CITY OF MORRO BAY
WATER RECLAMATION FACILITY
CITIZEN ADVISORY COMMITTEE (WRFCAC)
AGENDA

The City of Morro Bay is dedicated to the preservation and enhancement of the quality of life. The City shall be committed to this purpose and will provide a level of municipal service and safety consistent with and responsive to the needs of the public.

Wednesday, October 22, 2014
Morro Bay Community Center - 3:00 P.M.
1001 Kennedy Way, Morro Bay, CA

Barbara Spagnola	Bill Woodson	Dale Guerra
John Diodati	Mary (Ginny) Garelick	Paul Donnelly
Valerie Levulett	Planning Commissioner: Richard Sadowski	Public Works Advisory Board Member: Steven Shively

ESTABLISH QUORUM AND CALL TO ORDER
MOMENT OF SILENCE/PLEDGE OF ALLEGIANCE
ANNOUNCEMENTS/PRESENTATIONS

PUBLIC COMMENT PERIOD
Members of the audience wishing to address the Board on City business matters other than scheduled items may do so at this time. To increase the effectiveness of the Public Comment Period, the following rules shall be followed:

- When recognized by the Chair, please come forward to the podium and state your name and address for the record. Board meetings are audio and video recorded and this information is voluntary and desired for the preparation of minutes.
- Comments are to be limited to three minutes.
- All remarks shall be addressed to the Board, as a whole, and not to any individual member thereof.
- The Board respectfully requests that you refrain from making slanderous, profane or personal remarks against any elected official, commission and/or staff.
- Please refrain from public displays or outbursts such as unsolicited applause, comments or cheering.
- Any disruptive activities that substantially interfere with the ability of the Board to carry out its meeting will not be permitted and offenders will be requested to leave the meeting.
- Your participation in Board meetings is welcome and your courtesy will be appreciated.

In compliance with the Americans with Disabilities Act, if you need special assistance to participate in this meeting, please contact the Public Services Department at (805) 772-6264. Notification 24 hours prior to the meeting will enable the City to make reasonable arrangements to ensure accessibility to this meeting.

SITE TOUR
Adjourn to the potential future WRF "Rancho Colina" Site, located 1.0 Miles Easterly of the existing City Limits (1045 Atascadero Road) for a tour then reconvene at the Morro Bay Community Center at 4:00 p.m.

A. CONSENT CALENDAR

A-1 Approval of minutes from the Water Reclamation Facility Citizen Advisory Committee meeting of October 8, 2014
Staff Recommendation: Approve minutes as submitted.

B. OLD BUSINESS

B-1 WRFCAC Sub-Committee Updates - No Staff Report
Recommendation: Receive updates.

C. NEW BUSINESS

C-1 Review of Report Regarding Initial Findings on Hydrologic Evaluation of the Potential Benefits to the City Water Supply from Increasing Wastewater Discharge to Either Morro Or Chorro Creek by Cleath Harris Associates
Recommendation: Provide Comments to Staff.

D. COMMITTEE MEMBER CLOSING COMMENTS

E. ADJOURNMENT

Adjourn to the Water Reclamation Facility Citizen Advisory Committee meeting at the **Fire Station Conference Room, 715 Harbor Street**, on November 5, 2014, at 3:00 p.m.

This agenda is subject to amendment up to 72 hours prior to the date and time set for the meeting. Please refer to the agenda posted at the Public Services Department, 955 Shasta Avenue, for any revisions or call the department at 772-6264 for further information.

Materials related to an item on this Agenda are available for public inspection during normal business hours in the Public Services Department, at Mill's/ASAP, 495 Morro Bay Boulevard, or the Morro Bay Library, 695 Harbor, Morro Bay, CA 93442, or online at www.morro-bay.ca.us/wrfcac . Materials related to an item on this Agenda submitted to the Committee after publication of the Agenda packet are available for inspection at the Public Services Department during normal business hours or at the scheduled meeting.

AGENDA ITEM: A-1

DATE: October 22, 2014

ACTION: _____

CITY OF MORRO BAY
WATER RECLAMATION FACILITY
CITIZEN ADVISORY COMMITTEE (WRFCAC)

SYNOPSIS MINUTES

Regular Meeting – October 8, 2014

PRESENT:	John Diodati	Mary (Ginny) Garelick
	Barbara Spagnola	Dale Guerra
	Valerie Levulett	Paul Donnelly
	Bill Woodson	Steven Shively
	Richard Sadowski	

STAFF:	Rob Livick	Public Services Director
	Bruce Keogh	Wastewater Treatment Manager
	Rick Sauerwein	Capitol Projects Manager
	Kay Merrill	Administrative Utilities Technician

CONSULTANT: John Rickenbach

ESTABLISH QUORUM AND CALL TO ORDER

John Diodati called the meeting to order at 3:05pm., stating all Committee Members are present and asked for a moment of silence then led the Pledge of Allegiance.

Rob Livick noted corrections to the Agenda, Item A-1, Approval of the minutes, the meeting date should be September 10, 2014 not September 2, 2014 and reiterated the next meetings are on October 22, 2014 and November 5, 2014.

PUBLIC COMMENT

John Diodati opened Public Comment period.

Gary Hixon complimented the Committee for doing a good job.

John Diodati closed Public Comment period.

A. CONSENT CALENDAR – Approve minutes from the September 10, 2014 meeting.

A-1 MINUTES OF SEPTEMBER 10, 2014 WRFCAC MEETING

John Diodati stated on C-5 the correct date of the meeting is November 5, 2014, not November 11, 2014.

MOTION: Mary Garelick moved to approve the minutes with the correction, Barbara Spagnola seconded and the motion passed unanimously. (9-0).

B-1 SUB COMMITTEE FORMATION

Rob Livick stated at the previous WRFCAC meeting there was discussion to form three Sub Committees, Finance, Environmental and Engineering/Water Resources. Each of these Sub Committees may have up to four Committee members so there is no quorum and they can meet for discussion.

John Diodati asked who would like to be on the Sub-Committees. The Finance Committee members are: Mary Garelick, Barbara Spagnola and Richard Sadowski. The Environmental Committee members are: Dale Guerra, Valerie Levulett and Paul Donnelly. The Engineering/Water Resources members are: Steven Shively, Dale Guerra and Paul Donnelly.

John Diodati will participate in all three Sub Committees.

MOTION: Shively moved to approve all three Sub Committees as self-nominated, Guerra seconded and the motion passed unanimously. (9-0).

C. NEW BUSINESS

C-1 Water Reclamation Facility (WRF) Project Schedule Update - Report to be provided at or before the meeting.

John Rickenbach stated the Project Schedule Update is a two page schedule. The first page is an update of a long term schedule and the second page is a short term schedule for 2014. A copy of the schedule will be given to the Committee members. Preliminary reports have been given to the members and more reports will be coming and will be distributed. At the November 12, 2014 City Council meeting, a decision will be made by Council to either proceed with CMC and work with the County and State or choose the Rancho Colina site.

John Rickenbach clarified City Council is responsible for changes made to the schedule.

Rob Livick stated the major date that Council is looking at, which was approved by Resolution, is five years from the issuance of the next NPDES permit for the existing plant to have the new WRF constructed and operational.

John Diodati received and filed.

C-2 Review and Discussion of Report by Larry Walker and Associates (LWA): Regulatory Implications of Discharge Options for the Future City of Morro Bay Water Reclamation Facility

Rob Livick stated this report was presented to the City Council by Betsy Elzufon (LWA). The report covered various discharge options a new facility could have, comparing creek discharge, land disposal and ocean outfall. Regulatory requirements increase when you discharge to a more sensitive disposal area. Land disposal is the easiest, followed by ocean and then creek discharge.

John Rickenbach presented to staff and Committee members a guidance document which outlines recommendations for providing focused feedback on the various reports. Staff is looking for feedback from the

Committee, such as, did the report answer the questions that are needed to move forward on this topic and was anything missed that was fundamental.

Rob Livick clarified the report has been finalized and this report is for discharge permits. The objective of getting the report out to Council, Committees and the Public is to have time to read the report and then ask questions over the next month and present the report at the November 12, 2014 City Council meeting. Rob Livick stated Cayucos CSD is interested in participating in the CMC evaluation, but does not know if Cayucos will participate in the other studies.

John Diodati stated he is looking forward to the Sub Committee's analysis of this report.

John Diodati opened Public Comment period, and seeing none, closed Public Comment period.

C-3 Review and Discussion of Draft Report by Kestrel Consulting: Initial Findings on Grants and Strategy

Rob Livick stated this report has not been to City Council and is the initial public offering of Kestrels analysis on potential availability of funding for a Water Reclamation Facility. Monica Reid from Kestrel Consulting prepared some initial findings on grant strategy and an overview of grant and loan funding programs for Public Works projects.

John Rickenbach stated there are not many programs the City will be eligible for because the City is not a disadvantaged community. Realistically, the City will get funded 25% at best, and probably 10%. There is a lot of competition for a limited amount of money and it does take time and effort to pursue the funding services. Neither site has a funding advantage. If the Committee has specific questions, bring them to Monica and she can provide answers. Monica Reid will be available to meet with the Finance Sub-Committee at 8:00a.m. on Wednesday, October 15, 2014 at Public Services.

Rob Livick clarified that the City does not meet the requirements of a disadvantaged community.

The Committee and staff discussed and commented on various funding options, sources and cost.

John Rickenbach stated CEQA and NEPA requirements are intended to be addressed at the same time using the CEQA plus process.

Rob Livick stated the time to obtain funds from Prop 84 has passed.

John Diodati asked if the City Council is considering a resolution endorsing Prop 1 and Rob Livick responded it has not been brought to City Council.

John Diodati stated the City is a member of IRWM Program and Rob Livick is the representative for the City.

John Diodati stated there are funds available through IRWM and encouraged the public to learn more about Prop 1 that is in the November election. There are a lot of funds available for Climate Adaptation Managed Retreat and because this project is moving from coastline to inland, the City would be competitive for these funds.

John Diodati opened Public Comment, and seeing none, closed Public Comment.

John Diodati stated this is a non-action item.

COMMITTEE MEMBER CLOSING COMMENTS

Bill Woodson stated he was impressed by the questions the Committee asked and wanted to know if the smoke testing of the sewer lines would have any effect on the size of the project in any way, shape or form. Rob Livick responded I & I correction is an ongoing maintenance activity and sewer lines are continually repaired. The smoke testing will not reduce the size of the facility, and it helps to identify where repairs need to be made. A few illicit connections were discovered and were disconnected.

Richard Sadowski stated the Coastal Commission, in their review of the Wastewater Treatment Plant Project, stated they are linking some of the major parts of the collection systems with this project. Regarding, I & I, the flow is significant.

Bill Woodson asked if there are any drop dead dates for CMC sewer facility improvement or replacement. Rob Livick responded no, they have a fairly new system and a fairly new facility.

Paul Donnelly thanked John Rickenbach for a job well done for the City.

Rob Livick will ensure the City has the most current e-mails for all Committee members and that members receive a hard copy of the packets.

John Rickenbach stated reports will be forwarded to members as they become available.

John Diodati stated the Committee and staff should meet at 2:00pm, October 22, 2014 at Rancho Colina to visit the site and if possible, visit the CMC site.

E. ADJOURNMENT

The meeting adjourned at 4:10pm to the next special WRFCAC meeting at the Morro Bay Community Center, 1001 Kennedy Way, on Wednesday October 22, 2014 at 3:00pm.

_____

John Diodati, Chairperson

ATTEST:

_____

Rob Livick, Secretary

AGENDA NO: C-1

MEETING DATE: October 22, 2014

Staff Report

DATE: **October 17, 2014**

TO: **Water Reclamation Facility Citizens Advisory Committee**

FROM: **Rob Livick, PE/PLS - Public Services Director/City Engineer**

SUBJECT: **Review of Report Regarding Initial Findings on Hydrologic Evaluation of the Potential Benefits to the City Water Supply from Increasing Wastewater Discharge to either Morro Or Chorro Creek by Cleath Harris Associates**

RECOMMENDATION

Staff recommends the Water Reclamation Facility Citizens Advisory Committee (WRFCAC) review the report and provide any comments that will be transmitted to City Council and addressed in the final report at the November 12, 2014 City Council meeting.

BACKGROUND/DISCUSSION

The attached report from Cleath-Harris Geologists (CHG) is an evaluation of potential increases in groundwater yield to the City's Morro and Chorro Valley well fields from increased wastewater discharges to either Morro or Chorro Creeks. Constraints on City well field production include minimum surface flow requirements in Chorro Creek. Increasing the flow in Chorro Creek using wastewater discharges would allow the City to operate their well fields more frequently, with more available water during drought periods, in addition to providing water for environmental demand. This report presents the results of the study.

Regulatory constraints related to waste discharge permitting and groundwater quality were previously evaluated by Larry Walker and Associates. Additionally, direct wastewater reuse in the Chorro Valley was not part of this study, but was evaluated in the Rickenbach options report dated December 15, 2013 and found on the City's website (http://www.morro-bay.ca.us/index.aspx?NID=759).

The benefits analysis focuses on water rights and hydrology; specifically on compliance with the minimum stream flow requirements and benefits to extractions from the City's well fields in both the Morro and Chorro Valleys and how that relates to creek underflow.

This report from CHG is the third in a series of reports the City Council will use in making the final decision on where the City selects to treat its wastewater. The next report will be a detailed assessment of the California Men's Colony Wastewater Treatment Facility. These reports will culminate in a final decision currently scheduled for the November 12, 2014 City Council meeting.

ATTACHMENTS

1. Report from CHG dated October 17, 2014

Prepared by: __RL __ **Dept. Review: RL__**

City Manager Review:_____

City Attorney's Review:_____

ATTACHMENT 1

TECHNICAL MEMORANDA FROM CHEATH-HARRIS GEOLOGISTS (CHG)
REGARDING THE HYDROLOGIC EVALUATION OF THE POTENTIAL BENEFITS
TO THE CITY WATER SUPPLY FROM INCREASING WASTEWATER DISCHARGE TO
CHORRO AND MORRO CREEKS

Cleath-Harris Geologists, Inc.
11545 Los Osos Valley Road, Suite C-3
San Luis Obispo, California 93405
(805) 543-1413

Technical Memorandum

Date: October 6, 2014

From: Spencer Harris, HG 633

To: Rob Livick, Morro Bay Public Services Director/City Engineer

SUBJECT: **Hydrologic evaluation of the potential benefits to the City water supply from increasing wastewater discharge to Chorro Creek, San Luis Obispo County.**

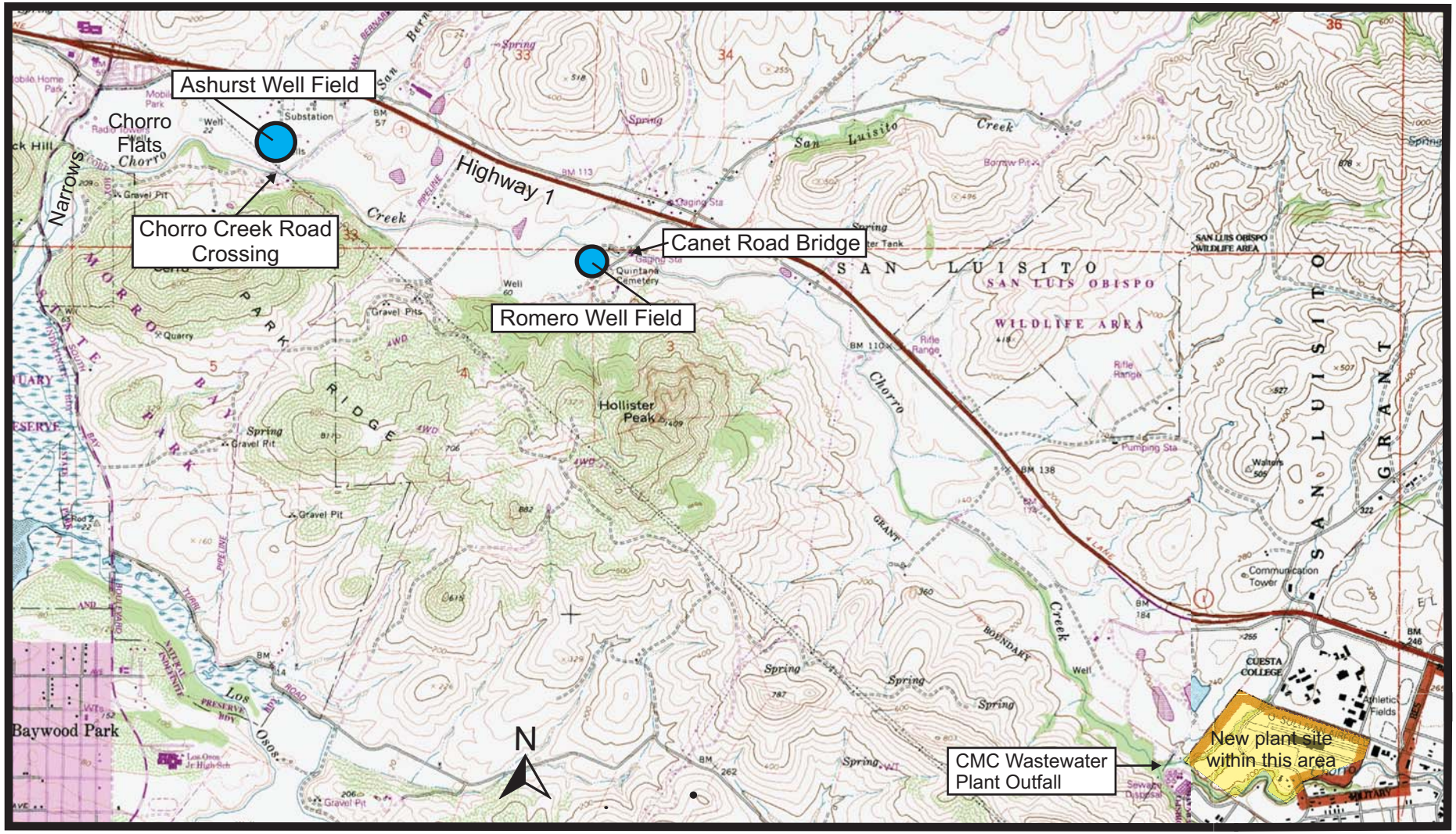
Cleath-Harris Geologists (CHG) has completed an evaluation, on behalf of the City of Morro Bay (City), of potential increases in groundwater yield to the City's Chorro Valley well fields from increased wastewater discharges to Chorro Creek. Constraints on City well field production include minimum surface flow requirements in Chorro Creek. Increasing the flow in Chorro Creek using wastewater discharges would allow the City to operate their well fields more frequently, with more available water during drought periods, in addition to providing water for environmental demand. This Technical Memorandum presents the results of the study.

Regulatory constraints related to waste discharge permitting and groundwater quality were not evaluated in this memorandum. Direct wastewater reuse in the Chorro Valley was also not part of this study. The benefits analysis focuses on water rights and hydrology, and specifically on compliance with the minimum stream flow requirements contained in the City's permit for diversion and use of Chorro Creek underflow.

Background

The City of Morro Bay is evaluating sites for constructing a new water reclamation facility. One of the potential locations has been identified as the area near the existing California Mens Colony (CMC) wastewater plant in the Chorro Valley (Figure 1). The CMC wastewater plant operates under Waste Discharge Order R3-2012-0027, with a permitted average dry-weather discharge of 1.2 million gallons per day (MGD) to Chorro Creek, and a minimum continuous discharge requirement of 0.75 cubic feet per second (cfs).

The Second Public Draft Options Report prepared for the City indicates the new facility could either be constructed and operated by the City, independent from the existing CMC wastewater plant, or be constructed and operated as a regional facility under a multi-agency project, which would replace the older CMC plant (Rickenbach, 2013). In either case, the new facility would process effluent from both Morro



Base Maps: U.S.G.S. Morro Bay North (1995), Atascadero (1995), Morro Bay South (1994), and San Luis Obispo (1995) Quadrangles, San Luis Obispo County, California, 7.5 Minute Series (Topographic)

0 3,000

Scale: 1 inch = 3,000 feet

Figure 1
Chorro Valley Well Fields
City of Morro Bay

Cleath-Harris Geologists, Inc.

Bay and Cayucos. Wastewater discharges to Chorro Creek would be projected to increase by an average of 1.5 MGD, equivalent to approximately 2.32 cfs.

Constraints on City Well Field Production

The City operates two well fields in the Chorro Valley, the Romero well field and the Ashurst well field. The constraints on the City's ability to pump from the Chorro Valley have been grouped into four categories: water rights, water quality, facilities, and stream flow interference.

Water Rights

Both Chorro Valley well fields operate under State Water Resource Control Board, Division of Water Rights Permits for Diversion and Use of Water. For this benefits analysis, the City is assumed to be constrained by water rights permits to cease production at the well fields when surface flow in Chorro Creek (measured downstream of the respective fields) is less than 1.4 cfs. The current permitted maximum allocation for City groundwater production from the Chorro Valley well fields is 1,142.5 acre-feet per year (CH2M Hill, 2011 Appendix F). If the City increases wastewater discharges to Chorro Creek, however, it is assumed that the City well field allocation of creek underflow may also be increased.

Water Quality

Water from the Chorro Valley well fields has historically been impacted by elevated nitrate concentrations, which are attributed primarily to agricultural fertilizer applications (CHG, 2009). The City is working to resolve the nitrate problem by providing treatment or blending by 2020 (CH2M Hill, 2011). Addressing nitrate contamination or future regulatory standards for emerging contaminants, including pharmaceuticals and personal care products, would be required with or without the additional wastewater discharges to Chorro Creek. Therefore, water quality constraints on production are not a factor in this benefits analysis.

Historically, seawater intrusion has not been a problem for the City's Chorro Valley well fields. The Department of Water Resources seawater intrusion study in 1972 documented elevated salinity associated with seawater intrusion in the narrows area downstream of Chorro Flats (Figure 1). Since that study, chloride level fluctuations at the County golf course irrigation well also suggested occasional periods of intrusion in the narrows area (Cleath & Associates, 1993). Increases in wastewater discharges to Chorro Creek would reduce the potential impact of seawater intrusion in the narrows.

Facilities

Under normal system pressure, maximum production from the Romero well field is approximately 240 gallons per minute (gpm) from one active well, and maximum production from the Ashurst well field is approximately 1,150 gpm from four wells (assuming future treatment/blending for nitrates). The resulting combined production capacity for the City's Chorro Valley well fields is 1,390 gpm, or 3.1 cfs. Wells are not typically pumped continuously for extended periods, and a 75 percent duty factor is assumed for maximum sustainable production, equivalent to approximately 1,040 gpm (coincidentally 2.32 cfs, or 1.5 MGD). The previously mentioned 1,142.5 acre-feet per year permitted maximum allocation is equivalent to 710 gpm, or 1.6 cfs. The City has the capacity, with a 50 percent duty factor for peaking, to extract the current maximum allocation.

Stream Flow Interference

The amount of stream flow interference during well field pumping varies by well and the duration of pumping. For the purposes of this benefits analysis, however, a Chorro Creek stream flow depletion rate of 100 percent of the total well field production rate is assumed. In other words, groundwater production at the City well fields will reduce stream flow by an equivalent amount.

Methodology

CHG has been monitoring stream flow at two locations on Chorro Creek every two weeks from January 2010 to present (the study period). The monitoring locations are at the Canet Road bridge (adjacent to the County stream gage), and at the Chorro Creek Road crossing. The Canet Road bridge site is approximately 600 feet upstream of the Romero well field, and the Chorro Creek Road crossing is immediately adjacent to the Ashurst well field (Figure 1). This flow data, along with well field production constraints and adjustments for increased agricultural water demand, provide the information needed to complete the benefits analysis using the four steps outlined below.

Step 1. Treated wastewater discharges to Chorro Creek (1.5 MGD) are added directly to the January 2010 - September 2014 flow data measured at Chorro Creek Road, except during periods of no flow. Low flow correlation with Canet Road provides a basis for adjustment when there are no measurable surface flows at Chorro Creek Road.

Step 2. Potential increases in local agricultural water demand, based on a land survey conducted between the CMC wastewater discharge site and the City well fields, are subtracted from the surface flows calculated in Step 1 to account for future losses in stream flow not benefitting the City.

Step 3. The maximum available production from City well fields are compared with and without increased City wastewater discharges. Well field production constraints are applied. The potential benefit to the City is calculated as the increased production available under project conditions during 2010-2014 study period, which includes an exceptional drought.

Step 4: Increasing the maximum permitted diversions from Chorro Creek underflow will also directly increase the potential City benefit during years where the minimum flow threshold does not significantly restrict production (i.e. non-drought years). The current maximum permitted diversion is 1,142.5 acre-feet per year. The continuous sustainable capacity of the City well field facilities is estimated at 1,040 gpm, or 1,678 acre-feet per year. The benefit to the City from increasing the maximum permitted discharge is the difference between annual production under project conditions and 1,142.5 acre-feet per year (up to 535 acre-feet of increased annual production).

Benefits Analysis

Bi-weekly flow measurements for Chorro Creek at the Chorro Creek Road crossing from January 2010 through September 2014 are plotted in Figure 2. The 1.4 cfs flow threshold for permitted diversions from City well fields is shown, along with the allowable extractions by the City well fields, assuming a maximum facilities production rate of 1,040 gpm (2.32 cfs) with 100 percent of production resulting in stream flow depletion. Periods where the annual permitted maximum diversion of 1,142.5 acre-feet would be reached is also shown.

Adjustments for potential increased agricultural water demand and for the flow deficit during periods of low flow are needed prior to adding the 1.5 MGD increased discharges under project conditions. These adjustments are described below.

Increased Agricultural Demand Adjustment

A land use survey using aerial imagery identified three properties with wells in the Chorro Valley groundwater basin, between the CMC wastewater plant discharge site and the Ashurst well field, where additional land could be farmed. Increasing irrigated acreage would increase overall future groundwater extractions and reduce stream flow, compared to current conditions. Room for 20 acres of increased vineyard acreage and 40 acres of other potential crops were identified, which could result in up to 120 acre-feet per year of additional groundwater demand. Assuming 85 percent consumptive use (15 percent return flow), and 100 percent of the consumptive use derived from stream depletion, the estimated potential average decrease in Chorro Creek stream flow from increased agricultural water use would be approximately 100 acre-feet per year (63 gpm; 0.14 cfs).

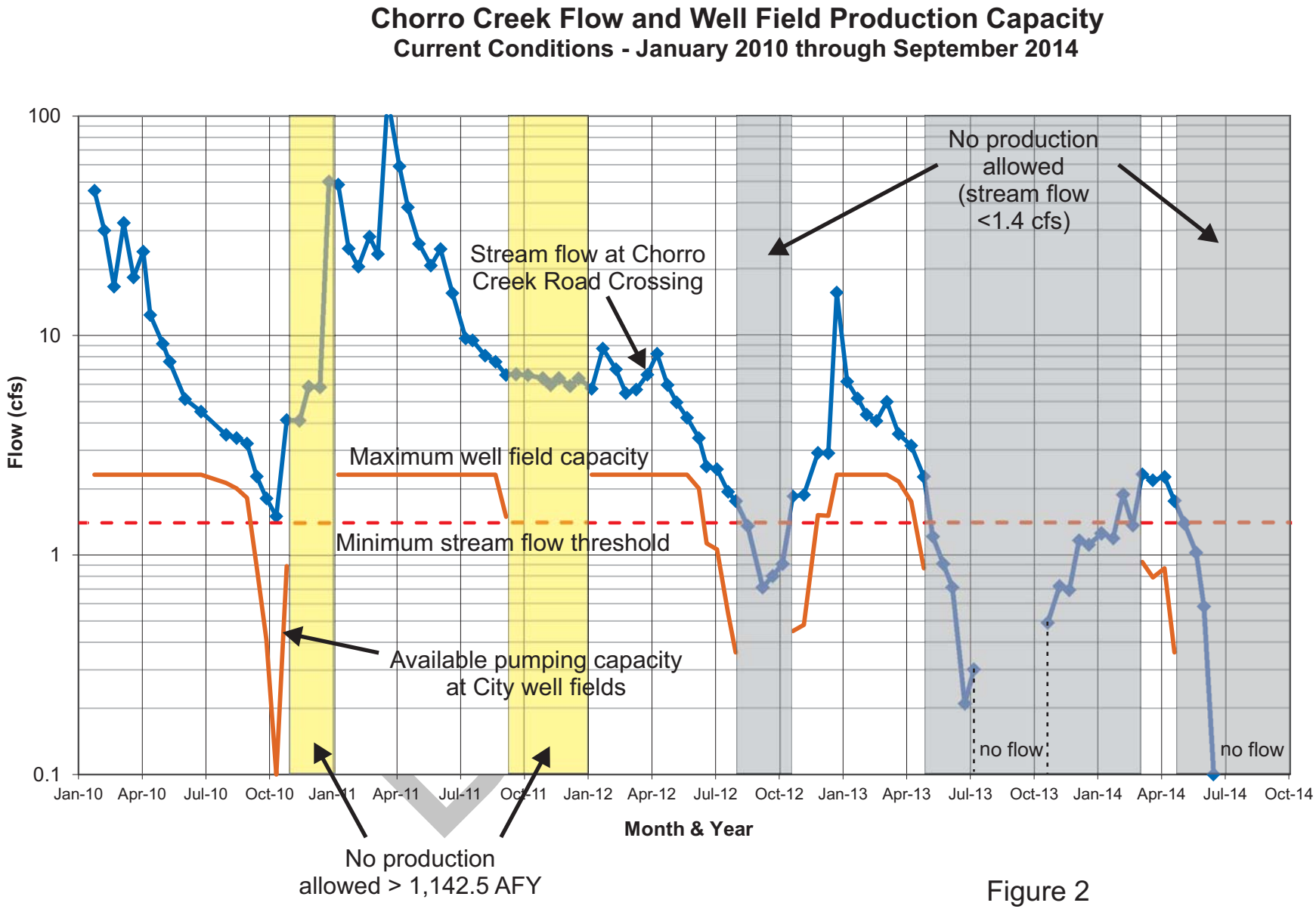


Figure 2
Chorro Creek Flow
Current Conditions
City of Morro Bay

Cleath-Harris Geologists

Low Flow Conditions Adjustment

Figures 3 and 4 present the correlation between stream flow at Canet Road and Chorro Creek Road. At moderate flows of 2-8 cfs, Chorro Creek is generally a gaining stream between Canet Road and Chorro Creek Road (Figure 3). At flows less than 1.5 cfs, however, Chorro Creek becomes a losing stream. There is no flow at Chorro Creek Road when flow at Canet Road falls below a threshold of approximately 0.7 cfs (Figure 4). This low flow correlation can be used to estimate the accumulated deficit in flow at Chorro Creek Road, which subtracts from the 1.5 MGD increase in surface flow under project conditions.

For example, on July 26, 2013, flow on Chorro Creek at Canet Road was measured at 0.29 cfs, with no flow at Chorro Creek Road. Since a flow of 0.7 cfs is needed at Canet Road before any surface flow is observed at Chorro Creek Road, the corresponding flow deficit would be 0.41 cfs. For an increased wastewater discharge of 1.5 MGD (2.32 cfs) upstream of Canet Road, the stream would lose 0.41 cfs between Canet Road and Chorro Creek Road, and the resulting surface flow at Chorro Creek Road would be estimated at 1.91 cfs.

City Water Supply Benefit from Increased Stream Flow

The bi-weekly flow measurements for the study period presented in Figure 2 are re-plotted in Figures 5 and 6. Figure 5 shows the anticipated changes in stream flow from adding 1.5 MGD wastewater discharges to Chorro Creek at a constant rate. Figure 6 shows the anticipated changes in flow from adding 1.5 MGD wastewater discharges in the form of a variable monthly discharge rate, based on the monthly flow distribution observed at the existing plant in 2005, a wet year (Table 1).

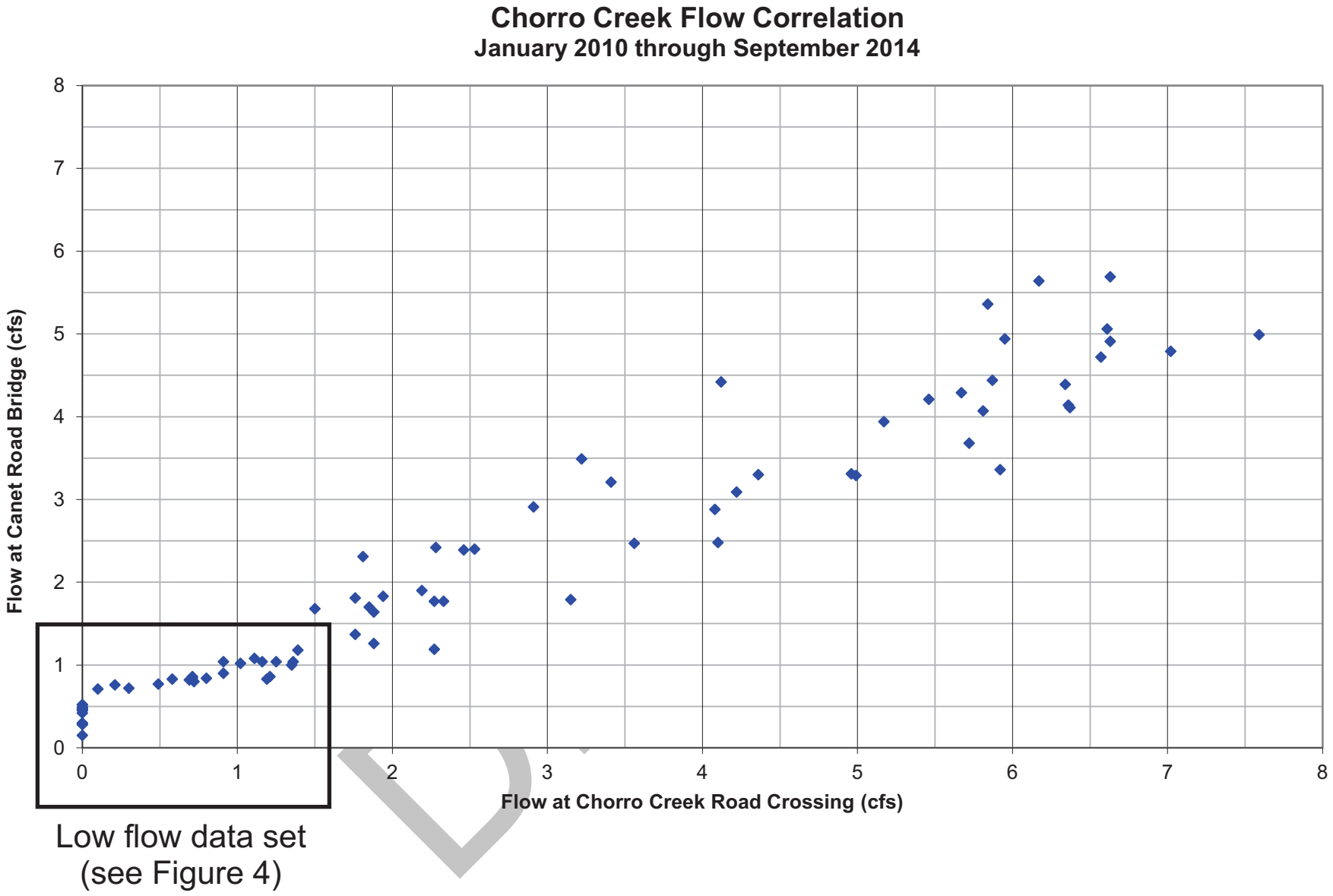


Figure 3
Chorro Creek Flow Correlation
Current Conditions
City of Morro Bay

Cleath-Harris Geologists

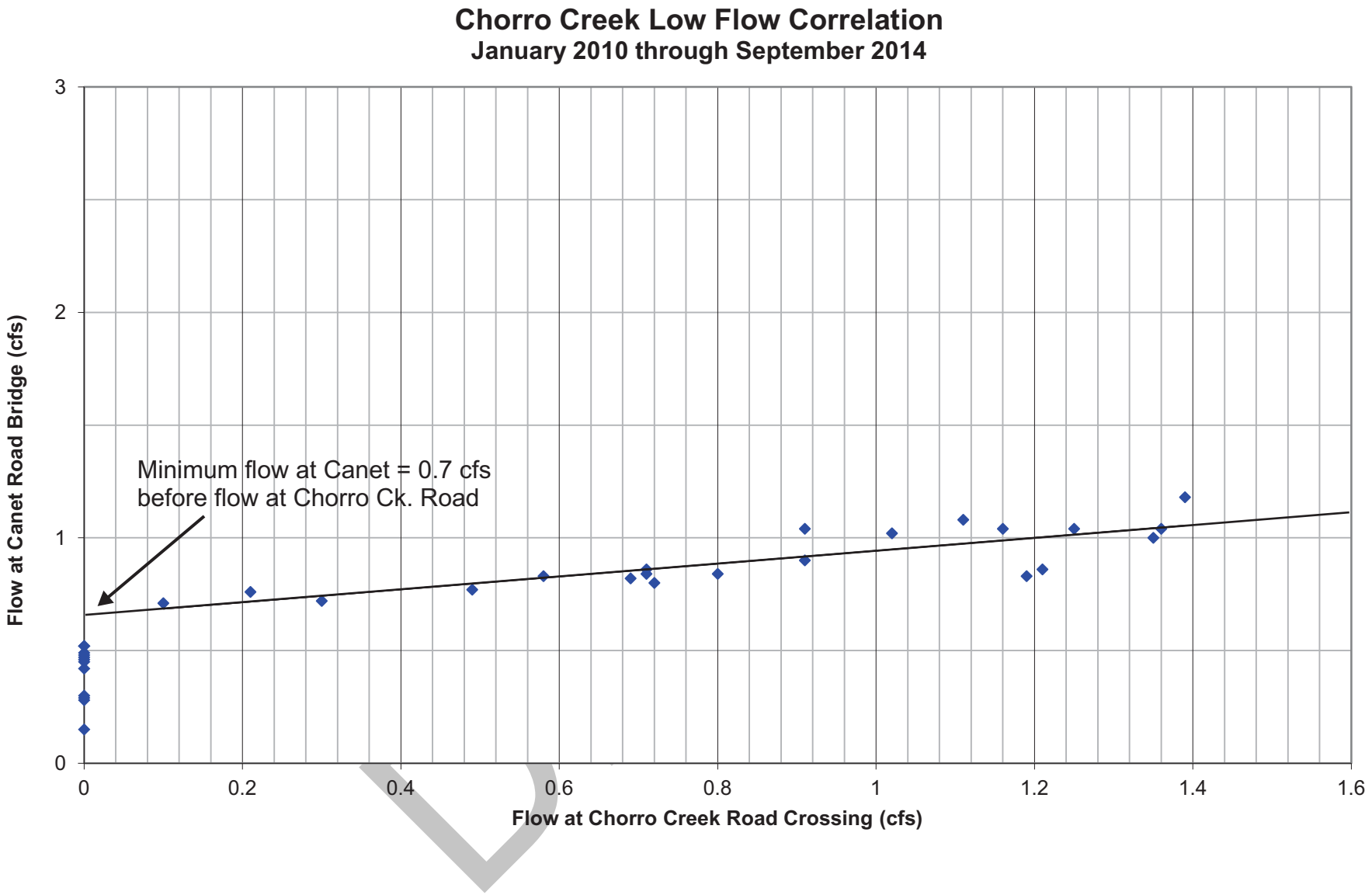


Figure 4
Chorro Creek Flow Correlation
Low Flow Data Set
City of Morro Bay

Cleath-Harris Geologists

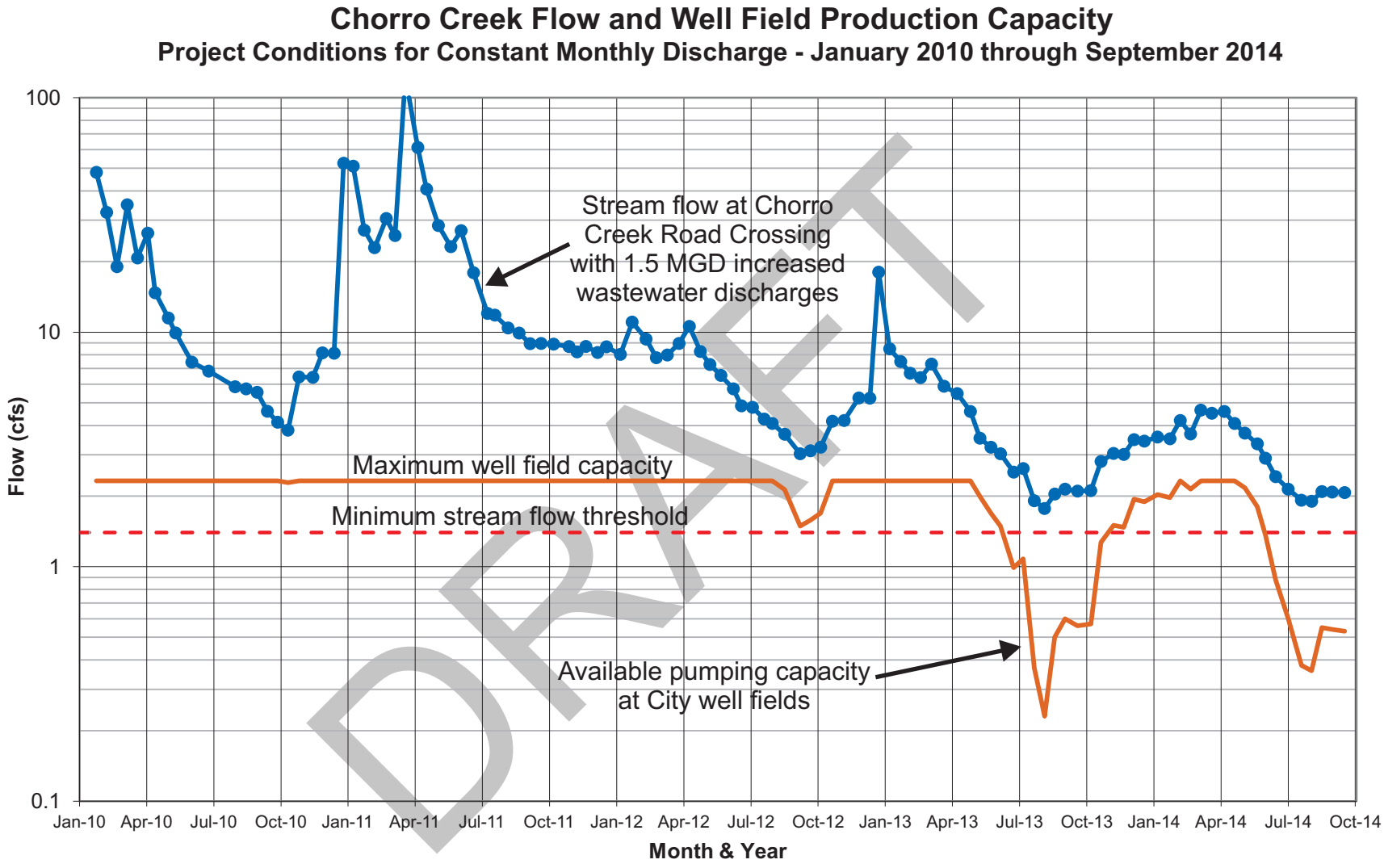


Figure 5
Chorro Creek Flow
Project Conditions - Constant Discharge
City of Morro Bay

Cleath-Harris Geologists

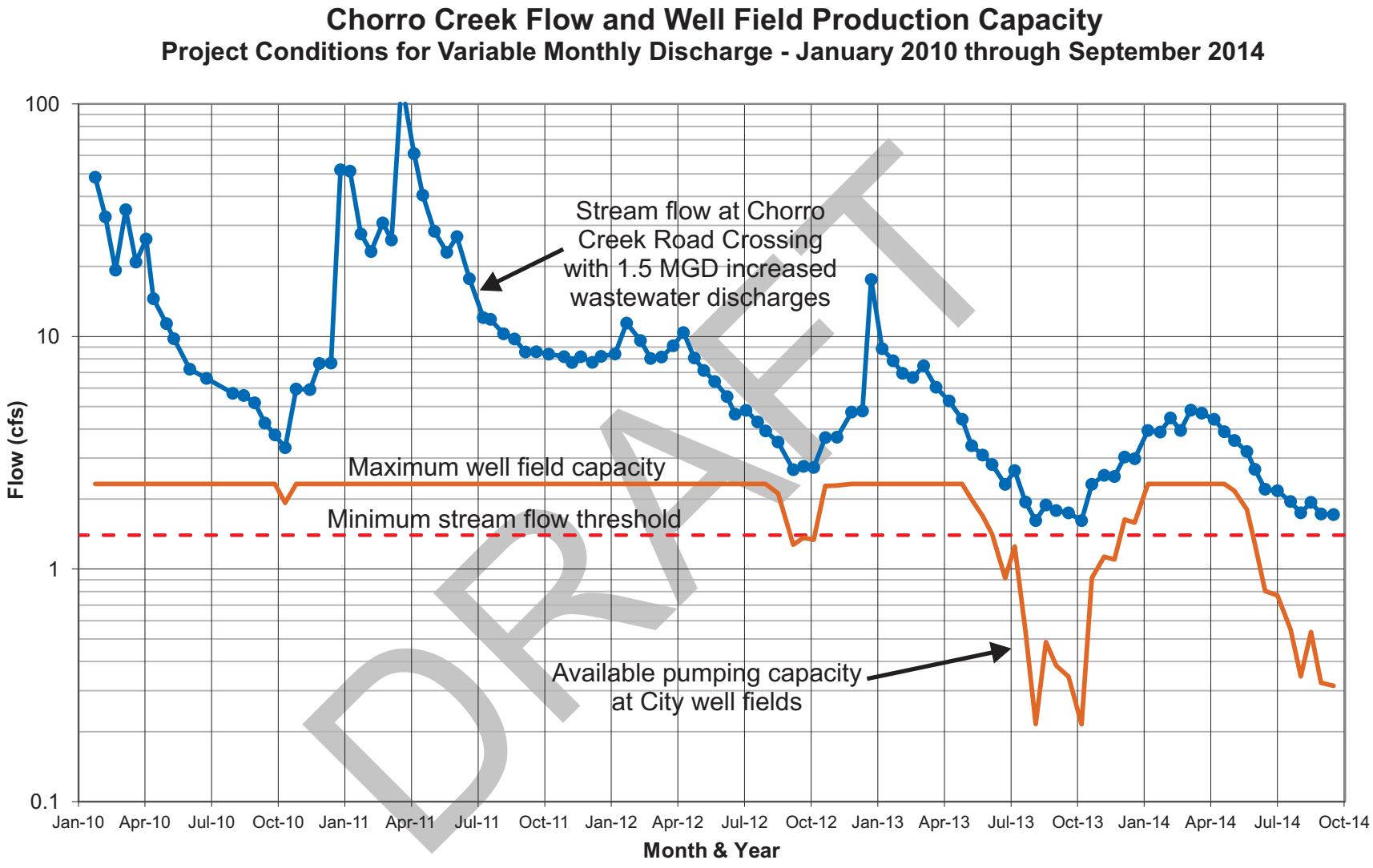


Figure 6
Chorro Creek Flow
Project Conditions - Variable Discharge
City of Morro Bay

Cleath-Harris Geologists

Table 1
Project Conditions
Variable Wastewater Discharge Rate

Month	Average Daily Flow (MGD)
January	1.83
February	1.76
March	1.70
April	1.47
May	1.50
June	1.45
July	1.61
August	1.49
September	1.36
October	1.27
November	1.26
December	1.30
Average	1.50

Adjustments for potential increased agricultural water demand and for low flow conditions have been applied. The 1.4 cfs flow threshold for permitted diversions from City well fields is shown, along with the allowable extractions by the City well fields, assuming a maximum facilities production rate of 2.32 cfs with 100 percent of production resulting in stream flow depletion.

Figures 7 and 8 show the potential benefit of the increased wastewater discharges, based on the difference in the allowable extractions by the City well fields between current and project conditions. Table 2 and 3 below summarize the increased water supply available to the City based on project conditions over the January 2010 to September 2014 study period.

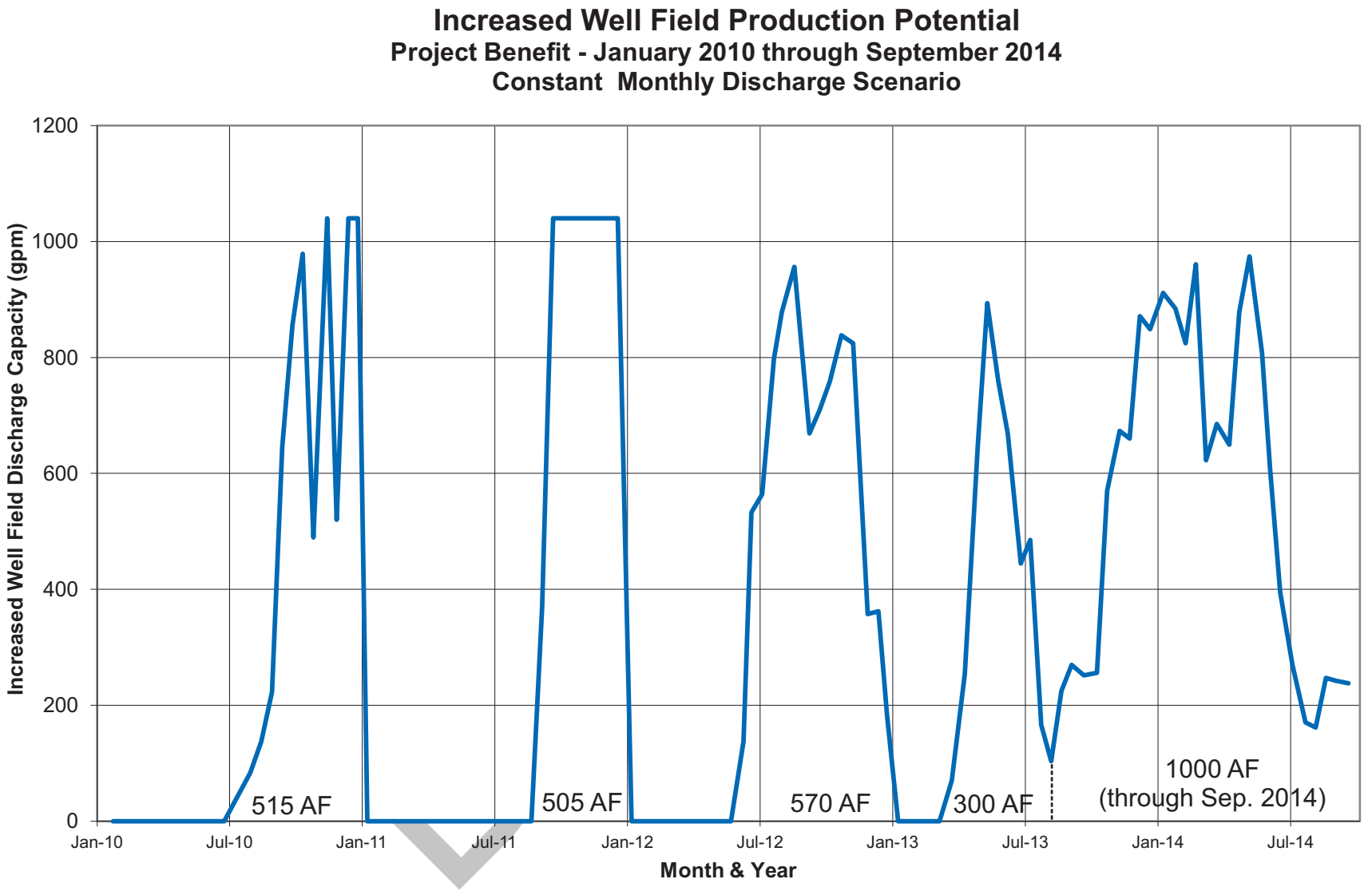


Figure 7
Project Benefit - Constant Discharge
City of Morro Bay

Cleath-Harris Geologists

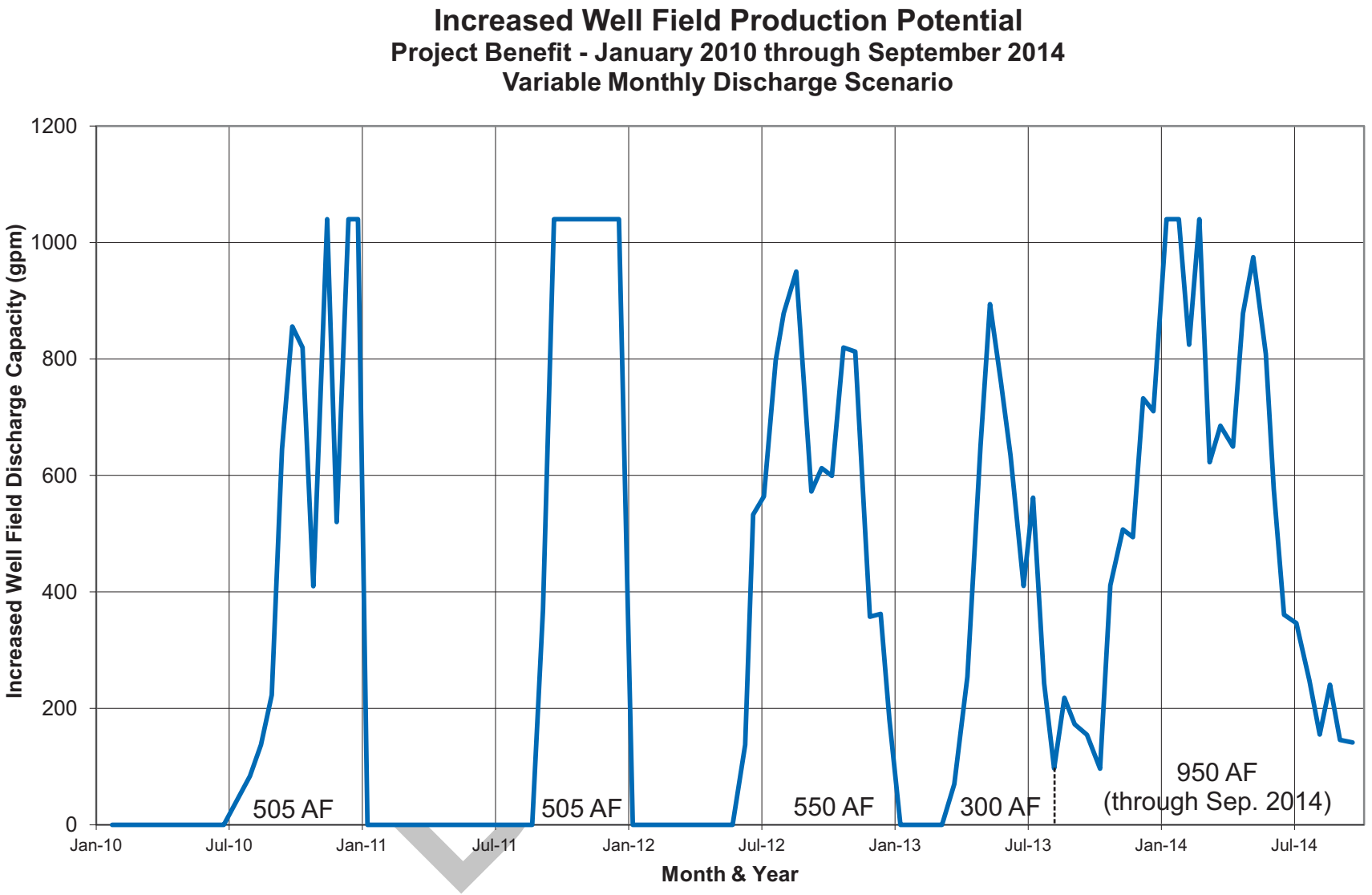


Figure 8
Project Benefit - Variable Discharge
City of Morro Bay

Cleath-Harris Geologists

Table 2
City Water Supply Benefit - Constant 1.5 MGD Discharge Rate
January 2010 - September 2014

Time Periods with benefit under project conditions during 57-month study period	Maximum City Well Field Production (Acre-Feet)		
	Current Condition	Project Condition	Project Benefit
July - October 2010 (4 mos.)	255	770	515
Sep.- December 2011 (4 mos.)	25	530	505
June - December 2012 (7 mos.)	300	870	570
March - August 2013 (6 mos.)	130	430	300
Sep. 2013 - Sep. 2014 (13 mos.)	100	1100	1000
TOTAL (34 mos.)	810	3700	2890

Table 3
City Water Supply Benefit - Variable Discharge Rate
January 2010 - September 2014

Time Periods with benefit under project conditions during 57-month study period	Maximum City Well Field Production (Acre-Feet)		
	Current Condition	Project Condition	Project Benefit
July - October 2010 (4 mos.)	255	760	505
Sep.- December 2011 (4 mos.)	25	530	505
June - December 2012 (7 mos.)	300	850	550
March - August 2013 (6 mos.)	130	430	300
Sep. 2013 - Sep. 2014 (13 mos.)	100	1050	950
TOTAL (34 mos.)	810	3620	2810

The benefits analysis identifies five periods totaling 34 months between January 2010 and September 2014 when the City could have produced more water from its Chorro Valley well fields under project conditions, compared to current conditions. The maximum City production available during those 34 months is

estimated at 810 acre-feet with the current CMC wastewater treatment plant discharges and up to 3,700 acre-feet after increasing treated wastewater discharges by a constant 1.5 MGD (a net gain of 2,890 acre-feet). The total average increase in wastewater discharges over the 57-month study period would be 7,980 acre-feet.

The average net benefit to the City is approximately 36 percent of the total increased discharges to Chorro Creek over the 57-month study period, and approximately 60 percent of the increased discharges to Chorro Creek during the 34 months of actual project benefits. The benefit is maximized during drought periods, with an average of 85 acre-feet per month added to the available water supply.

With increased treated wastewater discharges, the minimum threshold for flow in Chorro Creek required for City well field production would be met at all times, even under the current exceptional drought condition. As shown in Figure 2, there have been close to 16 months during the 57-month study period when stream flow at Chorro Creek Road was at or below the 1.4 cfs threshold for well field operation. Under project conditions, flow would exceed the 1.4 cfs threshold in all months (Figures 5 and 6).

City Water Supply Benefit from Increasing the Maximum Permitted Diversion

As previously mentioned, up to 535 acre-feet of increased annual production (averaging 45 acre-feet per month benefit) would be available to the City, provided the City's maximum permitted diversion is increased. During drought, the benefit specific to increasing the maximum permitted diversion will decline, but the overall benefit will increase due to gains from meeting the minimum flow threshold. Figure 9 illustrates this dynamic benefit to the City water supply during the study period.

Environmental Water Supply Benefit

Siting the new City wastewater plant in the Chorro Valley and increasing average dry weather flows in Chorro Creek by 1.5 MGD would provide more water for meeting environmental demand. Surface flows at Chorro Creek Road would be above the 1.4 cfs threshold for 16 additional months under project conditions, compared to the study period flow record. In addition, there were approximately 7 months of no flow at Chorro Creek Road over the study period, which under the project would have continuous flows of at least 1.4 cfs.

Cumulative Maximum Annual City Production
January 2010 through September 2014

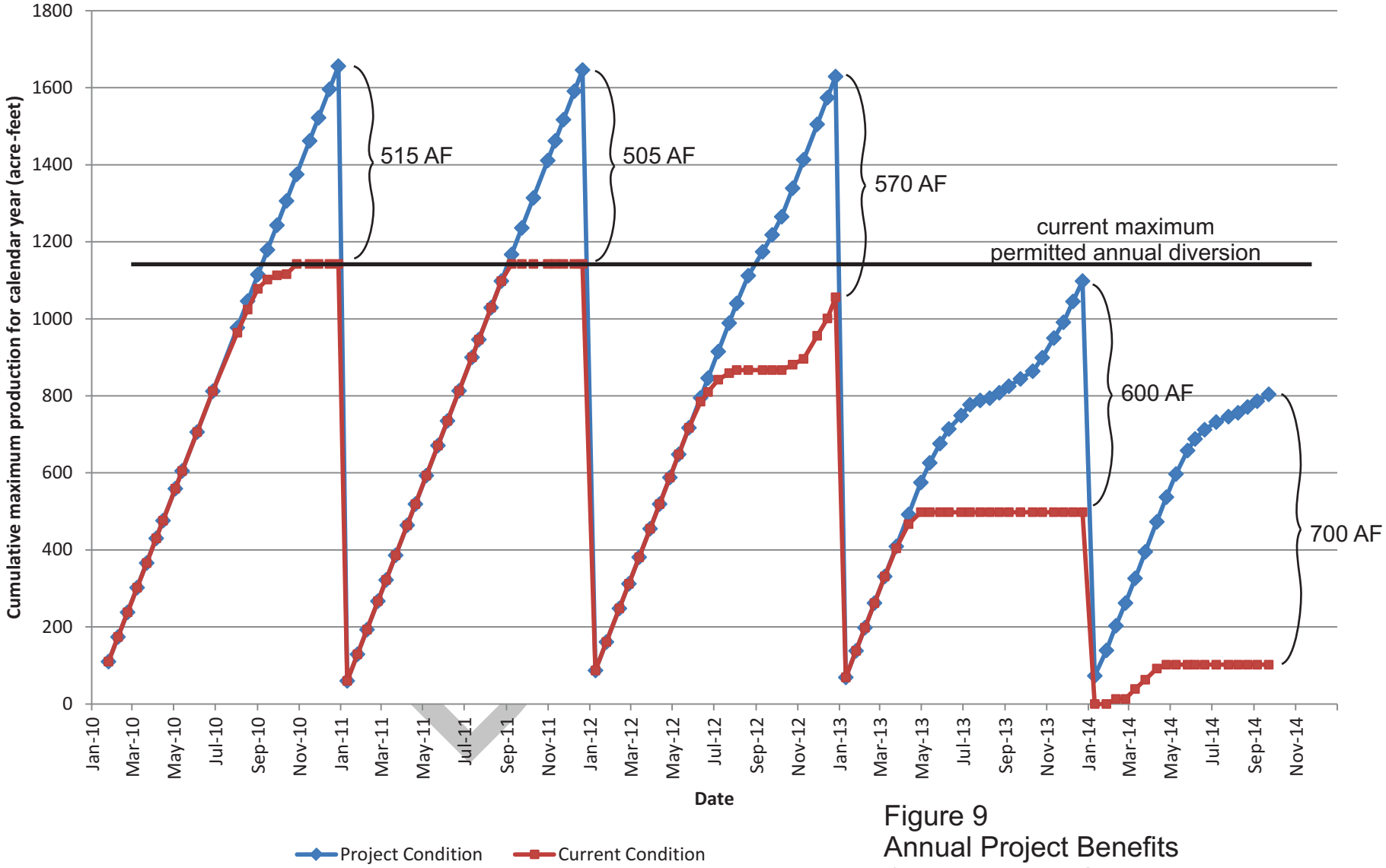


Figure 9
Annual Project Benefits
Constant 1.5 MGD Discharge
City of Morro Bay

Cleath-Harris Geologists

Discharge Management Strategies

Under current conditions, once storm water runoff has dissipated, stream flow in Chorro Creek fluctuates between approximately 0.5 and 1 cfs at the Canet Road bridge, based on correlating stage readings from the County stream gage. These fluctuations relate to a combination of the timing of wastewater discharges from the CMC wastewater treatment plant, riparian corridor evapotranspiration, and pumping activities upstream of Canet Road. The flow peaks are generally overnight or in the morning hours.

If the City had sufficient treated wastewater storage capacity to control the timing of the non-continuous portion of the permitted discharges, it may be possible to coordinate releases at the new treatment plant with well field operations downstream. For example, if declining flows at Chorro Creek Road approached the 1.4 cfs threshold, the City could adjust well field pumping times to coincide with peak overnight flow periods, taking advantage of both low evapotranspiration and increased releases. Due to the fluctuations in average stream flow velocity and related travel times, the actual timing of peak releases at the new treatment plant may need to vary under this type of management strategy.

An alternative or concurrent management strategy would be to use the flexible (non-continuous) permitted discharge capacity of a new City or multi-agency wastewater treatment plant to offset existing irrigation in the Chorro Valley, thereby reducing groundwater production. A decline in groundwater production will increase surface flows and contribute toward meeting the in-stream flow requirements for permitted diversions.

Summary

This study provides an overview of the constraints on City well field operation in the Chorro Valley and of the potential benefits to the City water supply from increasing wastewater discharges to Chorro Creek. Results of the study indicate that adding 1.5 MGD in discharges to Chorro Creek from a new wastewater plant in the Chorro Valley could provide an average of 85 acre-feet per month increased groundwater yield to the City well fields during drought, and 45 acre-feet per month during non-drought periods.

References

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DRAFT

ATTACHMENT 1

Cleath-Harris Geologists, Inc.
71 Zaca Lane, Suite 140
San Luis Obispo, California 93401
(805) 543-1413

Technical Memorandum

Date: October 20, 2014

From: Spencer Harris, HG 633

To: Rob Livick, Morro Bay Public Services Director/City Engineer

SUBJECT: **Hydrologic evaluation of the potential benefits to the City water supply from reclaimed water use in the Morro Valley, San Luis Obispo County.**

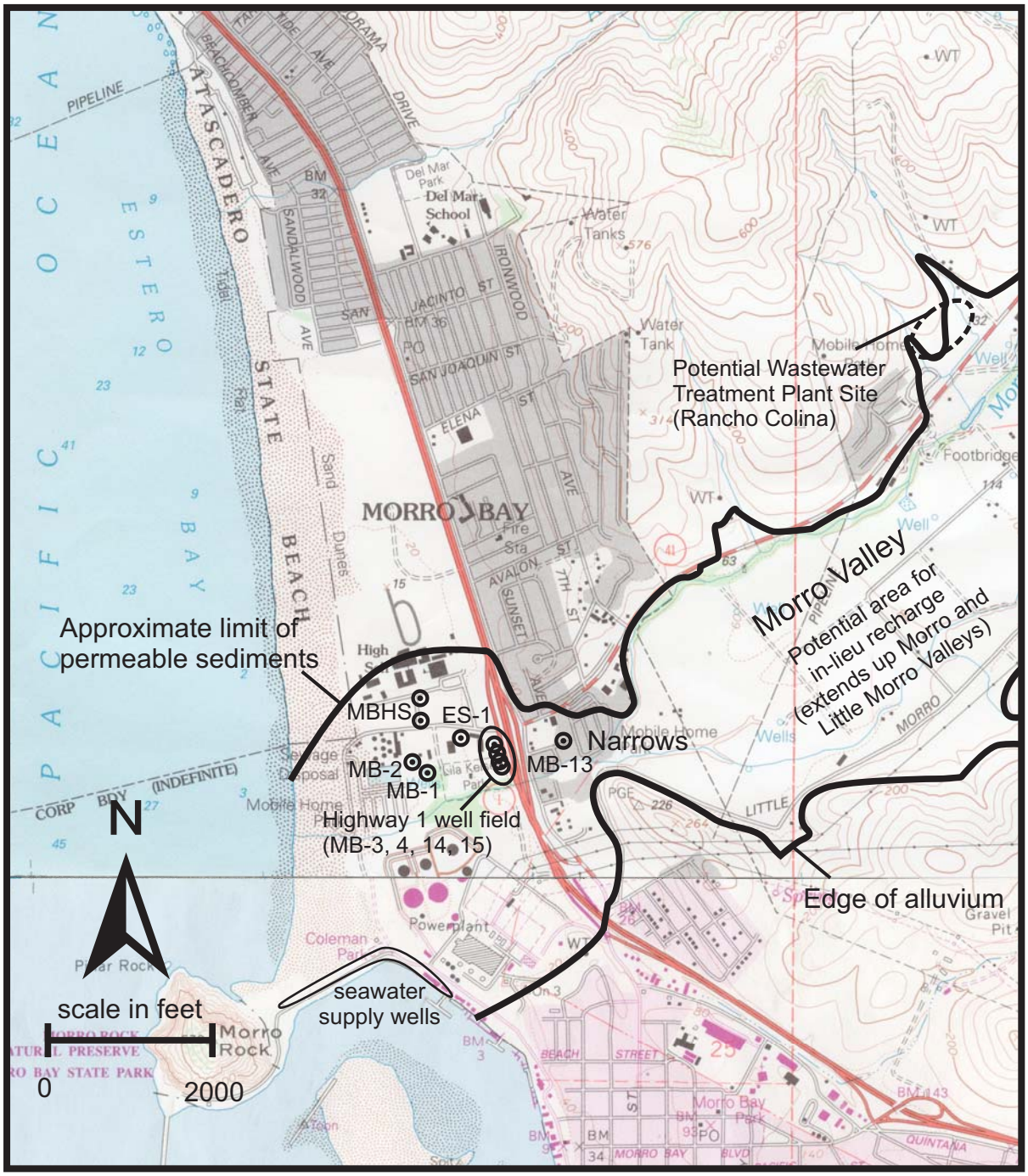
Cleath-Harris Geologists (CHG) has completed an evaluation, on behalf of the City of Morro Bay (City), of potential increases in yield from the City's Morro Valley groundwater basin wells due to the use of reclaimed water for agriculture in the Morro Valley. This memorandum presents the results of the study.

The Morro basin is in overdraft. The City wells are the farthest downstream wells in the basin, and have lost a significant portion of their historical yield. Providing reclaimed water to growers in the Morro Valley would reduce agricultural pumping and provide in-lieu recharge to the groundwater basin. This in lieu-recharge would restore the freshwater yield during drought years and increase the City's Morro groundwater basin yield during normal to wet periods, in addition to providing water for environmental demand.

Regulatory constraints related to waste discharge permitting and groundwater quality were not evaluated in this memorandum. Direct wastewater reuse in the Morro Valley was assumed to be feasible. The benefits analysis focuses primarily on groundwater use and hydrology, and specifically on potential increases to the maximum permitted diversion of Morro Creek underflow from in-lieu recharge credit, and on increases to the available yield of the basin downstream of the narrows.

Background

The City of Morro Bay is evaluating sites for constructing a new water reclamation facility. One potential location has been identified along Highway 41 in the Morro Valley (Rancho Colina; Figure 1). According to the Second Public Draft Options Report, the Cayucos Sanitary District (CSD) remains a potential partner to the City for all new wastewater facility sites, but are pursuing future options through its own studies, and the efforts of the two agencies are independent of one another (Rickenbach, 2013). For the purposes of this benefits analysis, a water reclamation facility in the Morro Valley would only process effluent from the City, which is estimated to average 1.13 million gallons per day (MGD).



Base Maps: U.S.G.S. topographic map, Morro Bay North, 1995 and Morro Bay South, 1994.

Legend

- ⊙ City water well

Figure 1
Morro Valley
City of Morro Bay

Cleath-Harris Geologists

Methodology

The benefits analysis combines basin yield estimates with the principal of conservation of mass used in the standard hydrologic balance equation: groundwater basin inflow = groundwater basin outflow + change in storage. The maximum production capacity of the City wells is also evaluated to be compared with available yield under project conditions. The project benefit is defined as the increase in yield available to City well between current and project conditions.

This analysis takes a "maximum benefit" approach, based on key assumptions discussed below. These assumptions will not necessarily be fully met. They are assumed in order to bracket the upper range of the potential benefit. The benefit to the City water supply from reclaimed water use in the Morro Valley would decline if the assumptions are not fully met. The likelihood of meeting these assumptions should be considered during the wastewater plant siting process. The assumptions are as follows:

1) The water quality delivered to the growers is suitable for the irrigation of existing crops.

Avocado are sensitive to salt content in the irrigation water. An evaluation of the suitability of the reclaimed water for existing crop irrigation should be performed.

2) Reclaimed water use is maximized by the growers to meet their existing water demand.

If reclaimed water is available, the growers will use as much of it as possible to meet their applied water demand. This will maximize the amount of credit the City would accrue as in-lieu recharge.

3) Reclaimed water delivery to growers would be offset by reduced pumpage from the groundwater basin.

The intent of this assumption is for growers to use recycled water instead of pumping groundwater from their wells. Otherwise, the concept of in-lieu recharge is voided, and the City would not benefit from the deliveries. In situations where a grower uses recycled water to develop new orchards or plant crops in previously undeveloped areas, the City would not take the in-lieu recharge credit.

4) The maximum permitted diversion from Morro Creek underflow is not limited to 581 acre-feet per year or 1.2 cfs maximum discharge.

Credit for in-lieu recharge is available to the City on a 1:1 basis. This credit would only be valid (from a technical perspective) when Assumption 3 above is met. Credit for in-lieu recharge will

not necessarily equal the increased freshwater yield available to City wells, particularly during drought (this is discussed in the Benefits Analysis section).

Even recycled water that is economic, good quality, reliable, and delivered may not have as many customers as the available supply. This analysis assumes most Morro Valley growers are able to make long-term commitments to the City to use reclaimed water in a manner that will provide credit for in-lieu recharge. If that is not the case, the benefit to the City water supply will be lower.

City Water Supply Wells

Historically, there were eight wells in the groundwater basin that available City production records indicate were used by the City for water supply. These were wells MB-1, MB-2, MB-3, MB-4, MB-5, MB-13, MB-14, and MB-15. Well MB-5 is abandoned. Wells MB-1 and MB-2 are in the City's Corporation yard area , Well MB-13 is located in the narrows area, and Wells MB-3, MB-4, MB-14, and MB-15 form the Highway 1 (or Keiser Park) well field (Figure 1).

Other city wells include two irrigation wells serving Morro Bay High School, and a groundwater extraction well constructed during remediation activities for methyl tertiary butyl ether (MTBE) contamination that was transferred to the City several years ago (ES-1, or Flippos well). There is also a City well field along the Embarcadero towards Morro Rock that supplies seawater for the desalination plant (Figure 1).

Water Rights

City Wells MB-1, MB-2, MB-3, MB-4, MB-13, MB-14, and MB-15 operate under State Water Resource Control Board (SWRCB), Division of Water Rights Permits for Diversion and Use of Water. The current permitted maximum allocation for City groundwater production from these wells is 581 acre-feet per year (AFY; CH2M Hill, 2011 Appendix F). The maximum permitted combined flow rate from the wells is 1.2 cubic feet per second (cfs). If the City provides reclaimed water to growers in the Morro Valley that directly offsets groundwater pumping, however, it is assumed that the City's annual well field allocation of creek underflow may be increased.

Water Quality

Historically, seawater intrusion has been a problem for the City's wells during drought, including chloride concentrations at the Highway 1 well field approaching 1,000 mg/l in 1977 and 1990 (Cleath & Associates, 1993). Groundwater contamination from methyl tertiary butyl ether (MTBE) impacted Highway 1 well field operations between 2000-2008, and elevated nitrate concentrations have also been a problem. The City has installed Brackish Reverse Osmosis Treatment to allow

continued extractions from City wells in light of the degraded water quality and nitrate contamination (CH2M Hill, 2011).

City Well Pumping Capacity

In order to maximize the benefit to the City water supply, facilities in place would need sufficient capacity to pump the existing permitted maximum plus any available in-lieu recharge. The historical performance of the wells are used herein to estimate constraints on the City's maximum pumping capacity in the basin. Some of the City wells may require rehabilitation, or even replacement to achieve historical performance.

The pumping capacity estimates are not intended to be used for basin yield and do not preclude seawater intrusion; they are facilities constraints. The City wells are also shallow, and are subject to production declines during drought. Table 1 summarized the estimated pumping capacities.

Table 1
Maximum Pumping Capacity (Facilities Constraint)
City Wells in Morro Basin

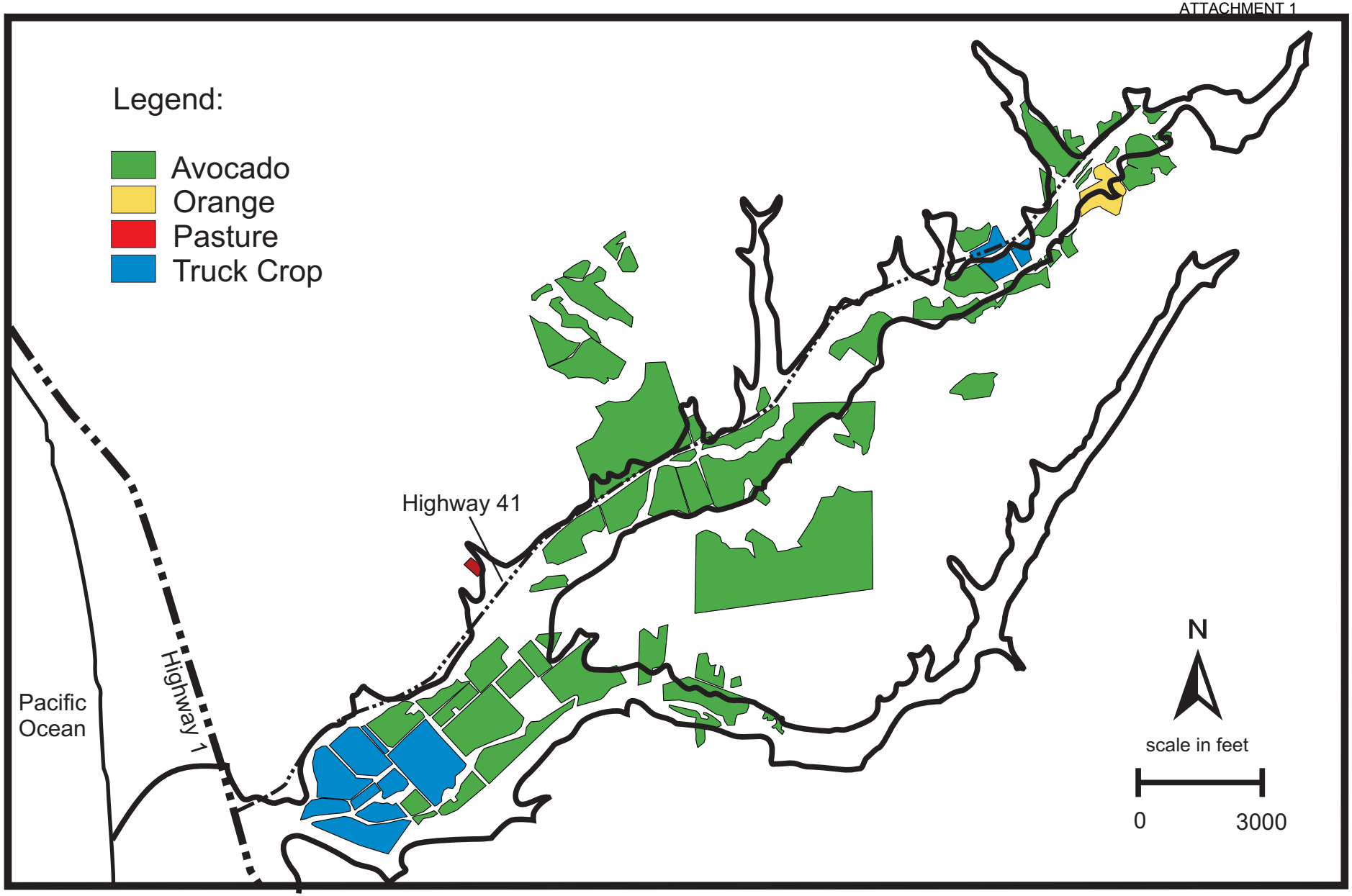
City Well	Maximum Pumping Capacity (acre-feet per year)
MB-1 and MB-2	290
Highway 1 Well Field (MB-3, 4, 14, 15)	640
MB-13	110
High School irrigation wells and ES-1	300
Total	1,340

NOTE: Not a groundwater yield estimate - for facilities constraints analysis only

The combined maximum pumping capacity of all the City wells below the narrows (excluding the seawater wells) is estimated at 1,340 AFY. As noted above, these pumping capacity estimates are not groundwater yield estimates and are for facilities constraints analysis only.

Groundwater Pumping Offset Potential

CHG conducted a crop survey in August 2014 to develop an applied water use estimate for this benefits analysis. The results of the survey are shown in Figure 2 and summarized below in Table 2.



Field reconnaissance August 2014
using areal photograph August 2013 as base map

Figure 2
August 2014 Crop Survey
Morro Valley
City of Morro Bay

Cleath-Harris Geologists

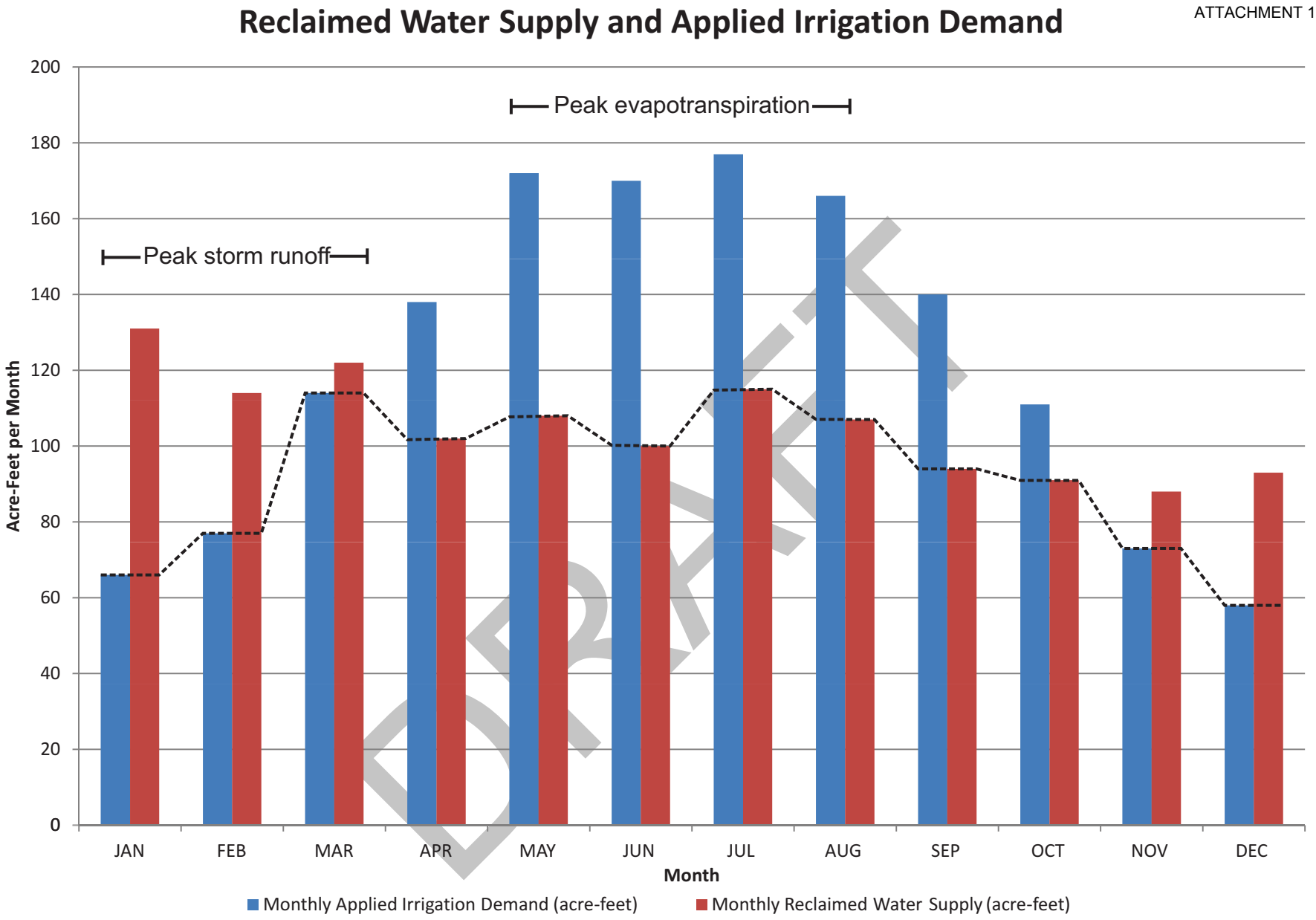
Table 2
Morro Valley Crop Survey - August 2014

Crop	Acres	Applied Water Factor (AF/Ac/Yr)*	Water Demand (AFY)
Citrus and Avocados	837	1.5	1,256
Vegetable	143	1.4	200
Pasture	2	2.9	6
Total	983		1,460

* Applied water in acre-feet per acre per year, assumes 3 vegetable crops per year, from medium demand condition on Table A1 of County Master Water Report (Carollo, 2012).

The existing applied water demand in the Morro Valley in Table 1 is estimated at 1,460 AFY. This includes water demand for citrus orchards that are currently stumped due to the exceptional drought conditions. Up to 1.13 MGD of reclaimed water would be available to growers in the Morro Valley, equivalent to 1,265 AFY. Variations in the reclaimed water supply are impacted by wet weather flow, which peaks in January, and does not coincide with the July peak in applied water demand.

The potential to offset groundwater pumping with reclaimed water use would be the lowest of either the monthly applied water demand or the reclaimed water supply. In order to compare the projected reclaimed water supply to irrigation demand, monthly estimates of the applied water were calculated based on the variation in local reference evapotranspiration rate from CIMIS station 160 (San Luis Obispo West). The monthly reclaimed water supply is based on monthly flow factors for 2005. The demand versus supply comparison is shown in Figure 3 and in Table 3.



Explanation

Potential Groundwater Pumping Offset

Figure 3
Reclaimed Water Supply
and Applied Irrigation Demand
City of Morro Bay

Cleath-Harris Geologists

Table 3
Morro Valley Applied Water Demand vs Reclaimed Water Supply

Month	Reference ET (inches)	Applied Water Demand (acre-feet)	Reclaimed Water Supply (acre-feet)	Groundwater Pumping Offset Potential* (acre-feet)
JAN	2.14	66	131	66
FEB	2.53	77	114	77
MAR	3.73	114	122	114
APR	4.5	138	102	102
MAY	5.63	172	108	108
JUN	5.55	170	100	100
JUL	5.78	177	115	115
AUG	5.41	166	107	107
SEP	4.56	140	94	94
OCT	3.64	111	91	91
NOV	2.37	73	88	73
DEC	1.89	58	93	58
TOTAL	47.73	1460	1265	1105

NOTES: Reference ET for CIMIS Station 160 (San Luis Obispo West).
*Offset potential will vary from year to year based on actual applied water demand and reclaimed water supply.

Based on the estimates in Table 3 above, the available reclaimed water can potentially offset 1,105 acre-feet of applied water demand in the Morro Valley. The groundwater offset potential is not a fixed value but will vary from year to year based on actual applied water demand and available reclaimed water supply. For example, applied water factors are typically reported for low, medium, and high water demand conditions. The range of applied irrigation water demand in the Morro Valley, using the low and high factors from the County Master Water Report, is between 1,110 AFY and 1,760 AFY. The resulting range groundwater offset potential (using the same reclaimed water distribution in Table 2) is 1,000 AFY to 1,170 AFY. As previously discussed, this is a maximum benefits analysis and assumes a high level of grower participation.

Basin Yield

Sustainable yield estimates developed for the Morro basin include 1,500 AFY (Cleath & Associates, 1993) and 1,529 AFY (Brown and Caldwell, 1981). In addition, Brown and Caldwell developed a long-term yield of 1,770+ AFY for normal precipitation years.

The Morro basin is in overdraft. Groundwater withdrawals exceed natural replenishment of the basin during drought periods. Under the current exceptional drought, avocado orchards are being stumped and truck crop acreage left fallow due to a shortage of water. The City wells are the farthest downstream wells in the basin, and as a result of increases in agricultural pumping, the City wells have lost a significant portion of their historical freshwater yield.

The average applied water demand for existing agriculture has been estimated at 1,460 AFY (and may range higher under dry conditions). Rural domestic water demand in the valley was previously estimated at 30 AFY in 1992 (Cleath & Associates, 1993) and has likely increased. For the purpose of this benefits analysis, the prior sustainable yield estimate of approximately 1,500 AFY appears reasonable.

Benefits Analysis

Approximately 75 percent of applied water demand for agricultural irrigation in the Morro Valley (1,105 AFY) could be offset using reclaimed water from a new wastewater treatment plant. This offset becomes in-lieu recharge to the groundwater basin.

Not all of the in-lieu recharge credit would necessarily be available to City wells. As indicated earlier, the hydrologic balance equation is: groundwater basin inflow = groundwater basin outflow + change in storage. Using the concept of in-lieu recharge, reclaimed water may be represented by an increase in basin inflow. This results in an increase to groundwater in storage and/or an increase in basin outflow (to Morro Creek and the ocean). Conversely, if reclaimed water is represented by a reduction in outflow (from wells), then the result of the hydrologic balance is an increase in storage and/or a decrease in basin inflow. Generally speaking, the potential for increasing outflow and reducing inflow increases as a basin fills up. The basin narrows (Figure 1) also restricts subsurface underflow from the upper basin to the area where the City's wells are located, and the primary mechanism for transferring in-lieu recharge is expected to be stream flow. The potential change in storage must be accounted for when estimating available in-lieu recharge.

During drought, pumping depressions expand and carry over from year to year because of lower than normal recharge to the aquifer. A significant portion of the in-lieu recharge would be needed to fill storage declines upstream of the narrows before any benefits are available to downstream users.

Groundwater storage declines during drought have been estimated based on the basin area, water level hydrographs, and specific yield. Spring water level declines during drought appear to increase

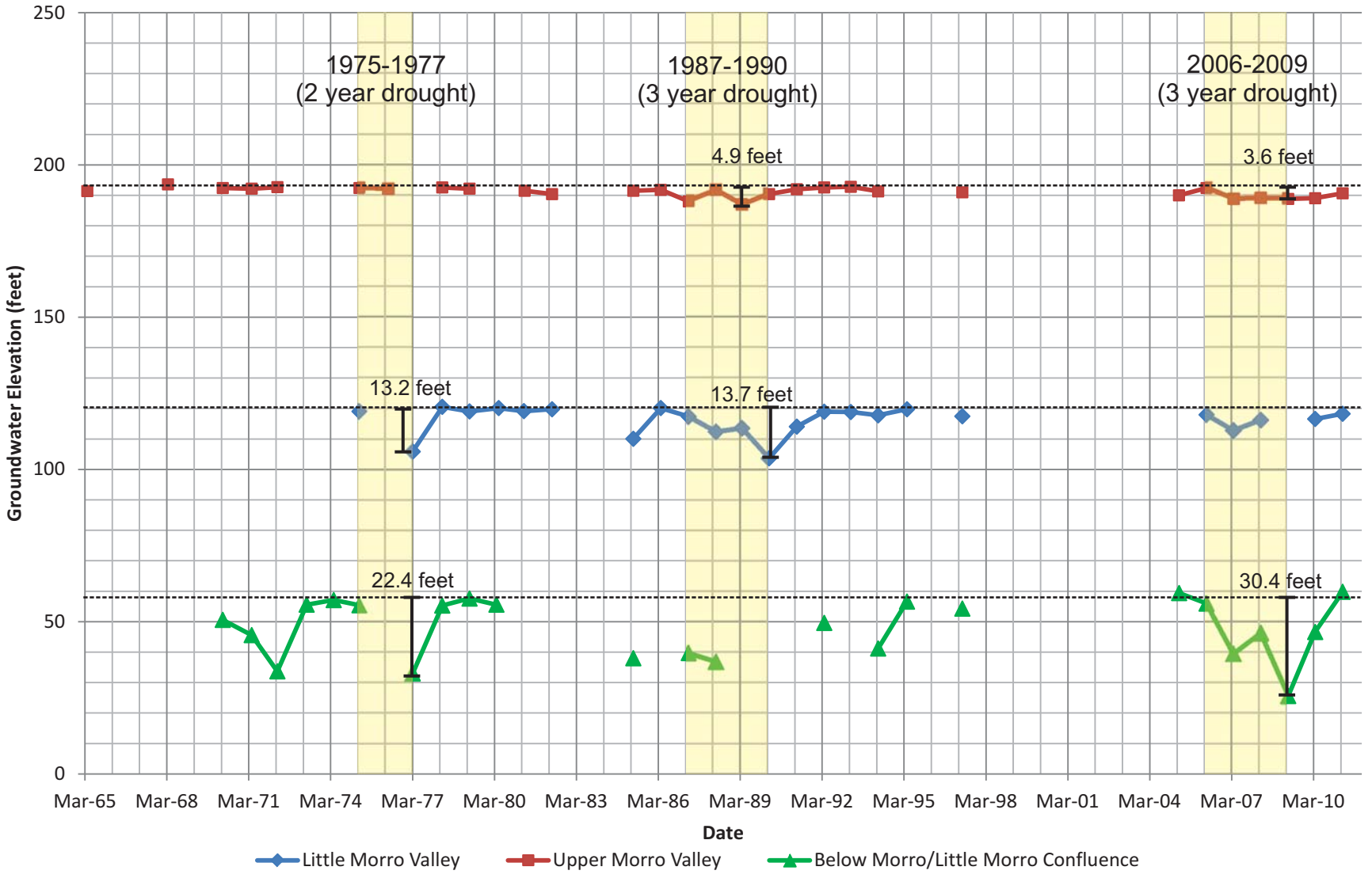
from upstream to downstream, ranging from 5 feet in the upper reaches of the Morro Valley to approximately 30 feet in the lower valley upstream of the narrows (Figure 4). The declines are typically cumulative over two or three drought years. For the purposes of this analysis, an average water level decline of 18 feet over three years, or 6 feet per year, is assumed under drought conditions upstream of the narrows.

During normal or wet periods under the current condition, available water level hydrographs show basin storage above the narrows returns to a full condition almost every year. Therefore, little or no use of in-lieu recharge would be needed to fill the basin. Additional stream flow, together with increased subsurface outflow through the narrows, would take place on an annual basis and be available to benefit the City water supply. City water demand typically peaks in the summer and fall, however, while stream flow peaks in the winter. Even in normal years, extending the duration of base flow between the upper basin and the lower basin may be necessary to avoiding seawater intrusion, due to the limited lower basin storage and proximity of City wells to the ocean. The duration of flow becomes more critical as the yield of the City wells increase. As a conservative measure to assist extending the duration of base flows, a nominal two feet of water level decline upstream of the narrows is assumed to be offset by in-lieu recharge during normal years.

The basin upstream of the narrows covers approximately 890 acres. Assuming an average annual decline during drought of 6 feet, and an average specific yield of 10 percent, the resulting storage loss under current conditions would be 535 AFY. After accounting for this change in storage, an estimated 570 AFY of in-lieu recharge would flow through the narrows and be available to benefit the City wells during drought. In normal to wet years, up to 180 AFY of in-lieu recharge would offset potential storage decline in the upper basin, leaving an estimated 925 AFY of available benefit to the City.

As previously discussed, the Morro basin yield is assumed to be 1,500 AFY during drought (the sustainable yield), and 1,770+ AFY during normal to wet years. These yield values provide a basis for estimating the available water for City wells under current conditions, so that the relative benefit of the project can be determined. The benefit to the City water supply from using reclaimed water in the Morro Valley is summarized in Table 4 below.

Spring Water Levels
Morro Basin above Narrows



Explanation

13.2 feet

Spring groundwater elevations
with drought period decline in feet

Figure 4
Spring Water Levels
Morro Valley
City of Morro Bay

Cleath-Harris Geologists

Table 4
Project Benefit
Morro Valley Reclaimed Water Use

Scenario	Description	Drought Years	Normal to Wet Years
		(acre-feet per year)	
Current Conditions	Basin Yield	1500	1770+
	Ag Water Demand	1460*	
	City Yield	40	310+ (581 maximum)
Project Conditions	In-Lieu Credit	1105	
	Storage Adjustment	535	180
	City Yield	570	925+
	Project Benefit	530	615+

NOTE: City yield from Morro Creek underflow without seawater intrusion.
Project benefits will vary from year-to-year, and will be less if assumptions are not met.
*Ag water demand value is average and will typically be greater in dry years than in normal to wet years

Groundwater available to City from the Morro basin, under current conditions and without inducing seawater intrusion, is significantly less than the 581 AFY permitted diversion amount. This is because the City wells are the farthest downstream wells in the basin, and are therefore the last to receive inflow from stream seepage, which is the primary source of basin recharge.

Under project conditions, most of the current permitted diversion will be restored during drought years (570 AFY yield), and during normal to wet years the City yield would exceed 900 AFY. Comparing the project's City yield with the maximum pumping capacity at City wells in Table 1 indicates the City has the facilities to produce the increased yield.

Environmental Water Supply Benefit

Siting the new City wastewater plant in the Morro Valley and providing reclaimed water for irrigated agriculture would provide more water for environmental demand. Under project conditions, groundwater levels in the Morro Valley would be maintained at higher levels, resulting in periods of greater stream flow. Extending the duration of base flow is expected to be an important mechanism for transferring in-lieu recharge from the upper valley through the narrows and toward the City wells. Not all of the in-lieu recharge will become available to the City, and a portion will contribute to the riparian habitat.

Management Strategies

A reclaimed water project of this magnitude will require cooperation between the City, other public agencies, and private stakeholders. A detailed discussion of potential management strategies are beyond the scope of this analysis. However, the difference in Table 2 between the available reclaimed water supply and the applied water demand supports the use of ag reservoir storage capacity to effectively increase the utilization of reclaimed water.

Summary

The City wells are the farthest downstream wells in the basin, and have lost a significant portion of their historical freshwater yield. Providing reclaimed water to growers in the Morro Valley would reduce agricultural pumping and provide in-lieu recharge to the groundwater basin. This would restore the freshwater yield during drought years and increase the yield during normal to wet periods, in addition to providing water for environmental demand. The project water supply benefit is estimated at 530 AFY during drought and 615+ AFY during normal to wet years. These are maximum anticipated benefits, and would require a high level of grower participation in the reclaimed water program.

References

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