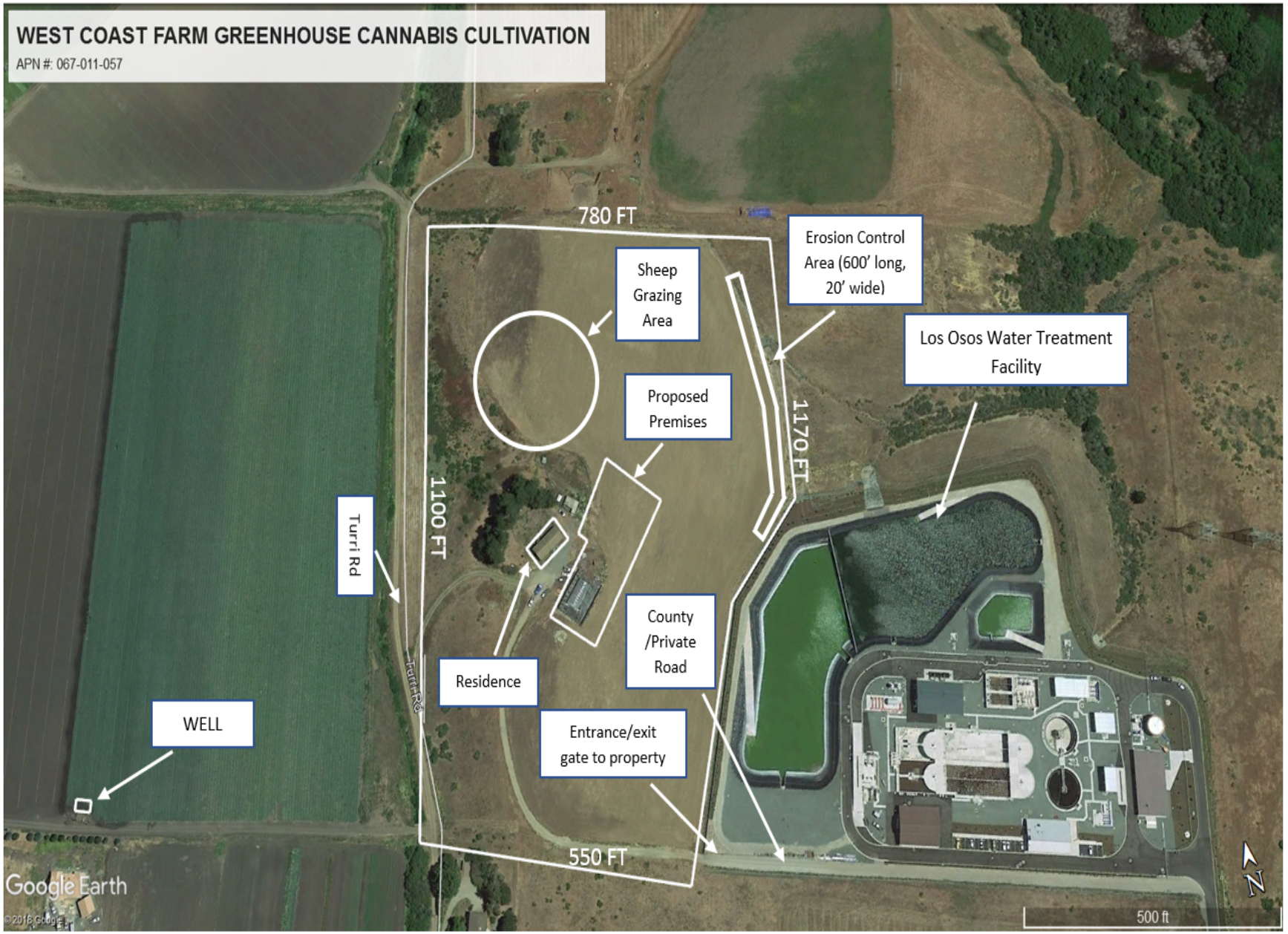
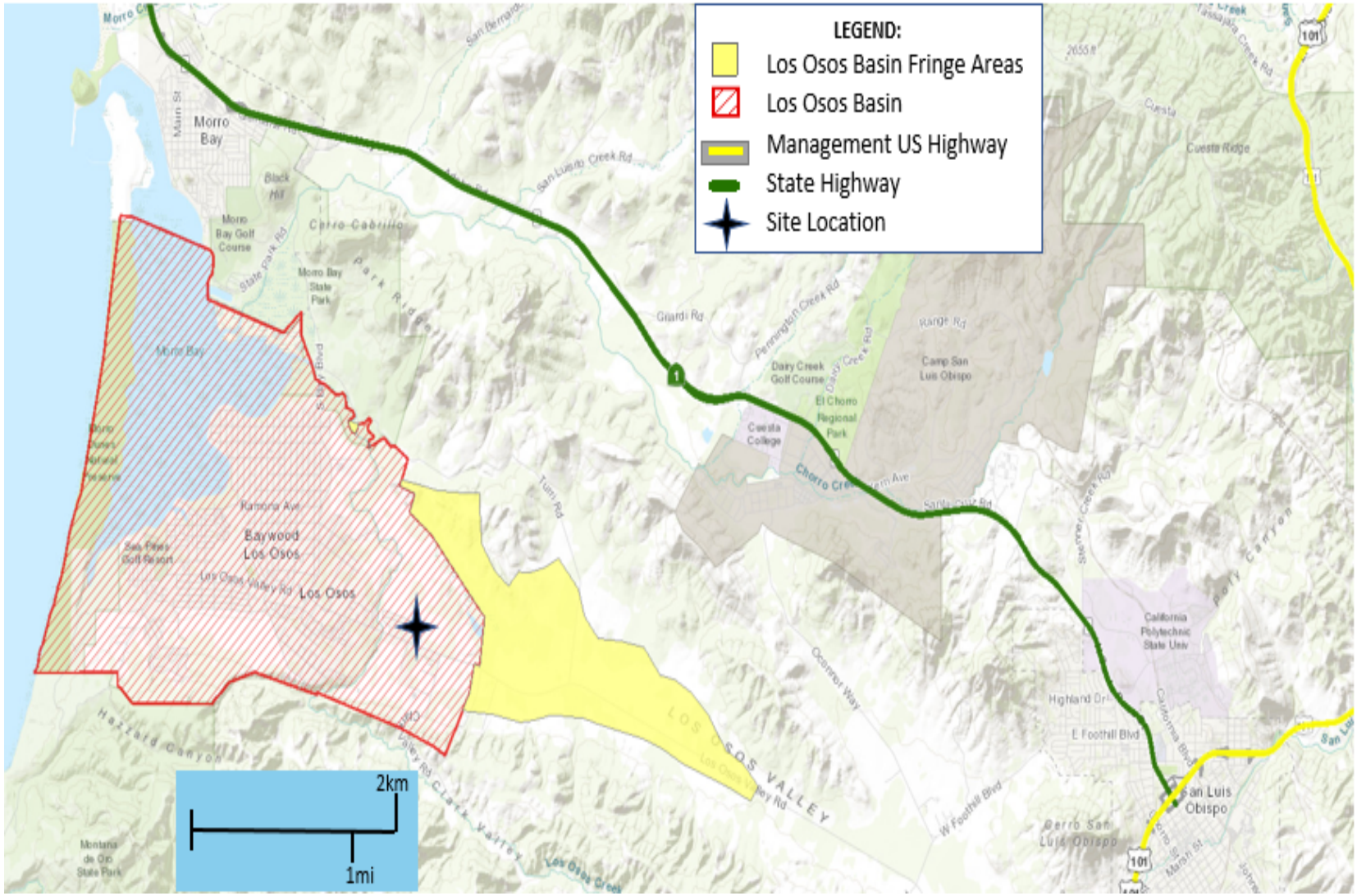
Location Map

2019.03.002 - Wild Coast Farms


WEST COAST FARM GREENHOUSE CANNABIS CULTIVATION
APN #: 067-011-057
780 FT
Sheep Grazing Area
Erosion Control Area (600' long, 20' wide)
Los Osos Water Treatment Facility
Proposed Premises
1170 FT
1100 FT
Turri Rd
Turri Rd
County /Private Road
Residence
WELL
Entrance/exit gate to property
550 FT
Google Earth
500 ft
N

ATTACHMENT B: LOS OSOS GROUNDWATER BASIN MAP


LEGEND:
Los Osos Basin Fringe Areas
Los Osos Basin
Management US Highway
State Highway
Site Location
Morro Bay
Los Osos
Baywood
Los Osos
LOS OSOS VALLEY
San Luis Obispo
Cuesta College
Camp San Luis Obispo
California Polytechnic State Univ
2km
1mi

ATTACHMENT C: COUNTY OF SAN LUIS OBISPO – INFORMATION HOLD LETTER

COUNTY OF SAN LUIS OBISPO
DEPARTMENT OF PLANNING & BUILDING
TREVOR KEITH, *DIRECTOR*

January 14, 2019

Adam Kirchner
2198 Los Osos Valley Road
Los Osos, CA 93402
Via email: info@wildcoastfarm.com

Subject: Information Hold Letter – DRC2018-00215 (Souza)

Your application has been reviewed by the Department of Planning and Building, and the information that is on the attached list is required before it can be accepted as complete for processing, as required by California Government Code Section 65943.

You can help expedite the review process by making sure all the information listed below is submitted at one time, and that the re-submittal package has the project number on a cover sheet. If the requested information is not received within 90 days of this letter, your application will be deemed withdrawn (pursuant to Section 22.64.030B of the Land Use Ordinance).

Upon the submittal of this information your application can be accepted as complete for processing and staff will begin its environmental determination pursuant to the California Environmental Quality Act (CEQA). During the environmental review process, you may be asked to provide additional information. The Environmental Division will contact you if additional information is needed.

Your application is subject to a discretionary review process. A discretionary permit requires the review and approval of the Administrative Hearing Officer, the Subdivision Review Board, the Planning Commission or the Board of Supervisors. A discretionary permit may be approved, approved with conditions or denied. Application for a discretionary permit does not guarantee approval, whether a project complies with all applicable standards or has been recommended for approval. All decisions on discretionary permits can be appealed to the Board of Supervisors, who will then make the final decision on the project.

If you have any questions, please contact me at (805) 781-5625. I would suggest once you have reviewed this letter, we schedule a meeting to discuss the items requested.

Sincerely,

Jan DiLeo

Jan DiLeo, Project Manager

cc. John Giacomazzi, 127 2nd Street, #1, Los Altos, CA 94022
Jerad Souza, Wild Coast Farms, 2198 Los Osos Valley Road, Los Osos, CA 93402

A. Items Required for Acceptance. Based upon preliminary review, the items in this list are required before your project can be accepted as ***complete for processing***. Please make sure the project's resubmittal includes all the information indicated below.

1. Clarifications:

a. Project Description/Project Plans. More clarity is required in your project description and plans. The current documents are unclear regarding the type of structures proposed and specifically what cannabis activities are proposed within these structures.

1. *Greenhouses Versus Hoop Houses.* You note "greenhouses" for proposed cultivation and nursery area on your site plans; however, in your project description you also discuss two 16' x 100' well built hoop structures for baby plants. Please note, hoop houses are considered outdoor cultivation and/or an outdoor nursery. No electrical (lights, etc.), no drying, no processing, etc. is allowed within a hoop house. Greenhouses are considered indoor cultivation and/or indoor nursery. Greenhouses (with a "U" occupancy) allow indoor cultivation and drying; however, no processing, manufacture, etc. Please clarify on your plans and within your project description exactly what structures are proposed and what is proposed within those structures (e.g., cultivation, drying, processing, manufacturing, dispensary, nursery, etc.).
2. *Existing Greenhouses 1, 2, & 3.* You indicate these greenhouses as existing; however, our records show no existing greenhouses in this area. Please correct this on the site plan. For all existing and proposed structures please indicate their proposed use, i.e., cannabis cultivation, cannabis nursery, etc. See Attachments 1, 2, and 3.
3. *Future Greenhouses.* The plans indicate a "potential future 25,000 square foot greenhouse site". If you want this component considered as part of this permit, then it should be included in the project description and clarified on the project plans, i.e., indicate the greenhouses as proposed and their intended use (i.e., indoor cultivation, nursery, etc.). If this is not part of the current permit, then this reference should be removed from the plans.
4. *Existing & Proposed Structures.* The existing structures (barns, etc.) need to be clarified in terms of what use they will have in the future and whether it will be related to cannabis. In addition, the "future barn" should also be clarified in terms of the proposed future use.

   A building permit and consistency with the County's Building Code is required for an ag-exempt barn and outbuildings if these buildings are proposed to be used for drying, processing, or manufacturing of cannabis. Proposed storage facilities may also require a building permit depending on what items are stored within the structure. Staff would suggest you meet with the Building Division to determine

what buildings will best serve your needs. Once you have determined the various buildings and structures pertinent to your project, these buildings must be a part of your plans and project description.

5. *Existing Residence*. The Cannabis Ordinance does not allow cannabis activities within a residence. It is noted in the project description the farm office is located within the residence. For the cannabis operation another location is necessary. This should be corrected in the project's resubmittal.

b. Lighting. The Cannabis Ordinance provides lighting standards for each cannabis activity. Please review the project's proposed lighting and include a description of lighting for security and other purposes for each cannabis activity proposed onsite (in addition to what is provided in your attachment 5). This information should be provided in the project description and on the project plans.

c. Employees/Traffic. Thank you for the traffic generations figures. Please note, these trip generation figures indicate "manufacturing" and cannabis drying and curing as activities proposed onsite. Currently the project description does not include these activities. Again, all documents need to be consistent. As noted above, please clarify all cannabis activities proposed onsite within the project description and on the project plans. For each *cannabis activity* (i.e., outdoor cultivation, indoor cultivation, nursery, processing, manufacturing, deliveries, etc.) indicate the number of employees associated with that activity throughout the year. If you anticipate 3 to 4 harvest per year, also indicate the additional employees that may be necessary and/or extended hours during certain times of the year. Currently the application indicates 15 employees and hours of operation as 8 am to 5 pm. Please update this information and indicate:

1. The hours of operation for each cannabis activity,
2. The number of part-time and full-time employees associated with that cannabis activity,
3. Other employees (not associated with a cannabis activity) such as security personnel,
4. The number of trucks or vehicles associated with the delivery of goods (soil amendments, fertilizer, etc.) for cannabis,
5. The number of trucks or vehicles associated with deliveries from the site for each cannabis activity,
6. Other traffic or visitors not listed above associated with that cannabis activity.
7. Other agricultural uses that will remain onsite (not associated with cannabis). Please provide the number of existing employees and the hours of operation for these existing uses.

d. Fencing & Gates. The cannabis ordinance requires fencing for most cannabis activities and/or for security purposes. In order to evaluate the consistency of proposed fencing/gates please show existing (that will remain) and proposed fencing/gates on the project plans and provide an elevation of proposed and existing fencing.

2. ***Project Description.*** Please provide a project description that summarizes all cannabis activities proposed onsite (i.e., indoor cultivation, outdoor cultivation, drying, processing, manufacturing, nursery, etc.). The project description should be consistent with the project plans.
3. ***Project Statistics.*** Please provide the information indicated in Attachment 1. This information should also be used for the project plans and project description.
4. ***Project Site Plan***. Please see Attachment 2 for a list of items that should be included on the project site plans.[1] Staff would suggest you use Attachment 1 as the basis for your project description and for the cannabis activities shown on the plans. If cannabis drying, processing (trimming, curing, etc.), manufacture, transport, etc. are proposed onsite they must be indicated in order to be considered as part of your permit.
5. ***Elevations/Floor Plans***. Please see Attachment 3 for a list of elevations / floor plans that should be provided.[1]
6. ***Project Plans (Security, etc.)***. Please see Attachment 4 for various plans you will need to provide. If you have questions regarding the components of these plans, I can provide you with examples.

7. **Other Documents:** Please provide the following items:
   a. Real Time Billing Form. Please complete and sign the attached Cost Accounting Agreement. This agreement indicates the applicant will pay for the costs associated with application/permit processing.
   b. Easement for Access. A copy of the site's access easement from Los Osos Valley Road. The document is necessary to verify access rights and restrictions.
   c. Revised Project Description & Other Documents. If changes are made to your project as a result of the new information you provide, please revise your project description and associated plans (if relevant).
   d. Revised Application (Pages 4 and 5 of 16). Page 4 of 16 indicates John Giacomazzi as the property owner. Page 5 of 16 indicates Ronald Kline as the property owner and his signature on the Consent of Landowner form. Please correct and make these forms consistent.

8. **Modifications.** The project plans and description are not sufficient to determine if you are requesting any cannabis code modifications. If the applicant wishes to pursue any modifications additional information should be provided that clarifies why the applicant cannot meet the pertinent code section. Staff will then evaluate the response.

9. **Reports**.
   a. Cultural Report. A cultural report may be necessary for this project. It appears this site was part of the mitigation area for the Los Osos Wastewater Project. Staff is still reviewing whether a report from the applicant is necessary.
   b. Biological Report. The application includes a proposal for a biological assessment from Kevin Merk. Has the applicant begin work on a biological assessment?

B. **Items Required before your project is scheduled for a hearing.** The applicant should apply for a local business license before the project may be scheduled for a public hearing. Planning is provided with data as part of this process. This data must be provided to Planning staff before the project's staff report is completed.

C. ***Agency Review/Input***. Once the County receives the information indicated above, it will be circulated to other agencies, including County Fire/Cal Fire, Environmental Health, CalTrans, Agricultural Commissioner, Regional Water Quality Control Board (RWQCB), Tribal Consultation, and CDFW. Please note, once Planning staff and the agencies noted above review your new information, additional information or modifications to the requests above may be required.

Attachment 1
Project Statistics/Information

Please complete the information provided below. I interpreted the data provided on your site plan and in your project description. In some incidences I was unsure what was proposed and thus the information provided below should be corrected. I would suggest once you complete the information that these tables and the item number also be used in your legend and on the site plan(s).

Please note that existing facilities (i.e., barns, water tanks, etc.) will be evaluated as part of this permit. If you have information regarding permits obtained for "existing" facilities that would be helpful and/or may be required. A proposed change in use (for example, use of an ag-exempt barn for cannabis drying and curing) will likely require a building permit and/or upgrades for the change in use of that structure.

In addition, please clarify below whether the proposed nursery would be self-supporting or whether it would serve other cannabis facilities.

#	Proposed Outdoor Cultivation Item Cannabis	Acres*
1	Outdoor Area within Hoop houses (#1)	
2	Outdoor Area within Hoop houses (#2)	
3	Outdoor Area within Hoop houses (#3)	
Total		

Notes: **Outdoor cultivation may not exceed two acres gross.

#	Proposed Indoor Cultivation Item Cannabis	Square Footage Proposed**
4	Greenhouse 1	2,880
5	Greenhouse 2	2,880
6	Greenhouse 3	2,880
7	Greenhouse 4 (convert existing?)	
Total		

Notes: **Indoor cultivation may not exceed 22,000 sf gross.

#	Nursery Area for Cannabis***	Square Footage Proposed
8	Nursery Area Greenhouse (indoor)	
9	Nursery Area Hoop Houses (Outdoor)	
Total		

Notes: ***Nursery items would be used for onsite cannabis only, i.e., the nursery would be self-supporting to the onsite cannabis operation.
****Nursery would serve other cannabis operations located off-site.

#	Other Items Used / Proposed for Cannabis Activities	Square Footage Proposed
10	Existing Ag Barn processed for ????	1,472
11	Existing outbuildings? proposed for ???	???
12	Parking Area	???
13	Future Barn proposed for ???	???
14	Water Storage Tank (S?)	
15	Water well	
16	Composting Area	
17	Waste (trash / recycling) Area	
18	Drying (where?)	
19	Processing (curing, trimming, rolling, storing, packaging, and labeling of nonmanufactured cannabis products.	
20	Office Area (where?)	
21	Manufacturing (where?)	
22	Dispensary (where?)	
Total		

#	Other Items Existing Onsite – ***NOT*** Used for Cannabis	Square Footage Proposed
23	Existing Manufactured Residence (#1)	1,620
24	Existing Greenhouse for ???	???
25	Open Field Areas proposed for ???	
26	Septic System	
27	Chicken / Sheep Farming	13.6 acres
Total		

Attachment 2
Project Site Plan

Please make sure the project's resubmittal includes plans that include all the information indicated below, the information is clearly delineated, and that the information is provided at a scale that allows staff to adequately review project details /components. Please note, the project plans serve as a record of what is proposed and what eventually may be approved. If the plans are unclear there may be confusion regarding proposed project components. Plans should be prepared by a licensed professional.

1. Buffer Map. A buffer map (on a recent aerial) that shows uses within 1,000 feet of the site's property line. The distance (1,000 feet) should be clearly indicated on the plan along with roadways and other prominent features located adjacent to or within the 1,000-foot buffer. Within the 1,000-foot buffer the plan should label the distance to adjacent residences and/or items such as parks, schools, or daycare (if relevant).
2. Overall Site Plan. This plan may be generalized and may be a smaller scale. It should clearly delineate the items noted below and include:
   a. A map legend. The map legend should list "proposed" and "existing" facilities and should be consistent with Attachment 1. Existing facilities include items such as a residence, barn, etc. All existing and proposed facilities/components *should* be within the legend, labeled as "existing" or "proposed", and clearly depicted on the overall site plan. When facilities (including cultivation) are proposed near existing trees, include a symbol for existing trees within the legend and indicate the type of tree the symbol represents. Staff would suggest you use the information from Attachment 1 as your map legend and/or Project Statistics and that these be provided on each sheet of the site plan.
   b. The entire parcel with the site's property line and dimensions of the project site (parcel) clearly indicated.
   c. Existing and proposed uses onsite clearly labeled along with the square footage or acreage of that use indicated. You may provide the size of existing and proposed facilities/activities on the legend, on the plan sheet, or on separate project statistics. It should be clear whether *indoor cultivation*, *outdoor cultivation*, *indoor nursery*, or *outdoor nursery* is proposed. Other cannabis activities, such as processing, manufacturing, office area, etc. should be clearly labeled.
   d. Setbacks proposed from project components to property lines and to native trees, etc.
   e. Creek corridors (top of bank and riparian) delineated and clearly labeled (if applicable).[1]
   f. All adjacent roadways label. Label the roadway name, its surface, and width. Show where the site would take access from the adjacent roadway.

[1] Label the creek corridor(s) on the project plans and show the setback proposed from top of bank or the riparian corridor (whichever is greater). If there is no upland vegetation, generally a 50-foot setback from top of bank should be provided (Section 22.40.050 (D)(3)(d)). The associated floodplain of that creek should be shown as well. Wetlands should also be similarly denoted along with a minimum 100-foot setback from proposed uses/facilities any wetland. Please note this information affects your project's environmental review.

g. The site's interior access clearly labeled as well as access to project components. The plans should indicate the width and surface of the interior access and any proposed improvements and/or widening.
h. The location and extent of easements onsite. The plans should depict and label the easement and provide a copy of the easement in order to verify what is allowed within the easement area.
i. Site topography (overall) with contour lines provided and labeled.
j. The floodplain of creek and/or wetland areas (if applicable).
k. The site's fencing plan. If different types of fencing are proposed indicate this in the legend and on the plans.
l. Storage, composting, Trash/Recycling and other similar areas. The cannabis ordinance requires information how and where items such as pesticides, fertilizers, fuels, etc. will be stored. Please provide information regarding storage, composting site(s), and waste and recycling sites in the project description and on the project plans.
m. The location of equipment such as a generator. If a generator or other equipment is proposed, please include it in the project description and show where it will be located on the plans.
n. Site information such as the parcel number, address, owner, parcel acreage, etc.
o. If applicable, the location of larger scale (or blow-up) area plan sheets. Clearly label the sheet in terms of what layout it provides. For example, it may be helpful to provide a blow-up of the center of the site in order to more clearly see what is proposed in that area.

3. Larger Scale or Blow-up Plan Sheets. These sheets should contain a map legend (as noted above) and provide a larger-scale drawing(s) in order to clearly depict and/or label:
   a. The location of native trees onsite and the setback proposed to project components from the tree canopy.
   b. Proposed facilities (e.g., cannabis cultivation, greenhouse, nursery, processing, manufacturing, etc.) and the distance of that facility from resources (such as the canopy of native trees, etc.).
   c. Items such as parking area(s). This plan should indicate parking access, space dimensions, number of parking spaces proposed, and proposed surfacing.
   d. Items such as fencing, lighting, security measures (such as cameras, etc.), generators, etc.
   e. Topography in areas proposed for disturbance. Contour lines for areas proposed for improvements and/or disturbance should be provided. The contour lines should be clearly labeled and not exceed 5' intervals.
   f. The location of prime soils onsite and the location of proposed permanent structures such as greenhouses, nursery, etc.
   g. Access to individual components.
   h. The distance between nursery or other buildings/structures.
   i. The dimensions of items such as hoop houses, outdoor cultivation areas, indoor cultivation, etc.
   j. Site information such as the parcel number, address, owner, parcel acreage, etc.

4. Preliminary Drainage Plan. The proposed project includes permanent structures as well as potential terrain or drainage changes. Please include a preliminary drainage and erosion control plan. Drainage plans should clearly indicate any drainage proposed to wetland or creek areas.

5. Sheet Notes. For items not proposed, provide a note on each sheet of the project plans. For example, if no grading, lighting, road improvements are proposed indicate this in the project notes on the plan sheets.

Attachment 3
Elevations/Floor Plans

Provide elevations for the following with the color, height, and materials clearly indicated. Please make sure the plan sheet is labeled (for example, the plan sheet indicates the structure that is represented in the drawing):

1. *Outdoor Lighting - Elevations*. Proposed outdoor lighting including locations and type of lighting proposed. If different types of lighting are proposed, please indicate this on the plans. The project description and/or the plans should indicate the hours of operation for the various outdoor lighting. Elevations should be provided for lighting fixture including items such as security and/or motion detection lighting.
2. *Fencing & Gates - Elevations*. Provide elevations for the fencing and gates that are existing and proposed around facilities and the project site. If project fencing is not consistent with the Cannabis Ordinance, then a modification should be requested.
3. Buildings such as *greenhouses, processing facility, manufacturing facility – Elevations and Floor Plans*. Dimensions and height should be clearly labeled along with proposed colors and materials. If proposed, office, processing, manufacturing area, etc. should be shown on the floor plans.
4. *Hoop houses, Shade Structures – Elevations and Floor Plans*. Dimensions and height should be clearly labeled along with proposed colors and materials.
5. *Building Proposed for Storage – Elevations and Floor Plans.* Dimensions and height should be clearly labeled along with proposed colors and materials. If a use(s) is proposed in an existing structure, this should be clearly indicated. If proposing storage, indicate on the floor plan the different areas for storage (items such as shovels, farm implements, versus items such as fertilizers, pesticides, etc.).

Attachment 4
Required Cannabis Plans

Provision of the following plans. The cannabis ordinance requires the following plans for each activity proposed on a site. If you have questions regarding the content of these plans, please

contact me for assistance. Although some of these items are mentioned in your application, the information is not very thorough. Please provide the following plans either as part of your project description or as a separate plan.

a. *Security Plan.* This plan describes the security measures (both physical and operational) proposed onsite for each cannabis activity. It includes items such as cameras, lighting, alarms, fencing, etc.
b. *Odor Management Plan*. The cannabis ordinance requires that all cannabis activities be sited and/or operated in a manner that prevents cannabis nuisance odors from being detected offsite. This plan describes how the outdoor cultivation/nurseries will be sited to reduce odors and the planned equipment for indoor cannabis activities (ventilation controls, carbon scrubbers, etc.) in order to avoid nuisance odors offsite.
c. *Parking Plan*. This plan discusses the number of employees throughout the year associated with each cannabis activity and then determines the number of parking and loading spaces necessary for the project. The physical layout of proposed parking, including parking access, should be on the project's site plan as well.
d. *Employee Safety & Training Plan*. This plan indicates the training employees will receive in terms of site security and safety. In addition, it includes measures that will be implemented onsite for employee safety.
e. *Neighborhood Compatibility Statement & Plan*. Provide a statement on neighborhood compatibility and a plan for addressing potential compatibility issues.
f. *Waste Management Plan*. Cannabis activities shall provide solid waste and recycling collection consistent with Sections 22.10.050.B & C. In addition, any waste water should be discussed within this plan.
g. *Water Management Plan*. A detailed plan that includes the proposed water supply, proposed conservation measures, and any water offset requirements. Your project is located within the Los Osos Groundwater Basin. The Cannabis Ordinance, Section 22.40.050 D 5 requires the applicant to provide an estimate of water demand prepared by a licensed professional engineer or other expert on water demand as approved by the County's Planning Director, and a detailed description of how the new water demand will be offset. For each project cannabis component/activity please provide a water use estimate from a "licensed professional engineer" or "other expert". Also have the "expert" identify if and how offsets can be provided onsite.
h. *Sign Information*. The application must indicate the size, height, color, and design of any proposed signs onsite.
i. *Energy Source/ Information*. The source of energy onsite (all proposed sources) and anticipated energy use. If a generator is proposed, this should be clarified in this information and provided in the project description and on the project site plan. Fuel for the generator should also be listed in the storage and hazard response plan.
j. *A storage and hazard response plan*. This plan must provide a list of all pesticides, fertilizers, and any other hazardous materials that will be kept onsite. The location for where these materials will be stored onsite should be indicated in the storage & hazard response plan and on the project's site plan.

ATTACHMENT D: WATER DEMANDS FOR CANNABIS CALCULATION VIA JAIN IRRIGATION

Water Demands for Cannabis

Tuesday, June 20, 2017 Michael Derewenko

Recently doing some legwork on a design request I found myself making incorrect assumptions about the water demands of Cannabis. The overall demand of the plant *is* a little misleading. While Cannabis does in fact require quite a bit of water it prefers the application be across a long period of time and evenly distributed above the root base. Fortunately for growers, application options are plentiful and automation has made the waiting game not quite as painful as it used to be. For the project at hand I decided to dig deeper...and put the findings on paper.

Starting from the top; Cannabis like any plant is constantly using valuable energy trying to grow a root base. To be sure there are no interruptions in growth we must provide the plant with a combination of nutrients and water. As the plant uses water to grow we are left with a depletion level that must be replenished. In simple terms the water used or burned up by the plant is the plant's Crop Coefficient. Knowing the Crop Coefficient of many comparable species to Cannabis we're given a value of 1.0. The Crop Coefficient combined with the environments, soon to be explained ET value, is going to help guide a grower down the path of efficiency.

The ET value of our growing environment is going to help determine how much water we should apply to refill our plants depletion. Figuring out the ET value of an indoor environment can be a bit tricky. Fortunately the same variables that apply to our outdoor environments also apply to our indoor environments. Along with a plants growth stage and maturity level; humidity, temperature and solar radiation are all things to consider when determining an ET value for your room. For reference it's currently 72 degrees in San Diego with a nice cool breeze and...ok sorry, and the Daily ET is .12. Not too far removed from coastal SoCal in Phoenix it is a very exciting 116 degrees, if I had to guess it's a dry air. Current ET in Phoenix? .33 This pattern tells us that with dryer, warmer air our plants need more water.

Understandably growers do their best to keep rooms cool and well ventilated but with most conventional lighting setups creating room temperatures between 70 and 80 degrees we will use .18 as our value. With the majority of humidity coming from irrigation and what the plants emit our ET value should be relatively low. In other words our Cannabis needs .18 inches of water per day to thrive.

"No way!"

- Naysayers

They are actually correct! Keep in mind, not all the water leaving your emission device is making it *into* the plant. Stay with me here; on average, drip irrigation has what we call a **DU** or Distribution Uniformity rate of .9, meaning 90% of the water leaving the device makes it where we need it to go. With environmental conditions eating away at 10% of our water and multiple lighting cycles expediting photosynthesis we'll now need to apply 2 X our previously calculated .18 demand.

Here is our formula:

1.0 x **.36** = .36 inches of water per day

1.0 is the Crop Coefficient of Cannabis

.18 x **2** = **.36** ET Value (based on **two** 10 hour lighting cycles)

.36 is the plants daily watering demand

We've now determined that Cannabis needs approximately .36 inches of water per day to replenish what the plant has used for energy. We can now move on to the fun part, the application of water!

ATTACHMENT E: GROUNDWATER QUALITY SAMPLING RESULTS

BSK Associates Laboratory Fresno
1414 Stanislaus St
Fresno, CA 93706
559-497-2888 (Main)
559-485-6935 (FAX)

A8B2052
3/01/2018
Invoice: A805733

Caitlin Galloway
Abalone Coast Analytical, Inc.
141 Suburban, Suite C-1
San Luis Obispo, CA 93401

RE: Report for A8B2052 Main Project - e COC MCL (Non-EDT)

Dear Caitlin Galloway,

Thank you for using BSK Associates for your analytical testing needs. In the following pages, you will find the test results for the samples submitted to our laboratory on 2/16/2018. The results have been approved for release by our Laboratory Director as indicated by the authorizing signature below.

The samples were analyzed for the test(s) indicated on the Chain of Custody (see attached) and the results relate only to the samples analyzed. BSK certifies that the testing was performed in accordance with the quality system requirements specified in the 2009 TNI Standard. Any deviations from this standard or from the method requirements for each test procedure performed will be annotated alongside the analytical result or noted in the Case Narrative. Unless otherwise noted, the sample results are reported on an "as received" basis.

If additional clarification of any information is required, please contact your Project Manager, Michelle Kawaguchi , at 559-497-2888.

Thank you again for using BSK Associates. We value your business and appreciate your loyalty.

Sincerely,

Michelle Kawaguchi

Michelle Kawaguchi, Project Manager

Accredited in Accordance with NELAP
ORELAP #4021-009

BSK ASSOCIATES

Case Narrative

Project and Report Details		Invoice Details	
Client:	Abalone Coast Analytical, Inc.	**Invoice To:**	Abalone Coast Analytical, Inc.
Report To:	Caitlin Galloway	**Invoice Attn:**	Caitlin Galloway
Project #:	18-0995 Adam Kirchner	**Project PO#:**	-
Received:	2/16/2018 - 17:15		
Report Due:	2/27/2018		

Sample Receipt Conditions

Cooler: Default Cooler Initial receipt at BSK-FAL

Data Qualifiers

The following qualifiers have been applied to one or more analytical results:

BS	Blank spike recoveries did not meet acceptance limits.
BS1.0	Blank spike recovery for this analyte was biased high; no material impact on reported result as sample is ND for this parameter.
HT1.0	Holding time exceeded. Sample was received at the lab past holding time.
MS1.0	Matrix spike recoveries exceed control limits.

Report Distribution

Recipient(s)	Report Format	CC:
Caitlin Galloway (reports)	MCL.RPT	

Certificate of Analysis

Sample ID: A8B2052-01
Sampled By: Adam Kirchner
Sample Description: Faucet/Hose Bib

Sample Date - Time: 02/09/18 - 11:30
Matrix: Drinking Water
Sample Type: Grab

BSK Associates Laboratory Fresno

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	MCL	Batch	Prepared	Analyzed	Qual
Aggressive Index		**13**					A802778	02/28/18	02/28/18	
Alkalinity as CaCO3	SM 2320B	**410**	3.0	mg/L	1		A802255	02/18/18	02/18/18	
Bicarbonate as CaCO3	SM 2320B	**410**	3.0	mg/L	1		A802255	02/18/18	02/18/18	
Carbonate as CaCO3	SM 2320B	ND	3.0	mg/L	1		A802255	02/18/18	02/18/18	
Hydroxide as CaCO3	SM 2320B	ND	3.0	mg/L	1		A802255	02/18/18	02/18/18	
Chloride	EPA 300.0	**82**	1.0	mg/L	1		A802238	02/16/18	02/16/18	
Conductivity @ 25C	SM 2510B	**1100**	1.0	umhos/cm	1		A802255	02/18/18	02/18/18	
Langelier Index	SM 2330B	**1.1**					A802818	03/01/18	03/01/18	
MBAS, Calculated as LAS, mol wt 340	SM 5540C	ND	0.050	mg/L	1		A802226	02/16/18 16:55	02/16/18	HT1.0
Nitrate as N	EPA 300.0	**0.97**	0.23	mg/L	1	10	A802238	02/16/18 21:30	02/16/18	HT1.0
Orthophosphate as PO4	EPA 300.0	**2.7**	0.60	mg/L	1		A802238	02/16/18 21:30	02/16/18	HT1.0
pH (1)	SM 4500-H+ B	**8.1**		pH Units	1		A802255	02/18/18	02/18/18	
pH Temperature in °C		**23.6**								
Sulfate as SO4	EPA 300.0	**70**	1.0	mg/L	1		A802238	02/16/18	02/16/18	
Total Dissolved Solids	SM 2540C	**630**	5.0	mg/L	1		A802369	02/21/18	02/26/18	HT1.0

Metals

Analyte	Method	Result	RL	Units	RL Mult	MCL	Batch	Prepared	Analyzed	Qual
Boron	EPA 200.7	**0.13**	0.10	mg/L	1		A802367	02/22/18	02/26/18	
Calcium	EPA 200.7	**89**	0.10	mg/L	1		A802367	02/22/18	02/26/18	
Copper	EPA 200.7	ND	0.050	mg/L	1		A802367	02/22/18	02/26/18	
Hardness as CaCO3		**520**	0.41	mg/L						
Iron	EPA 200.7	ND	0.030	mg/L	1		A802367	02/22/18	02/26/18	
Magnesium	EPA 200.7	**71**	0.10	mg/L	1		A802367	02/22/18	02/26/18	
Manganese	EPA 200.7	**0.90**	0.010	mg/L	1		A802367	02/22/18	02/26/18	
Potassium	EPA 200.7	ND	2.0	mg/L	1		A802367	02/22/18	02/26/18	
Silver	EPA 200.7	ND	0.010	mg/L	1		A802367	02/22/18	02/28/18	
Sodium	EPA 200.7	**46**	1.0	mg/L	1		A802367	02/22/18	02/26/18	
Zinc	EPA 200.7	ND	0.050	mg/L	1		A802367	02/22/18	02/26/18	BS1.0

BSK Associates Laboratory Fresno

General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 300.0 - Quality Control											
Batch: A802238										Prepared: 2/16/2018	
Prep Method: Method Specific Preparation										Analyst: BCB	
Blank (A802238-BLK1)											
Chloride	ND	1.0	mg/L							02/16/18	
Nitrate as N	ND	0.23	mg/L							02/16/18	
Orthophosphate as PO4	ND	0.60	mg/L							02/16/18	
Sulfate as SO4	ND	1.0	mg/L							02/16/18	
Blank Spike (A802238-BS1)											
Chloride	100	1.0	mg/L	100		101	90-110			02/16/18	
Nitrate as N	22	0.23	mg/L	23		99	90-110			02/16/18	
Orthophosphate as PO4	16	0.60	mg/L	15		101	90-110			02/16/18	
Sulfate as SO4	100	1.0	mg/L	100		101	90-110			02/16/18	
Matrix Spike (A802238-MS1), Source: A8B1755-04											
Chloride	59	1.0	mg/L	50	8.8	101	80-120			02/16/18	
Nitrate as N	13	0.23	mg/L	11	1.9	98	80-120			02/16/18	
Orthophosphate as PO4	7.5	0.60	mg/L	7.7	ND	94	80-120			02/16/18	
Sulfate as SO4	62	1.0	mg/L	50	11	102	80-120			02/16/18	
Matrix Spike (A802238-MS2), Source: A8B1997-01											
Chloride	59	1.0	mg/L	50	8.3	102	80-120			02/16/18	
Nitrate as N	12	0.23	mg/L	11	1.0	99	80-120			02/16/18	
Orthophosphate as PO4	7.9	0.60	mg/L	7.7	ND	99	80-120			02/16/18	
Sulfate as SO4	54	1.0	mg/L	50	2.8	103	80-120			02/16/18	
Matrix Spike Dup (A802238-MSD1), Source: A8B1755-04											
Chloride	60	1.0	mg/L	50	8.8	103	80-120	2	20	02/16/18	
Nitrate as N	13	0.23	mg/L	11	1.9	100	80-120	1	20	02/16/18	
Orthophosphate as PO4	8.0	0.60	mg/L	7.7	ND	101	80-120	7	20	02/16/18	
Sulfate as SO4	63	1.0	mg/L	50	11	105	80-120	2	20	02/16/18	
Matrix Spike Dup (A802238-MSD2), Source: A8B1997-01											
Chloride	60	1.0	mg/L	50	8.3	104	80-120	2	20	02/16/18	
Nitrate as N	12	0.23	mg/L	11	1.0	101	80-120	2	20	02/16/18	
Orthophosphate as PO4	8.2	0.60	mg/L	7.7	ND	102	80-120	4	20	02/16/18	
Sulfate as SO4	55	1.0	mg/L	50	2.8	105	80-120	2	20	02/16/18	
SM 2320B - Quality Control											
Batch: A802255										Prepared: 2/18/2018	
Prep Method: Method Specific Preparation										Analyst: CEG	
Blank (A802255-BLK1)											
Alkalinity as CaCO3	ND	3.0	mg/L							02/18/18	
Bicarbonate as CaCO3	ND	3.0	mg/L							02/18/18	
Carbonate as CaCO3	ND	3.0	mg/L							02/18/18	
Hydroxide as CaCO3	ND	3.0	mg/L							02/18/18	
Blank Spike (A802255-BS1)											

BSK Associates Laboratory Fresno

General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
SM 2320B - Quality Control											
Batch: A802255										Prepared: 2/18/2018	
Prep Method: Method Specific Preparation										Analyst: CEG	
Blank Spike (A802255-BS1)											
Alkalinity as CaCO3	90	3.0	mg/L	100		90	80-120			02/18/18	
Blank Spike Dup (A802255-BSD1)											
Alkalinity as CaCO3	91	3.0	mg/L	100		91	80-120	1	20	02/18/18	
Duplicate (A802255-DUP1), Source: A8B1818-01											
Alkalinity as CaCO3	200	3.0	mg/L		210			1	10	02/18/18	
Bicarbonate as CaCO3	200	3.0	mg/L		210			1	10	02/18/18	
Carbonate as CaCO3	ND	3.0	mg/L		ND				10	02/18/18	
Hydroxide as CaCO3	ND	3.0	mg/L		ND				10	02/18/18	
SM 2510B - Quality Control											
Batch: A802255										Prepared: 2/18/2018	
Prep Method: Method Specific Preparation										Analyst: CEG	
Blank Spike (A802255-BS1)											
Conductivity @ 25C	1400	1.0	umhos/cm	1400		96	90-110			02/18/18	
Blank Spike Dup (A802255-BSD1)											
Conductivity @ 25C	1300	1.0	umhos/cm	1400		95	90-110	0	20	02/18/18	
Duplicate (A802255-DUP1), Source: A8B1818-01											
Conductivity @ 25C	510	1.0	umhos/cm		510			0	20	02/18/18	
SM 2540C - Quality Control											
Batch: A802369										Prepared: 2/21/2018	
Prep Method: Method Specific Preparation										Analyst: DEH	
Blank (A802369-BLK1)											
Total Dissolved Solids	ND	5.0	mg/L							02/26/18	
Blank Spike (A802369-BS1)											
Total Dissolved Solids	990	5.0	mg/L	1000		99	70-130			02/26/18	
Duplicate (A802369-DUP1), Source: A8B1566-01											
Total Dissolved Solids	190	5.0	mg/L		190			3	20	02/26/18	
Duplicate (A802369-DUP2), Source: A8B2137-03											
Total Dissolved Solids	140	5.0	mg/L		140			0	20	02/26/18	
SM 4500-H+ B - Quality Control											
Batch: A802255										Prepared: 2/18/2018	
Prep Method: Method Specific Preparation										Analyst: CEG	
Duplicate (A802255-DUP1), Source: A8B1818-01											
pH (1)	7.9		pH Units		7.9			0	20	02/18/18	

BSK Associates Laboratory Fresno

General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
SM 4500-H+ B - Quality Control											
Batch: A802255										Prepared: 2/18/2018	
Prep Method: Method Specific Preparation										Analyst: CEG	
Duplicate (A802255-DUP1), Source: A8B1818-01											
SM 5540C - Quality Control											
Batch: A802226										Prepared: 2/16/2018	
Prep Method: Method Specific Preparation										Analyst: SYY	
Blank (A802226-BLK1)											
MBAS, Calculated as LAS, mol wt 340	ND	0.050	mg/L							02/16/18	
Blank Spike (A802226-BS1)											
MBAS, Calculated as LAS, mol wt 340	1.1	0.050	mg/L	1.0		107	82-112			02/16/18	
Blank Spike Dup (A802226-BSD1)											
MBAS, Calculated as LAS, mol wt 340	1.1	0.050	mg/L	1.0		106	82-112	1	20	02/16/18	
Matrix Spike (A802226-MS1), Source: A8B1921-01											
MBAS, Calculated as LAS, mol wt 340	0.73	0.050	mg/L	1.0	ND	73	80-112			02/16/18	MS1.0 ***Low***
Matrix Spike Dup (A802226-MSD1), Source: A8B1921-01											
MBAS, Calculated as LAS, mol wt 340	0.74	0.050	mg/L	1.0	ND	74	80-112	2	20	02/16/18	MS1.0 ***Low***

BSK Associates Laboratory Fresno

Metals Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual	
EPA 200.7 - Quality Control												
Batch: A802367										Prepared: 2/22/2018		
Prep Method: EPA 200.2										Analyst: MDS		
Blank (A802367-BLK2)												
Boron	ND	0.10	mg/L							02/26/18		
Calcium	ND	0.10	mg/L							02/26/18		
Copper	ND	0.050	mg/L							02/26/18		
Iron	ND	0.030	mg/L							02/26/18		
Magnesium	ND	0.10	mg/L							02/26/18		
Manganese	ND	0.010	mg/L							02/26/18		
Potassium	ND	2.0	mg/L							02/26/18		
Silver	ND	0.010	mg/L							02/26/18		
Sodium	ND	1.0	mg/L							02/26/18		
Zinc	ND	0.050	mg/L							02/26/18		
Blank Spike (A802367-BS2)												
Boron	0.20	0.10	mg/L	0.20		100	85-115			02/26/18		
Calcium	4.0	0.10	mg/L	4.0		101	85-115			02/26/18		
Copper	0.20	0.050	mg/L	0.20		100	85-115			02/26/18		
Iron	0.20	0.030	mg/L	0.20		102	85-115			02/26/18		
Magnesium	4.2	0.10	mg/L	4.0		104	85-115			02/26/18		
Manganese	0.20	0.010	mg/L	0.20		101	85-115			02/26/18		
Potassium	4.1	2.0	mg/L	4.0		103	85-115			02/26/18		
Silver	0.10	0.010	mg/L	0.10		102	85-115			02/26/18		
Sodium	4.1	1.0	mg/L	4.0		102	85-115			02/26/18		
Zinc	0.20	0.050	mg/L	0.20		102	85-115			02/26/18		
Blank Spike Dup (A802367-BSD2)												
Boron	0.20	0.10	mg/L	0.20		102	85-115	2	20	02/26/18		
Calcium	4.1	0.10	mg/L	4.0		102	85-115	1	20	02/26/18		
Copper	0.20	0.050	mg/L	0.20		102	85-115	2	20	02/26/18		
Iron	0.23	0.030	mg/L	0.20		113	85-115	10	20	02/26/18		
Magnesium	4.3	0.10	mg/L	4.0		107	85-115	2	20	02/26/18		
Manganese	0.20	0.010	mg/L	0.20		101	85-115	0	20	02/26/18		
Potassium	4.1	2.0	mg/L	4.0		102	85-115	1	20	02/26/18		
Silver	0.10	0.010	mg/L	0.10		102	85-115	1	20	02/26/18		
Sodium	4.1	1.0	mg/L	4.0		103	85-115	1	20	02/26/18		
Zinc	0.67	0.050	mg/L	0.20		333	85-115	106	20	02/26/18	BS	***High***
Matrix Spike (A802367-MS3), Source: A8B1955-01												
Boron	0.31	0.10	mg/L	0.20	0.10	100	70-130			02/26/18		
Calcium	100	0.10	mg/L	4.0	100	NR	70-130			02/26/18	MS1.0	***Low***
Copper	0.20	0.050	mg/L	0.20	ND	98	70-130			02/26/18		
Iron	0.21	0.030	mg/L	0.20	ND	105	70-130			02/26/18		
Magnesium	51	0.10	mg/L	4.0	49	45	70-130			02/26/18	MS1.0	***Low***
Manganese	0.20	0.010	mg/L	0.20	ND	99	70-130			02/26/18		
Potassium	4.8	2.0	mg/L	4.0	ND	121	70-130			02/26/18		
Silver	0.10	0.010	mg/L	0.10	ND	102	70-130			02/26/18		
Sodium	41	1.0	mg/L	4.0	38	65	70-130			02/26/18	MS1.0	***Low***
Zinc	0.21	0.050	mg/L	0.20	ND	105	70-130			02/26/18		

BSK Associates Laboratory Fresno

Metals Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
EPA 200.7 - Quality Control											
Batch: A802367										Prepared: 2/22/2018	
Prep Method: EPA 200.2										Analyst: MDS	
Matrix Spike (A802367-MS4), Source: A8B1997-06											
Boron	0.25	0.10	mg/L	0.20	ND	99	70-130			02/26/18	
Calcium	20	0.10	mg/L	4.0	16	105	70-130			02/26/18	
Copper	0.20	0.050	mg/L	0.20	ND	101	70-130			02/26/18	
Iron	0.27	0.030	mg/L	0.20	0.061	104	70-130			02/26/18	
Magnesium	12	0.10	mg/L	4.0	8.1	102	70-130			02/26/18	
Manganese	0.30	0.010	mg/L	0.20	0.10	98	70-130			02/26/18	
Potassium	8.2	2.0	mg/L	4.0	4.1	104	70-130			02/26/18	
Silver	0.10	0.010	mg/L	0.10	ND	103	70-130			02/26/18	
Sodium	22	1.0	mg/L	4.0	18	106	70-130			02/26/18	
Zinc	0.21	0.050	mg/L	0.20	ND	103	70-130			02/26/18	
Matrix Spike Dup (A802367-MSD3), Source: A8B1955-01											
Boron	0.31	0.10	mg/L	0.20	0.10	101	70-130	0	20	02/26/18	
Calcium	100	0.10	mg/L	4.0	100	18	70-130	1	20	02/26/18	MS1.0 ***Low***
Copper	0.20	0.050	mg/L	0.20	ND	98	70-130	0	20	02/26/18	
Iron	0.21	0.030	mg/L	0.20	ND	106	70-130	1	20	02/26/18	
Magnesium	52	0.10	mg/L	4.0	49	62	70-130	1	20	02/26/18	MS1.0 ***Low***
Manganese	0.20	0.010	mg/L	0.20	ND	100	70-130	1	20	02/26/18	
Potassium	4.8	2.0	mg/L	4.0	ND	120	70-130	1	20	02/26/18	
Silver	0.10	0.010	mg/L	0.10	ND	105	70-130	2	20	02/26/18	
Sodium	41	1.0	mg/L	4.0	38	73	70-130	1	20	02/26/18	
Zinc	0.21	0.050	mg/L	0.20	ND	106	70-130	0	20	02/26/18	
Matrix Spike Dup (A802367-MSD4), Source: A8B1997-06											
Boron	0.25	0.10	mg/L	0.20	ND	101	70-130	2	20	02/26/18	
Calcium	20	0.10	mg/L	4.0	16	113	70-130	2	20	02/26/18	
Copper	0.20	0.050	mg/L	0.20	ND	101	70-130	0	20	02/26/18	
Iron	0.27	0.030	mg/L	0.20	0.061	106	70-130	2	20	02/26/18	
Magnesium	12	0.10	mg/L	4.0	8.1	107	70-130	1	20	02/26/18	
Manganese	0.30	0.010	mg/L	0.20	0.10	99	70-130	1	20	02/26/18	
Potassium	8.2	2.0	mg/L	4.0	4.1	104	70-130	0	20	02/26/18	
Silver	0.10	0.010	mg/L	0.10	ND	102	70-130	1	20	02/26/18	
Sodium	22	1.0	mg/L	4.0	18	116	70-130	2	20	02/26/18	
Zinc	0.21	0.050	mg/L	0.20	ND	105	70-130	2	20	02/26/18	

Certificate of Analysis

Notes:

- The Chain of Custody document and Sample Integrity Sheet are part of the analytical report.
- Any remaining sample(s) for testing will be disposed of according to BSK's sample retention policy unless other arrangements are made in advance.
- All positive results for EPA Methods 504.1 and 524.2 require the analysis of a Field Reagent Blank (FRB) to confirm that the results are not a contamination error from field sampling steps. If Field Reagent Blanks were not submitted with the samples, this method requirement has not been performed.
- Samples collected by BSK Analytical Laboratories were collected in accordance with the BSK Sampling and Collection Standard Operating Procedures.
- J-value is equivalent to DNQ (Detected, not quantified) which is a trace value. A trace value is an analyte detected between the MDL and the laboratory reporting limit. This result is of an unknown data quality and is only qualitative (estimated). Baseline noise, calibration curve extrapolation below the lowest calibrator, method blank detections, and integration artifacts can all produce apparent DNQ values, which contribute to the un-reliability of these values.
- (1) - Residual chlorine and pH analysis have a 15 minute holding time for both drinking and waste water samples as defined by the EPA and 40 CFR 136. Waste water and ground water (monitoring well) samples must be field filtered to meet the 15 minute holding time for dissolved metals.
- Summations of analytes (i.e. Total Trihalomethanes) may appear to add individual amounts incorrectly, due to rounding of analyte values occurring before or after the total value is calculated, as well as rounding of the total value.
- RL Multiplier is the factor used to adjust the reporting limit (RL) due to variations in sample preparation procedures and dilutions required for matrix interferences.
- Due to the subjective nature of the Threshold Odor Method, all characterizations of the detected odor are the opinion of the panel of analysts. The characterizations can be found in Standard Methods 2170B Figure 2170:1.
- The MCLs provided in this report (if applicable) represent the primary MCLs for that analyte.

Definitions

mg/L:	Milligrams/Liter (ppm)	MDL:	Method Detection Limit	MDA95:	Min. Detected Activity
mg/Kg:	Milligrams/Kilogram (ppm)	RL:	Reporting Limit: DL x Dilution	MPN:	Most Probable Number
µg/L:	Micrograms/Liter (ppb)	ND:	None Detected at RL	CFU:	Colony Forming Unit
µg/Kg:	Micrograms/Kilogram (ppb)	pCi/L:	PicoCuries per Liter	Absent:	Less than 1 CFU/100mLs
%:	Percent	RL Mult:	RL Multiplier	Present:	1 or more CFU/100mLs
NR:	Non-Reportable	MCL:	Maximum Contaminant Limit		

Please see the individual Subcontract Lab's report for applicable certifications.

BSK is not accredited under the NELAP program for the following parameters:

Aggressive Index Langelier Index

Certifications: **Please refer to our website for a copy of our Accredited Fields of Testing under each certification.**

Fresno

EPA - UCMR4	CA00079	NELAP certified	4021-010	State of California - ELAP	1180
State of Hawaii	4021	State of Nevada	CA000792018-1	State of New York	12073
State of Oregon - NELAP	4021-010	State of Washington	C997-17b		

Sacramento

State of California - ELAP	2435

San Bernardino

NELAP certified	4119-002	State of California - ELAP	2993	State of Oregon - NELAP	4119-002

Vancouver

NELAP certified	WA100008-010	State of Oregon - NELAP	WA100008-010	State of Washington	C824-17

A8B2052

02162018

Abalo1080

Turnaround: Standard
Due Date: 3/6/2018

Abalone Coast Analytical, Inc.

Printed: 2/16/2018 4:49:11PM
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Abalo1080

02/16/2018
10

BSK Associates
Engineers & Laboratories

1414 Stanislaus St.
Fresno, CA 93706
559.497.2888

COC # 20180209004

Client: Abalone Coast Analytical, Inc.
Project: Main Project - e COC MCL (Non-EDT)

VG-0905

Sampler: Adam Kirchner
Project #: Adam Kirchner

Internal Use Only
Temperature 5.8° #45 °C Has the chilling process begun? Yes No
Delivery Method: Ontrac | UPS | GSO | Fedex | Walk-In | BSK: ____

Primary Bacti Contact
Secondary Bacti Contact

No.	Sample Description	Date / Time	Client Matrix	Sample Type	Comments
1	Faucet/Hose Bib	02/09/18 11:30	Drinking Water		

Analyses: Nitrate-N / General Mineral / Boron, CA DW ICP / Phosphate

ICNP / 1D HNO3

Additional Comments: OK to run out of HT

Relinquished By: (Signature and Printed Name)	Company	Date	Time	Received By: (Signature and Printed Name)	Company
J. Perez	ABC Coast	2/9/18	1800		
Relinquished By: (Signature and Printed Name)	Company	Date	Time	Received By: (Signature and Printed Name)	Company
					2/12/18
Received at Lab By: (Signature and Printed Name)		Date	Time	Payment Received at Delivery:	Check / Cash
Ronny Weber		2/12/18	17:05	Date: Amount:	PIA#: Init:

Payment for services rendered as noted herein are due in full within 30 days from the date invoiced. If not so paid, account balances are deemed delinquent. Delinquent balances are subject to monthly service charges and interest specified in BSK's current Standard Terms and Conditions for Laboratory Services. The person signing for the Client/Company acknowledges that they are either the Client or an authorized agent to the Client, that the Client agrees to be responsible for payment for the services on this Chain of Custody, and agrees to BSK's terms and conditions for laboratory services unless contractually bound otherwise. BSK's current terms and conditions can be found at www.bskassociates.com/BSKLabTermsConditions.pdf

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BSK Associates Engineers & Laboratories

Integrity
COC # 20180209004

Received By: Donald Weber
Received Date/Time: 02/12/2018 17:15
Delivery Method: Ontrac

Integrity Checks	Yes	No	NA
1. Did the samples meet temperature requirements?	✓		
Cooler 1 5.8°C			
2. Did all bottles arrive unbroken and intact?	✓		
3. Did all bottle labels agree with COC?	✓		
4. If cyanide containers were received, were the containers either free of chlorine or, if present, was the chlorine removed?			✓
5. Were correct containers and preservatives received for the tests requested?	✓		
6. Were there bubbles in the VOA vials? **(Volatiles Only)**			✓
7. Was a sufficient amount of sample received?	✓		
8. Do samples have a hold time <72 hours?	✗		
9. Were any bottles split and/or preserved?		✓	

Additional Comments	Initials	Date
Ok to run out of HT as per client 02/16/18 SAZ	SAZ	02/16/2018 15:50:24
Cooler 1: Blue, B/W	DRW	

A8B2052 02/16/2018
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BSK Associates
Engineers & Laboratories

Integrity
COC # 20180209004

Please carefully review the following information for any errors. If you find that any of the information below is incorrect, please contact your Project Manager immediately.

Sample 1		Faucet/Hose Bib	
Sampled:	02/09/2018 11:30	**Sample Matrix:**	Water
Sample Type:		**Regulatory ID:**	
Alias:			
Comments:			
Analyses:	Nitrate-N / General Mineral / Boron, CA DW ICP /		
Containers:	1L P / None, 500mL P / HNO3		

Labeled By: **Date/Time:** 2/16 1612

Checked By: SL **Date/Time:** 2/16/18 1

Rush Paged By: **Date/Time:**

ATTACHMENT F: WELL PUMP TEST

Pro- H2o Drilling and Pump Company

P.O. Box 5055
Paso Robles, Ca. 93447
Gen. Engineer/C-57 Lic. # 767541

New Well Test Report

Date: 11/05/2018

Address of test: 2198 Los Osos Valley Rd

Time	H20 Condition	H20 Level	G.P.M.	Comments: Static H20 Level: 28
12:25 P	Clear	28	24	Owner provided info :
12:30	"	33	23.5	Totalizer:
1:00	"	36	23.5	Pump Depth:
1:30	"	36	23.5	T.D.:690'
2:00	"	36	23.5	Casing Size:
2:30	"	36	23.5	Prod. Tee size:
3:00	"	36	23.5	Boosted ter size/ Make/
3:30	"	36	23.5	Size press. Tank?
4:00	"	36	23.5	Size Storage tank/Steel or plastic?
4:30 PM	"	36	23.5	Owner Name:
				Address of well: 2198 Los Osos Valley Rd APN # ~

Recovery: (at least 15 min)

Time	H20 Level	Time	H20	Time	H20 Level	Comments:
1:31	33	1:37	33	1:43	33	Escrow
1:32	33	1:38	33	1:44	33	
1:33	33	1:39	33	1:45	33	Phone Numbers
1:34	33	1:40	33	1:46	33	Realtor:
1:35	33	1:41	33			e-mail:
1:36	33	1:42	33			

ATTACHMENT G: TITLE 19: LOS OSOS RETROFIT CREDIT TABLE

COUNTY OF SAN LUIS OBISPO
DEPARTMENT OF PLANNING & BUILDING
James A. Bergman *Director of Planning & Building*

TITLE 19: LOS OSOS RETROFIT CREDIT TABLE

Existing Toilet (gpf)	Replacement Toilet (gpf)	Single-Family Residential Gallons Saved Per Day (Credits)	Multi-Family Residential[1] Credits	Mobile Home[2] Credits
6	1.28	52	39	26
	1.1	54	41	27
	0.8	57	43	29
3.5	1.28	24	18	12
	1.1	26	20	13
	0.8	30	22	15
1.6	1.28	4	3	2
	1.1	5	4	3
	0.8	9	7	5

[1] Multi-Family Residential (MFR) is 75% of Single-Family Residential Water Use
[2] Mobile Home is 50% of Single-Family Residential Water Use

Existing Shower (gpm)	Replacement Shower (gpm)	Single-Family Residential Gallons Saved Per Day (Credits)	Multi-Family Residential[1] Credits	Mobile Home[2] Credits
5	2.5	9	7	5
	2.0	11	8	5
	1.5	13	9	6
	1.0	14	11	7
2.5	2.0	4	3	2
	1.5	7	5	4
	1.0	11	8	5

Other Retrofits	Gallons Saved Per Day (Credits)
Washing Machine Replacement	Gallons Saved per Day based on Washer Application

Total retrofit credits needed for a new single family home is 300 gallons

976 Osos Street, Room 300 | San Luis Obispo, CA 93408 | (P) 805-781-5600 | 7-1-1 TTY/TDD Relay
planning@co.slo.ca.us | sloplanning.org
January 15, 2017

ATTACHMENT H: RO SYSTEM + PERMEATE PUMPS (W/ OR W/ OUT HYDRAULIC SHUT-OFF VALVE)

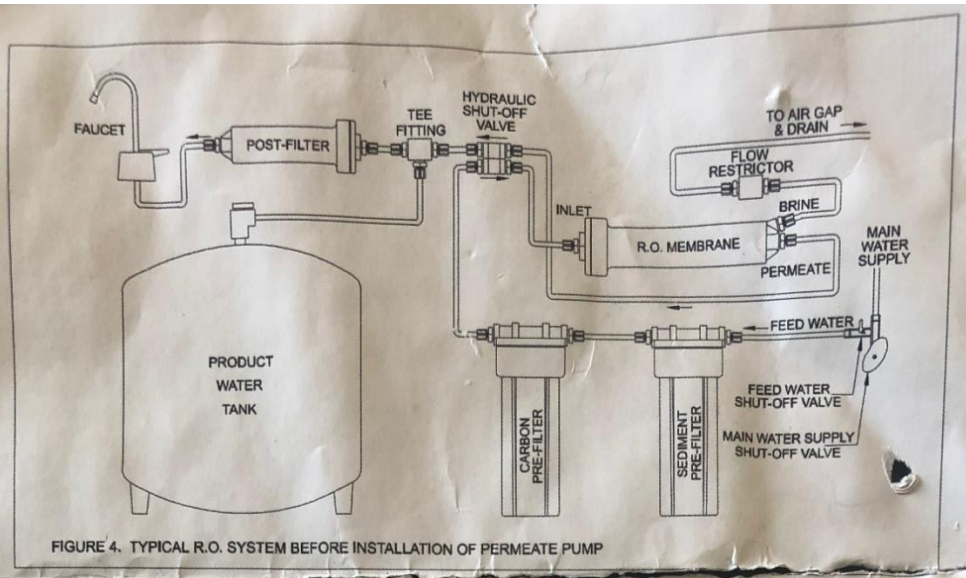

FIGURE 4. TYPICAL R.O. SYSTEM BEFORE INSTALLATION OF PERMEATE PUMP

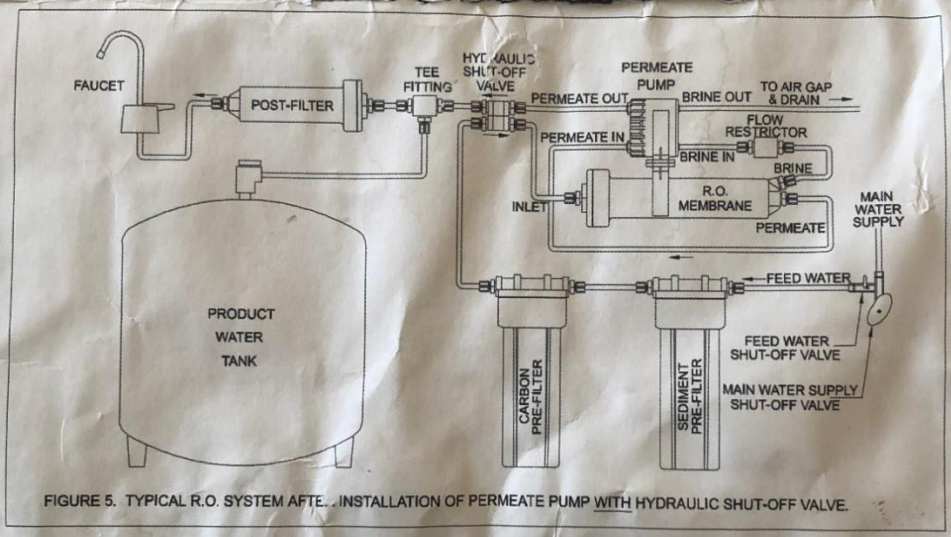

FIGURE 5. TYPICAL R.O. SYSTEM AFTER INSTALLATION OF PERMEATE PUMP WITH HYDRAULIC SHUT-OFF VALVE.

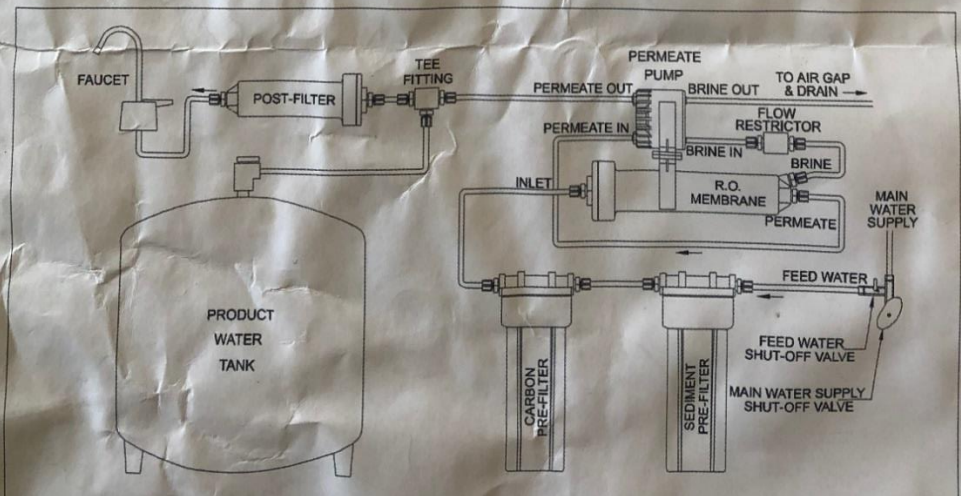

FIGURE 6. TYPICAL R.O. SYSTEM AFTER INSTALLATION OF PERMEATE PUMP WITHOUT HYDRAULIC SHUT-OFF VALVE.

ATTACHMENT I: EFFICIENCY STUDY ON IN-HOUSE RO/ WATER SYSTEMS

A STUDY OF EFFICIENCY IN CURRENT POINT OF USE WATER TREATMENT SYSTEMS

OR – "HOW MUCH WATER IS MY POU SYSTEM WASTING TO DRAIN EVERY TIME IT MAKES ANOTHER GALLON OF TREATED DRINKING WATER?"

Prepared By -

Van Newenhizen and Associates, Inc.

Water Treatment Consultants

Van Newenhizen and Associates Inc., 1661 Castillian Way – Suite 201, Mundelein, IL 60060
Phone: 847-226-0684 E-Mail: jvannew@comcast.net

Van Newenhizen and Associates, Inc.

Water Treatment Consultants

A STUDY OF EFFICIENCY IN POU SYSTEMS

Executive Summary –

The LINX system demonstrated superior efficiency in this study comparing typical and enhanced RO systems and a capacitive deionization system. The public is generally unaware of the amount of water a typical home RO system sends to waste when making product water. This study characterizes various Point-of-Use (POU) systems with a focus on the efficient use of water.

Study Purpose and Scope –

The testing plan is designed to evaluate the efficient use of water in several types of Point-of-Use (POU) treatment systems under various conditions. All POU systems in this study have the ability to reduce total dissolved solids (TDS). All the systems direct different amounts of waste water to drain in the process of making reduced TDS product water.

The efficiency and other data provided in this study characterize the essential performance of each of the different types of systems. A large scale POU efficiency test project could be developed for public awareness. Ideally this would be done as an independent University type of report with wide distribution to scientists and consumers.

Background -

All TDS reduction technologies must have a way to dispose of the cations and anions accumulated during the process of making reduced TDS product water. Reverse osmosis systems send waste water to drain whenever the membrane is producing water. Deionization systems make product water until a pre-determined exhaustion point. They then stop making product water to enter a regeneration cycle that disposes of the ions the treatment media has removed. When regeneration is complete the system is ready to deliver another batch.

Reverse Osmosis technology and materials have advanced from the first commercial systems to generic consumer appliances in less than 50 years. They are available from water treatment dealers, big box stores, internet sales, etc. Cost for a generic system at a big box is under $150. This low price point means there is an affordable RO for the masses.

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RO system providers acknowledge their systems create a waste stream. However, the websites and the data they provide are miles from the reality of actual efficiency when a system is operated in a household environment. Sites like those cited below state that waste per gallon of product is in the range of 3 to 4 gallons per gallon of product water produced. However, the data that supports this claim is done without the use of a storage tank exerting back pressure on product water production. In real world use, home RO systems don't get used without a storage tank. Our testing with a generic storage tank and typical product draws at various pressures showed waste from 8 – 10 gallons at higher pressures and up to 18 gallons on water pressure of 20 psi.

Typical website claims on efficiency -

AllAboutWater.org
Reverse osmosis, although it is less wasteful than distillation, is still an incredibly inefficient process. On average, the reverse osmosis process wastes three gallons of water for every one gallon of purified water it produces.

RO Water Systems Incorporated
The membrane used in the ROPure5 series will use an average of 3.5 gallons of tap water for every gallon of Reverse Osmosis water produced.

The in-home water meters utilities and water managers used in the past were not sensitive enough to register the very slow waste rates of consumer RO systems. The more advanced electronic meters of today now have the sensitivity to record such slow flow rates. The magnitude of the RO waste water issue is becoming more evident to users and regulators.

In water challenged areas the reduction of RO waste could have a greater impact on water savings than low-flush showers and toilets combined.

Electronic POU systems that have similar TDS reduction performance characteristics offer an alternative to RO systems. Our testing shows systems like the LINX 140 have the ability, under actual operating conditions, to produce a gallon of product water creating as little as 0.4 gallons of waste on waters with an inlet TDS of less than 400 ppm.

In an example of just one gallon used per day, this represents a potential savings of over 1000 gallons per year at 40 psi verses a conventional home RO system.

Methodology –

- All POU systems were operated per the manufacturer's instructions.
- The water source was a softened municipal supply. TDS 140–150 ppm.
- Pressures were adjusted to 20, 40, 60, and 80 psi for testing
- Temperature was monitored in-line
- Projections of RO performance at other temperatures were taken from correction charts provided by membrane suppliers.

NSF/ANSI Standard 53 describes the methodology of a lengthy 7 day test for RO systems. An efficiency calculation (% recovery) comes from this data. The method is very specific for home RO type systems and does not fit the electronic type of POU systems evaluated for this report. The use of water in any POU system can still be readily measured to arrive at a comparable efficiency values.

The basic calculation for efficiency is simple for any POU system --

% Recovery= (Product Water / Product Water + Waste Water) X100

BASIC TEST –

1. Run system at set conditions until the storage tank is full
2. Draw measured amounts of product water from each system
3. Collect and measure the amount of water sent to drain at each draw amount until the system returns to full tank status

*Data on TDS and flow rates was also collected to characterize the POU systems

Instrumentation and Equipment -

Myron L TDS Triple Scale
Myron L Model T2/pH
H&M Digital Dual Range In-Line TDS meters
NIST Traceable TDS Calibration Standards – 15, 150, 300 ppm
Liquid-filled Pressure Gauges 0-160 psi
Watts 560 Pressure Regulator
Digi-Flow 8000T Flow Meter
WX Minute Minder Timers
Nalgene Graduated Cylinders - Various

System Description and Technology

All the devices evaluated are designed to be operated as point of use (POU) water treatment systems. All systems are capable of reducing total dissolved solids (TDS). This distinguishes these POU devices from other physical filters, carbon filters, faucet filters and pitcher filters that do not reduce TDS. All systems tested had pre and post filters installed except the EWP system.

1. LINX 140 NT– Pionetics

- Technology
  - Uses a form of ion exchange to attract and hold dissolved ions
  - Regenerates using only electricity.
  - Stores product water in a captive air tank.
- Power
  - Requires a continuous 120 volt power supply. 6 amp.
- Operation
  - Service – Recharge – Return to Service
- Performance
  - Efficiency (% Recovery) - Averaged 72% (20 psi to 80 psi)
  - Rejection – At "Full" setting rejection rates were up to 95%
  - Temperature - - No significant impact on efficiency
  - Pressure - No significant impact on efficiency

- Other
  - Product water delivery to the faucet varies slightly depending on the amount in the air tank and incoming water pressure.
  - Regeneration is initiated by total product volume delivered
  - Different regeneration frequencies can be set according to TDS level of supply
  - Delivers 3 gallons of product water before regeneration on supply water TDS less than 400 ppm
  - TDS reduction has a customer adjustment to allow the customer to leave in some TDS to change the taste.
  - TDS level on first draw after long idle periods is slightly elevated

2. Typical Home RO

- Technology
  - Uses a generic Thin Film Composite (TFC) membrane in simple housing.
  - Stores product water in a captive air tank.
- Power
  - None required. Can use optional battery powered monitor.
- Operation
  - Service – Refill/Service – Service

- Performance
  - Efficiency (% Recovery) - 5% at 20 psi to 14% at 80 psi
  - Rejection – Rejection rates were up to 95%
  - Temperature – Efficiency reduced by 1.5–2% per degree F
  - Pressure - Impacts efficiency by 1% for each 10 psi reduction

- Other
  - Product water delivery to the faucet varies slightly depending on the amount in the air tank and incoming water pressure.
  - Recharge, refill of the storage tank, is initiated after more than 64 ounces have been withdrawn regardless of TDS, Temperature or Pressure
  - TDS rejection rates are not adjustable
  - TDS level on first draw after long idle periods is slightly elevated

3. NEXT RO Enhanced RO System

- Technology
  - Uses a generic Thin Film Composite (TFC) membrane in simple housing.
  - Stores product water in a “water on water” tank that uses incoming water pressure to push it back out for delivery. This reduces tank backpressure.
- Power
  - None required. Can use optional battery powered monitor
- Operation
  - Service – Refill/Service – Service
- Performance
  - Efficiency (% Recovery) - 22% at 20 psi to 31% at 80 psi
  - Rejection – Rejection rates were up to 95%
  - Temperature - Efficiency reduced by 1.5–2% per degree F
  - Pressure - Pressure impacts efficiency by 1.5% for each 10 psi reduction

- Other
  - Product water delivery is essentially constant for the entire cycle at a given incoming water pressure.
  - Recharge, refill of the storage tank, is initiated immediately whenever product water is delivered regardless of TDS, Temperature or Pressure
  - TDS rejection rates are not adjustable
  - TDS level on first draw after long idle periods was only slightly elevated

4. EWP – Aqua EWP

- Technology
  - Uses capacitive deionization to attract and hold ions from the water electrically.
  - Regenerates by stopping and reversing charge.
  - Stores product water in a captive air tank.
- Power
  - Requires a continuous 120 volt power supply. 1 amp.
- Operation
  - Service – Static – Change Polarity/Flush – Shunt - Service
- Performance
  - Efficiency (% Recovery) – 45% at 20 psi to 35% at 40 psi
  - Rejection – Rejection rates were less than 50%
  - Temperature - - No significant impact on efficiency
  - Pressure - No significant impact on efficiency

- Other
  - Product quality is strongly influenced by flow rate. At very slow flow rates the system showed rejection of up to 95%
  - The EWP system has a maximum pressure rating of 50 psi
  - Product water delivery to the faucet varies slightly depending on the amount in the air tank and incoming water pressure.
  - Recharge, refill of the storage tank, is initiated immediately whenever product water is delivered regardless of TDS, Temperature or Pressure
  - TDS rejection rates are not adjustable
  - TDS level on first draw after long idle periods was only slightly elevated

5. Low Cost RO – China (Enhanced Home RO)

This test was done with the same Low Cost RO characterized in #2. To enhance performance a device called the "Permeate Pump" was used. This device uses the pressure energy of the waste stream to push the product water into the storage tank. By eliminating the backpressure of the storage tank, the system efficiency is improved. In this testing, the efficiency more than doubled at each pressure.

- Technology
  - Uses a generic Thin Film Composite (TFC) membrane in simple housing.
  - Stores product water in a captive air tank using the Permeate Pump device to reduce backpressure
- Power
  - None required. Can use optional battery powered monitor.
- Operation
  - Service – Refill/Service – Service
- Performance
  - Efficiency (% Recovery) – 13% at 20 psi to 23% at 80 psi (NOTE: The device doubled the efficiency of #2.)
  - Rejection – Rejection rates were up to 95%
  - Temperature – Efficiency reduced by 1.5–2% per degree F
  - Pressure - Impacts efficiency by 1% for each 10 psi reduction
- Other
  - Product water delivery to the faucet varies slightly depending on the amount in the air tank and incoming water pressure.
  - Recharge, refill of the storage tank, is initiated after more than 64 ounces have been withdrawn regardless of TDS, Temperature or Pressure
  - TDS rejection rates are not adjustable
  - TDS level on first draw after long idle periods is slightly elevated

Discussion of Systems –

LINX 140NT

- The LINX claim of 70% recovery was verified at pressures from 20 to 80 psi.
- The LINX claim of >85% rejection was verified at pressures from 20 to 80 psi.

The LINX system out performed all the other systems tested. Rejection performance was improved with the storage tank added. The tank allows for ample flow at the faucet and the DI cartridges can operate at a reduced flow rate.
The data show that dispensing rates at the faucet were doubled at the same pressure using a storage tank. Other advantages of using the tank include the blending of product water and water available during regeneration of the cells.

It is possible to operate the LINX 140 without a storage tank. The system will deliver a continuous flow of product water for 3 gallons from 20 to 80 psi. In a configuration that provides this "no tank" feature, the system is too costly to compete effectively. Generic home RO systems can be purchased at retail for under $150 and they have rejection rates well over 90%. A configuration using one smaller cell to slowly fill a storage tank for on-demand use could potentially bring costs down and save millions of gallons lost to home RO waste.

LINX Percent Efficiency Projections verses Temperatures and Pressures

Pressure and Temperature	20 PSI	40 PSI	60 PSI	80 PSI
77 F	72	72	71	71
70 F	72	72	71	71
64 F	72	72	71	71
60 F	72	72	71	71
54 F	72	72	71	71
48 F	72	72	71	71
40 F	72	72	71	71

Low Cost RO (LC RO)

- The LC RO makes no direct claims for recovery or quality.
- There is a section with the statement, "Product water quality and production of RO systems is dependent on pressure and temperature."

The LC RO is representative of the generic home RO systems found at retail, through a water dealer or over the internet. These systems are simple enough for a do it yourself handyman.

Recovery (efficiency) was only 5% at 20 psi and 8% at 40 psi. At 5% recovery, 19 gallons of waste water is sent to drain to make 1 gallon of RO product water.

RO membrane production is typically rated at standard conditions – 77 F and 60 psi – discharging to atmosphere. RO production declines about 1.5% for every one degree

decline in temperature. RO production declines 0.5 - 1% for every one pound decline in pressure.

Example: RO system producing 50 gallons per day at 77 F and 60 psi
At 48 F and 60 psi = 25 gallons per day
At 77 F and 30 psi = 35 gallons per day
At 48 F and 30 psi = 20 gallons per day

Note: Subtract storage tank backpressure from these driving pressures and the production is even less.

Recovery goes down when RO production goes down. This is due to the use of a fixed restrictor in the waste line of this type of RO system. The waste will flow at the same rate even if the module in colder water is making product water at only half the rated capacity.

LC RO Efficiency Projections over a range of Temperatures and Pressures

Pressure and Temperature	20 PSI	40 PSI	60 PSI	80 PSI
77 F	7	10	12	14
70 F	6	9	10	13
64 F	5	8	9	11
60 F	5	7	8	10
54 F	4	6	7	9
48 F	4	5	6	8
40 F	3	4	5	6

NEXT RO

- The NEXT claim of 33% recovery was verified at pressures above 60 psi
- The NEXT makes only a “soft” claim on rejection, “Highest rejection”. TFC RO membranes typically have rejection specifications of over 90%. Testing verified >90% rejection.
- The NEXT claim of 500% less waste than a conventional home RO is true.

This system is an enhancement over a generic home RO system. NEXT RO addresses the backpressure problem of a captive air tank by using a water-on-water design. Line pressure is directed to “squeeze” the bladder of product water when the faucet is turned on. Then the squeeze water is sent to drain leaving the bladder with no backpressure energy. This line pressure energy pushes the water to the outlet dispensing water instead of the energy in an air bladder. The result is that the RO membrane can produce more water when it doesn’t have to overcome the energy of the tank backpressure. It can make product water faster so the waste stream is on for a shorter time.

Waste water is created from both the use of squeeze water and the reject from the RO membrane process. The design seems inherently limited to less than 50% efficiency. Water is a non-compressible fluid at these conditions. It takes 16 ounces of squeeze water to push 16 ounces of product water to the outlet. That is 50% efficiency before considering any RO reject waste.

NEXT RO Efficiency Projections over a range of Temperatures and Pressures

Pressure and Temperature	20 PSI	40 PSI	60 PSI	80 PSI
77	27	32	40	36
70	24	29	37	33
64	22	26	34	30
60	20	25	32	28
54	18	22	28	25
48	15	19	25	22
40	12	15	20	17

EWP

- The EWP claim of 75% recovery was not verified. Testing data show that a recovery rate of 58% is possible.
- The EWP claim of 80% "purification" was not verified. Testing data show rejection as low as 66% on this design.

The EWP system is limited to a maximum pressure of 50 psi. The system sent for testing has the appearance of a hand built prototype. This manufacturer would like to focus on selling the capacitive DI cells and leave system production to OEMs. The system as tested was only intended to reduce TDS to 50-75 ppm per the supplier.

This system needs changes to be a viable POU product when compared to the superior rejection rates the others tested. Product quality is strongly influenced by flow rate. Test data confirm that over 90% is possible if the flow is slowed down sufficiently. The system flow rate is adjusted by changing the inlet flow rate. The system times could revised to extend the service cycle without fear of scaling in the flush cycle. This is particularly true when the source is softened water. Alternately an additional cell in series or changes to the power source would improve rejection performance.

We believe it should be possible to achieve 50 - 80% recovery and 90% rejection with this technology if designed properly. Further testing with a constant inlet flow control still failed to verify the inventor's claim of 75% recovery. That performance would place it in the performance range of the LINX system.

EWP Efficiency Projections over a range of Temperatures and Pressures

Pressure and Temperature	20 PSI	40 PSI	60 PSI	80 PSI
77 F	58	56	Max @ 50 psi	
70 F	58	56		
64 F	58	56		
60 F	58	56		
54 F	58	56		
48 F	58	56		
40 F	58	56		

LC RO with Permeate Pump

- The Permeate Pump claims as much as a 400% improvement in recovery. Testing data show it doubled the recovery rate from 20 psi to 80 psi. The math would call that a 100% improvement.
- The Permeate Pump claims as much as an 80% reduction in waste water. Test data verify this claim.

The Permeate Pump (PP) uses the wasted energy of the RO reject water pressure to drive the product water into the storage tank against the back pressure of the air bladder. This enables the product water to be made against little to no backpressure. The storage tank is filled 2 to 4 times faster with the PP and this shuts off the RO reject sooner saving water. The PP also fills the storage tank closer to the feed line pressure providing more stored product water and a faster delivery rate to the faucet.

The PP can be retrofitted on most home RO systems and cut water usage in half. Earlier models had a clicking noise that has been resolved with newer models.

LC RO Efficiency Projections over a range of Temperatures and Pressures
With Permeate Pump added to system

Pressure and Temperature	20 PSI	40 PSI	60 PSI	80 PSI
77 F	16	14	24	28
70 F	14	12	22	25
64 F	13	16	20	23
60 F	12	10	18	21
54 F	10	9	16	19
48 F	9	8	14	16
40 F	7	6	11	13

Comments

Storage Tanks –

The backpressure of a captive air tank directly decreases the driving force of the RO membrane process. The NEXT RO system and the Permeate Pump option are both designed to improve RO membrane performance by reducing the backpressure that steals energy from the driving force.

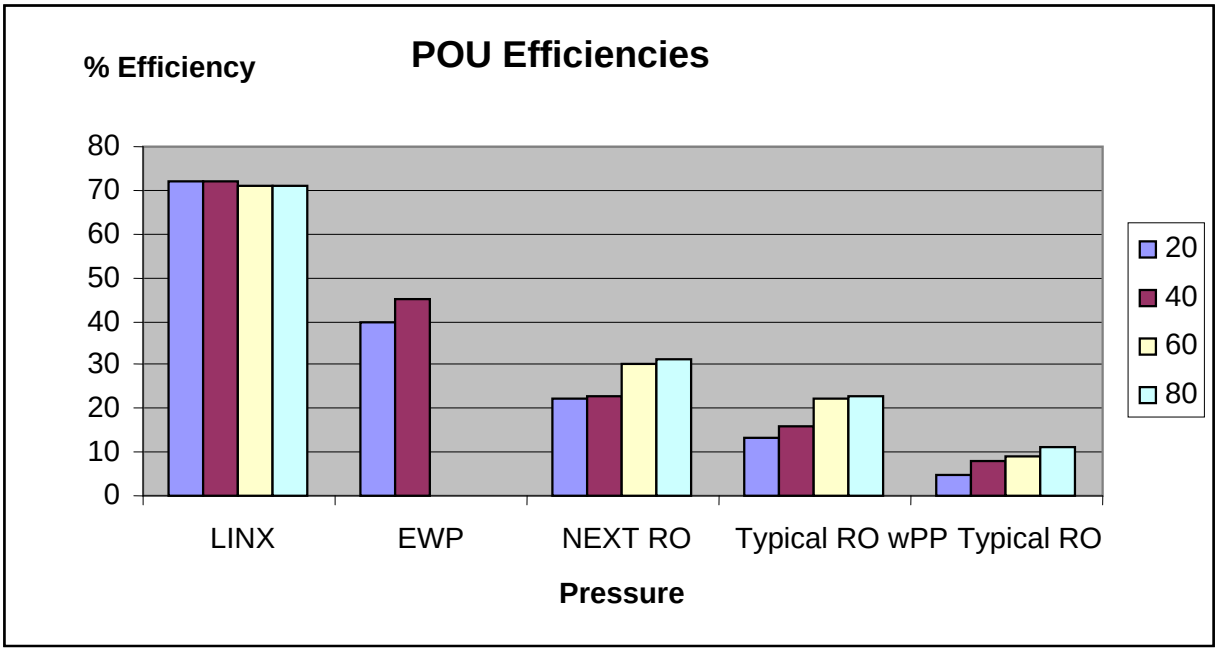
The LINX and EWP systems do not suffer the same impact since they do not rely on pressure to drive the TDS reduction process. Testing data show that the process performance is not impacted strongly by pressure. In either system, a slower flow rate helps to lower product TDS. The use of a storage tank to hold product water for use while letting the system slowly refill it will result in the smallest, low cost system.

Microbiological –

Commercial RO technology is recognized as an effective barrier against biological contaminants. Many medical water systems use a double pass RO configuration. Home RO systems with carbon filters, storage tanks and low flow rates are not sold with any biological claims.

There is data showing that the LINX and EWP technologies may also provide excellent performance against microbiological materials. Could this capability be designed into a home system with biological reduction claims? A final polishing filter may be needed to secure a certified claim.

EFFICIENCY COMPARISONS



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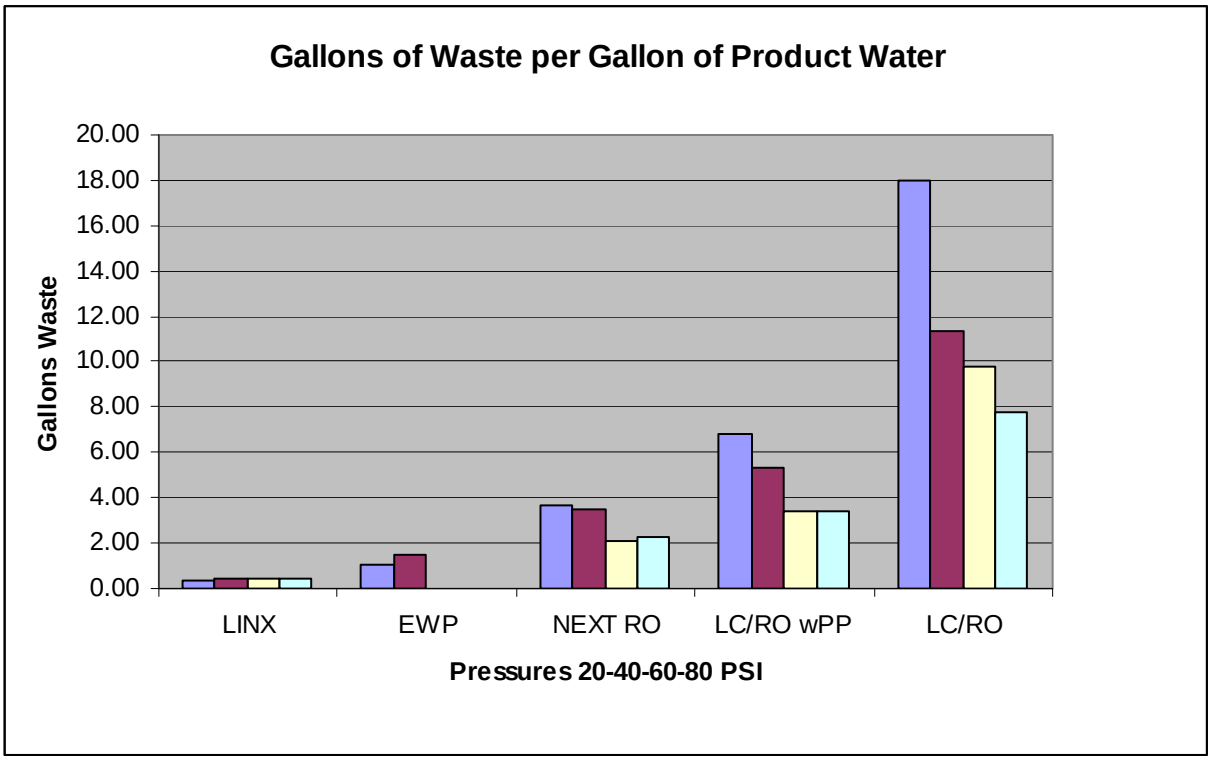

Real World Efficiency Example:

Annual waste to drain at 40 PSI from a family using one gallon of product water each day and the height of a 12" diameter filled with that waste amount –

POU SYSTEM	Waste Per Year	Height of 12" Column
LINX	145 gallons	25 feet
EWP	548 gallons	93 feet
NEXT RO	1277 gallons	218 feet
LC/RO w/Permeate Pump	1948 gallons	332 feet
LC/RO	4152 gallons	707 feet

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Conclusions

- The LINX 140NT system performance was superior to the other POU systems tested.
- The public is generally unaware of the volume of water wasted by low cost home RO systems.
- In a cost driven world the low cost RO is the current king.
- A retrofit program with Permeate Pumps has the potential to immediately cut RO waste by 50%
- The EWP technology needs design refinement over the unit tested to achieve its full potential as a competitive POU system.
- The microbiological capability of electronic systems may provide a key advantage verses an RO system.
- A large scale University test protocol could follow to methodology used in this study. The differences in efficiency are very clear.

John Van Newenhizen
Van Newenhizen and Associates, Inc.
September 9, 2011

Introduction Bio for John Van Newenhizen

John Van Newenhizen is President and founder of Van Newenhizen and Associates, Inc., providing expert consulting on water treatment issues and equipment to a wide range of global clients.

Mr. Van Newenhizen has 37 years of experience in the water treatment field. He spent 30 years at Culligan International in the technical management of all product lines. In numerous positions he played an integral role in directing Culligan's industry leading research and development (R&D) efforts, supervising new product design, regulatory affairs, analytical services and overall quality for household, commercial and industrial markets. As Director of Custom Engineering, John also has extensive experience in the engineering design and manufacturing of specialty water treatment equipment.

An active member of the Water Quality Association, John is currently serving on the Water Sciences Committee. Other affiliations include AWWA, the Water Reuse Association and the National Groundwater Association. He is professionally known for an ability to translate complex subjects into meaningful concepts for stakeholders at all levels.

Mr. Van Newenhizen received a Bachelor of Sciences degree in chemistry and physics from Lake Forest College, holds numerous product patents and has traveled to China, South America and Europe to give technical presentations on water treatment.

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