Appendix A – Public Notification Documents

Beau Kayser

From:	Beau Kayser
Sent:	Thursday, March 31, 2011 7:21 AM
To:	'ENV012@co.santa-cruz.ca.us'
Cc:	Steve Palmisano
Subject:	City of Watsonville: Urban Water Management Plan 2010

March 31, 2011

John Ricker
Water Resources Division Director
Santa Cruz County Environmental Health Services

Hello Mr. Ricker,
I am writing to inform you that the City of Watsonville is preparing its 2010 Urban Water Management Plan. Informing the County in which we provide water supplies, at least 60 days prior to public hearing on the plan, is one of the plan requirements (see item #6 below).
I am coordinating the preparation of the document. Please do not hesitate to contact me if you have any questions.
Thank you,
Beau

#6. Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days prior to the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision (10621(b)).

Beau Kayser
City of Watsonville
Water Operations
(831) 768-3193 - office

CITY OF WATSONVILLE
PUBLIC HEARING NOTICE
CITY COUNCIL

2010 Urban Water Management Plan Update

NOTICE IS HEREBY GIVEN that a public hearing will be held by the City Council of the City of Watsonville, on Tuesday, June 14, 2011, at the 6:30 p.m. session, in the City Council Chambers, 275 Main Street, 4th Floor (**6th Level Parking—Entrance off Rodriguez Street**), Watsonville, California, to consider and receive input regarding the proposed revisions and updates to the UWMP for 2010.

The City of Watsonville is currently preparing an update to its 2005 Urban Water Management Plan ("UWMP") in compliance with the California Urban Water Management Planning Act. An update is required every five (5) years.

The proposed updates to the Plan will be available for public review on the City's website, http://www.ci.watsonville.ca.us , on May 31, 2011. Comments can be provided up until the date of the Public Hearing to the contact listed below.

Contact Information: Beau Kayser
320 Harvest Drive
Watsonville, CA 95076
phone: (831) 768-3193
email: bkayser@ci.watsonville.ca.us

Dated: June 1, 2011

/s/Beatriz Vázquez Flores
City Clerk

Americans with Disabilities Act

The City of Watsonville does not discriminate against persons with disabilities. The City Council Chambers is an accessible facility. If you wish to attend this meeting and you will require special assistance in order to attend an/or participate, please call the City Clerk's Office (768-3040) at least five (5) days in advance of the meeting to make arrangements. The City of Watsonville TDD number is 763-4075.

PUBLIC NOTICE

more fully described in the above referenced Deed of Trust. The street address and other common designation, if any, of the real property described above is purported to be: 623 ORCHARD STREET, WATSONVILLE, CA, 95076. The undersigned Trustee disclaims any liability for any incorrectness of the street address and other common designation, if any, shown herein. The total amount of the unpaid balance with interest thereon of the obligation secured by the property to be sold plus reasonable estimated costs, expenses and advances at the time of the initial publication of the Notice of Sale is $668,235.70. It is possible that at the time of sale the opening bid may be less than the total indebtedness due. In addition to cash, the Trustee will accept cashier's checks drawn on a state or national bank, a check drawn by a state or federal credit union, or a check drawn by

PUBLIC NOTICE

a state or federal savings and loan association, savings association, or savings bank specified in Section 5102 of the Financial Code and authorized to do business in this state. Said sale will be made, in an "AS IS" condition, but without covenant or warranty, express or implied, regarding title, possession or encumbrances, to satisfy the indebtedness secured by said Deed of Trust, advances thereunder, with interest as provided, and the unpaid principal of the Note secured by said Deed of Trust with interest thereon as provided in said Note, plus fees, charges and expenses of the Trustee and of the trusts created by said Deed of Trust. DATED: 04/30/2010 RECONTRUST COMPANY, N.A. 1800 Tapo Canyon Rd., CA6-914-01-94 SIMI VALLEY, CA 93063 Phone: (800) 281 8219, Sale Information (626) 927-4399 By:-- Trustee's Sale Officer RECONTRUST COMPANY, N.A. is a deb

PUBLIC NOTICE

collector attempting to collect a debt. Any information obtained will be used for that purpose. ASAP# 3999174 05/24/2011, 05/31/2011, 06/07/2011
May 24, 31, 2011
June 7, 2011
3999174

NOTICE OF TRUSTEE'S SALE TS No. 11-0010833 Title Order No. 11-0007352 Investor/Insurer No. 1705781248 APN No. 071-191-13 YOU ARE IN DEFAULT UNDER A DEED OF TRUST, DATED 12/18/2007. UNLESS YOU TAKE ACTION TO PROTECT YOUR PROPERTY, IT MAY BE SOLD AT A PUBLIC SALE. IF YOU NEED AN EXPLANATION OF THE NATURE OF THE PROCEEDING AGAINST YOU, YOU SHOULD CONTACT A LAWYER." Notice is hereby given that RECONTRUST COMPANY, N.A., as duly appointed trustee pursuant to the Deed of Trust executed by LINDA VILAS, AN UN-

PUBLIC NOTICE

MARRIED WOMAN, dated 12/18/2007 and recorded 12/28/07, as Instrument No. 2007-0064710, in Book -, Page -), of Official Records in the office of the County Recorder of Santa Cruz County, State of California, will sell on 06/07/2011 at 1:30PM, At the Ocean Street entrance to the Administration Building, 701 Ocean Street, Santa Cruz, CA 95060 at public auction, to the highest bidder for cash or check as described below, payable in full at time of sale, all right, title, and interest conveyed to and now held by it under said Deed of Trust, in the property situated in said County and State and as more fully described in the above referenced Deed of Trust. The street address and other common designation, if any, of the real property described above is purported to be: 6625 COOPER STREET, FELTON, CA, 950189408. The undersigned Trustee dis-

PUBLIC NOTICE

claims any liability for any incorrectness of the street address and other common designation, if any, shown herein. The total amount of the unpaid balance with interest thereon of the obligation secured by the property to be sold plus reasonable estimated costs, expenses and advances at the time of the initial publication of the Notice of Sale is $454,814.10. It is possible that at the time of sale the opening bid may be less than the total indebtedness due. In addition to cash, the Trustee will accept cashier's checks drawn on a state or national bank, a check drawn by a state or federal credit union, or a check drawn by a state or federal savings and loan association, savings association, or savings bank specified in Section 5102 of the Financial Code and authorized to do business in this state. Said sale will be made, in an "AS IS" condition, but without covenant or warranty, express or implied, regarding title, possession or encumbrances, to satisfy the indebtedness secured by said Deed of Trust, advances thereunder, with interest as provided, and the unpaid principal of the Note secured by said Deed of Trust with interest thereon as provided in said Note, plus fees, charges and expenses of the Trustee and of the trusts created by said Deed of Trust. DATED: 05/16/2011 RECONTRUST COMPANY, N.A. 1800 Tapo Canyon Rd., CA6-914-01-94 SIMI VALLEY, CA 93063 Phone: (800) 281 8219, Sale Information (626) 927-4399 By: - Trustee's Sale Officer RECONTRUST COMPANY, N.A. is a debt collector attempting to collect a debt. Any information obtained will be used for that purpose. ASAP# FNMA3976611 05/17/2011, 05/24/2011, 05/31/2011
May 17, 24, 31, 201
FNMA3976611

NOTICE OF TRUSTEE'S SALE TS No. 09-0015488 Title Order No. 090107797 Investor/Insurer No. 1698764881 APN No. 015-141-02 YOU ARE IN DEFAULT UNDER A DEED OF TRUST, DATED 05/11/2005. UNLESS YOU TAKE ACTION TO PROTECT YOUR PROPERTY, IT MAY BE SOLD AT A PUBLIC SALE. IF YOU NEED AN EXPLANATION OF THE NATURE OF THE PROCEEDING AGAINST YOU, YOU SHOULD CONTACT A LAWYER." Notice is hereby given that RECONTRUST COMPANY,

PUBLIC NOTICE

N.A., as duly appointed trustee pursuant to the Deed of Trust executed by JOSE S RODRIGUEZ, A MARRIED MAN, AS HIS SOLE AND SEPARATE PROPERTY, dated 05/11/2005 and recorded 05/20/05, as Instrument No. 2005-0033804, in Book , Page), of Official Records in the office of the County Recorder of Santa Cruz County, State of California, will sell on 06/21/2011 at 1:30PM, At the Ocean Street entrance to the Administration Building, 701 Ocean Street, Santa Cruz, CA 95060 at public auction, to the highest bidder for cash or check as described below, payable in full at time of sale, all right, title, and interest conveyed to and now held by it under said Deed of Trust, in the property situated in said County and State and as more fully described in the above referenced Deed of Trust. The street address and other common designation, if any, of the real property described above is purported to be: 213 SUNNYHILLS DRIVE, WATSONVILLE, CA, 95076. The undersigned Trustee disclaims any liability for any incorrectness of the street address and other common designation, if any, shown herein. The total amount of the unpaid balance with interest thereon of the obligation secured by the property to be sold plus reasonable estimated costs, expenses and advances at the time of the initial publication of the Notice of Sale is $346,120.48. It is possible that at the time of sale the opening bid may be less than the total indebtedness due. In addition to cash, the Trustee will accept cashier's checks drawn on a state or national bank, a check drawn by a state or federal credit union, or a check drawn by a state or federal savings and loan association, savings association, or savings bank specified in Section 5102 of the Financial Code and authorized to do business in this state. Said sale will be made, in an "AS IS" condition, but without covenant or warranty, express or implied, regarding title, possession or encumbrances, to satisfy the indebtedness secured by said Deed of Trust, advances thereunder, with interest as provided, and the unpaid principal of the Note secured by said Deed of Trust with interest thereon as provided in said Note, plus fees, charges and expenses of the Trustee and of the trusts created by said Deed of

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Trust. DATED: 05/20/2009 RECONTRUST COMPANY, N.A. 1800 Tapo Canyon Rd., CA6-914-01-94 SIMI VALLEY, CA 93063 Phone: (800) 281 8219, Sale Information (626) 927-4399 By:-- Trustee's Sale Officer RECONTRUST COMPANY, N.A. is a debt collector attempting to collect a debt. Any information obtained will be used for that purpose. ASAP# FNMA4003096 05/31/2011, 06/07/2011, 06/14/2011
May 31, 2012
June 7, 14, 2012
FNMA4003096

NOTICE OF TRUSTEE'S SALE Trustee Sale No. FC27263 11 Loan No. 0211613 Title Order No. 5109007 APN 018 682 37 TRA No.: YOU ARE IN DEFAULT UNDER A DEED OF TRUST DATED 03/22/06. UNLESS YOU TAKE ACTION TO PROTECT YOUR PROPERTY, IT MAY BE SOLD AT A PUBLIC SALE. IF YOU NEED AN EXPLANATION OF THE NATURE OF THE PROCEEDINGS AGAINST YOU, YOU SHOULD CONTACT A LAWYER. On June 14, 2011 at 01:30 PM, MORTGAGE LENDER SERVICES, INC. as the duly appointed Trustee under and pursuant to Deed of Trust Recorded on 04/03/06 as Document No. 2006 0018250 and re-recorded September 22, 2006 as Document No. 2006-0055664 of official records in the Office of the Recorder of SANTA CRUZ County, California, executed by: PEDRO LOMELI AND CARMELA LOMELI, as Trustor, WILL SELL AT PUBLIC AUCTION TO THE HIGHEST BIDDER FOR CASH (payable at time of sale in lawful money of the United States, by cash, a cashier's check drawn by a state or national bank, a check drawn by a state or federal credit union, or a check drawn by a state or federal savings and loan association, savings association, or savings bank specified in section 5102 of the Financial Code and authorized to do business in this state). At: AT THE OCEAN STREET ENTRANCE TO THE ADMINISTRA¬TION BUILDING AT 701 OCEAN STREET, SANTA CRUZ, CA., all right, title and interest conveyed to and now held by it under said Deed of Trust in the property situated in said County, California describing the land therein: AS MORE FULLY DE¬SCRIBED IN SAID DEED OF TRUST. The property heretofore described is being sold

PUBLIC NOTICE

"as is". The street address and other common designation, if any, of the real prop¬erty described above is purported to be: 1464 PONTE VEDRA COURT, WATSONVILLE, CA 95076. The undersigned Trustee disclaims any liability for any incorrectness of the street address and other common designation, if any, shown herein. Said sale will be made, but without covenant or warranty, expressed or implied, regarding title, possession, or encumbrances, to pay the remain¬ing principal sum of the note(s) se¬cured by said Deed of Trust, with interest thereon, as provided in said note(s), advances, if any, under the terms of the Deed of Trust, estimated fees, charges and expenses of the Trustee and of the trusts created by said Deed of Trust, to-wit: $235,147.66 (Estimated). Accrued interest and additional advances, if any, will increase this figure prior to sale. The Beneficiary may elect to bid less than the full credit bid. The bene-ficiary under said

PUBLIC NOTICE

Deed of Trust heretofore executed and delivered to the undersigned a written Declara¬tion of Default and Demand for Sale, and a written Notice of Default and Election to Sell. The undersigned caused said Notice of Default and Election to Sell to be recorded in the county where the real property is located and more than three months have elapsed since such recordation. Date: 05/17/11 MORTGAGE LENDER SERVICES, INC. 81 BLUE RAVINE ROAD, SUITE 100, FOLSOM, CA 95630, (916) 962-3453 Sale Information Line: (916) 939-0772 or www.nationwideposting.com Tara Campbell, Trustee Sale Officer MORTGAGE LENDER SERVICES,INC. MAY BE A DEBT COLLECTOR ATTEMPTING TO COLLECT A DEBT. ANY INFORMATION OBTAINED WILL BE USED FOR THAT PURPOSE. NPP0181577 PUB: 05/24/11, 05/31/11 06/07/11
May 24, 31, 2011
June 7, 2011
NPP0181577

PUBLIC NOTICE

City of Watsonville
County of Santa Cruz
NOTICE INVITING SEALED BIDS
for
PAJARO RIVER CARE PROJECT
CITY PROJECT NO. WW-11-01

Notice is hereby given that the Purchasing Officer of the City of Watsonville will receive sealed bids at City Hall, 250 Main Street, Watsonville, California 95076 for:

PAJARO RIVER CARE PROJECT
CITY PROJECT NO. WW-11-01

The project consists of performing the following, including, but not limited to:

Construction of new embankment adjacent to the existing levee along the Pajaro River, construction of new trails within the Pajaro River bench area, ESA fencing, seeding and mulching, construction survey, compaction testing.

The Engineer's estimate is $282,700.

Bidders are to be licensed in accordance with the provisions of the Contractors' License Law, Chapter 9 of Division 3 of the State Business and Professions Code. In addition, bidder must have at the time the contract is awarded for this project, one of the following classification(s) of contractor's license:

Class A (General Engineering)

Complete copies of the contract documents may be purchased from:
Watsonville Blueprint
41 Hangar Way
Watsonville, CA 95076-2471
Phone (831) 728-7717
Online http://wbplan.com/

Alternatively, project information (plans, specifications, addendums, planholder list) is available at the City of Watsonville website:
http://www.watsonvilleutilities.org/index.php?option=com_content&task=view&id=177&Itemid=393
You may click through to an external site where all documents may be viewed and downloaded, at no cost, following free registration. This service is free to all registrants.

Individual drawings and other sections of the contract documents may also be viewed or purchased through the following plan rooms:

Builders Exchange of Santa Cruz County;
Builders Exchange of Merced and Mariposa;

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CITY OF WATSONVILLE
PUBLIC HEARING NOTICE
CITY COUNCIL

2010 Urban Water Management Plan Update

NOTICE IS HEREBY GIVEN that a public hearing will be held by the City Council of the City of Watsonville, on Tuesday, June 14, 2011, at the 6:30 p.m. session, in the City Council Chambers, 275 Main Street, 4th Floor (6th Level Parking—Entrance off Rodriguez Street), Watsonville, California, to consider and receive input regarding the proposed revisions and updates to the UWMP for 2010.
The City of Watsonville is currently preparing an update to its 2005 Urban Water Management Plan ("UWMP") in compliance with the California Urban Water Management Planning Act. An update is required every five (5) years.

The proposed updates to the Plan will be available for public review on the City's website, http://www.ci.watsonville.ca.us , on May 31, 2011. Comments can be provided up until the date of the Public Hearing to the contact listed below.

Contact Information:
Beau Kayser
320 Harvest Drive
Watsonville, CA 95076
phone: (831) 768-3193
email:bkayser@ci.watsonville.ca.us

Dated: May 24, 2011

/s/Beatriz Vázquez Flores
City Clerk

Americans with Disabilities Act
The City of Watsonville does not discriminate against persons with disabilities. The City Council Chambers is an accessible facility. If you wish to attend this meeting and you will require special assistance in order to attend an/or participate, please call the City Clerk's Office (768-3040) at least five (5) days in advance of the meeting to make arrangements. The City of Watsonville TDD number is 763-4075.

May 31, 2011
June 7, 2011
10807

PUBLIC NOTICE

Trust. DATED: 08/02/2008 RECONTRUST COMPANY 1757 TAPO CANYON ROAD, SVW-88 SIMI VALLEY, CA 93063 Phone: (800) 281 8219, Sale Information (626) 927-4399 By:--_ Trustee's Sale Officer RECONTRUST COMPANY is a debt collector attempting to collect a debt. Any information obtained will be used for that purpose. ASAP# 4007819 06/07/2011, 06/14/2011, 06/21/2011
June 7, 14, 21, 2011
4007819

NOTICE OF TRUSTEE'S SALE TS No. 10-0023357 Title Order No. 100106840 Investor/Insurer No. 6183739793 APN No. 05130118 YOU ARE IN DEFAULT UNDER A DEED OF TRUST, DATED 10/13/2006. UNLESS YOU TAKE ACTION TO PROTECT YOUR PROPERTY, IT MAY BE SOLD AT A PUBLIC SALE. IF YOU NEED AN EXPLANATION OF THE NATURE OF THE PROCEEDING AGAINST YOU, YOU SHOULD CONTACT A LAWYER." Notice is hereby given that RECONTRUST COMPANY, N.A., as duly appointed trustee pursuant to the Deed of Trust executed by MARTIN AGUILERA AND MARIA IRMA AGUILERA, dated 10/13/2006 and recorded 10/24/06, as Instrument No. 2006-0061574, in Book , Page), of Official Records in the office of the County Recorder of Santa Cruz County, State of California, will sell on 06/28/2011 at 1:30PM, At the Ocean Street entrance to the Administration Building, 701 Ocean Street, Santa Cruz, CA 95060 at public auction, to the highest bidder for cash or check as described below, payable in full at time of sale, all right, title, and interest conveyed to and now held by it under said Deed of Trust, in the property situated in said County and State and as more fully described in the above referenced Deed of Trust. The street address and other common designation, if any, of the real property described above is purported to be: 270 CAMBRIDGE DR, WATSONVILLE, CA, 95076. The undersigned Trustee disclaims any liability for any incorrectness of the street address and other common designation, if any, shown herein. The total amount of the unpaid balance with interest thereon of the obligation secured by the property to be sold plus reasonable estimated costs, expenses and advances at the time of the initial publication of the Notice of Sale is $634,601.68. It is possible that at the time of sale the opening bid may be less than the total indebtedness due. In addition to cash, the Trustee will accept cashier's checks drawn on a state or national bank, a check drawn by a state or federal credit union, or a check drawn by a state or federal savings and loan association, savings association, or savings bank specified in Section 5102 of the Financial Code and authorized to do business in this state. Said sale will be made, in an "AS IS" condition, but without covenant or warranty, express or implied, regarding title, possession or encumbrances, to satisfy the indebtedness secured by said Deed of Trust, advances thereunder, with interest as provided, and the unpaid principal of the Note secured by said Deed of Trust with interest thereon as provided in said Note, plus fees, charges and expenses of the Trustee and of the trusts created by said Deed of Trust. DATED: 05/26/2010 RECONTRUST COMPANY, N.A. 1800 Tapo Canyon Rd., CA6-914-01-94 SIMI VALLEY, CA 93063 Phone: (800) 281 8219, Sale Information (626) 927-4399 By: - Trustee's Sale Officer RECONTRUST COMPANY, N.A. is a debt collector attempting to collect a debt. Any information obtained will be used for that purpose. ASAP# 4010501 06/07/2011, 06/14/2011, 06/21/2011
June 7, 14, 21, 2011
4010501

PUBLIC NOTICE

IIBIT A
DED PUBLICATION
to Section 3381,
Taxation Code

through 3385, Revenue and
of Power to Sell Tax-Defaulted
Cruz County, State of Califor-
distributed to various news-
on published in the county. A
each of such newspapers.

ING POWER TO SELL
ED PROPERTY

axation Codes sections 3691

FICTITIOUS BUSINESS NAME STATEMENT

FBN No.: 2011-0001167
Began Transacting Business:
5/11/2011
Statement Expires On:
5/19/2016
Business is Conducted by:
Corporation
Business Address:
1840 41st Avenue
Suitwe 132
Capitola, CA 95010
County of Santa Cruz

Fictitious Business Name(s):
FINE ART ENTERPRISES
Registrant Address(es):
Fine Art Distributors, Inc
1840 41st Avenue

PUBLIC NOTICE

Suitwe 132
Capitola, CA 95010
AI#: 2845393
State: CA

NOTICE: In accordance with subdivision (a) of Section 17920, A Fictitious Name Statement Generally Expires At The End Of Five Years From The Date On Which It was Filed In The Office Of The County Clerk, Except, As Provided In Subdivision (b) Of Section 17920, Where It Expires 40 Days After Any Change In The Facts set Forth In The Statement Pursuant To Section 17913 Other Than A Change In The Residence Address Of A Registered Owner. A New Fictitious Business Name Statement Must Be Filed Before The Expiration. The Filing Of This Statement Does Not Of Itself Authorize The Use In This State Of A Fictitious Business Name In Violation Of the Rights Of Another Under Federal, State, Or Common Law (See Section 14411 ET SEQ., Business And Professions Code). I declare that all information in this statement is true and correct (A registrant who declares as true information which he or she knows to be false is guilty of a crime.)
/s/ Randy Hunter, President
June 7, 14, 21, 28, 2011
1167

FICTITIOUS BUSINESS NAME STATEMENT

FBN No.: 2011-0001230
Began Transacting Business:
4/1/2011
Statement Expires On:
6/1/2016
Business is Conducted by:
Individual
Business Address:
5 Erba Lane, Suite E
Scotts Valley, CA 95066
County of Santa Cruz

Fictitious Business Name(s):
THE REYNOLDS GROUP
Registrant Address(es):
Reynolds, Randy
146 Zinfandel Circle
Scotts Valley, CA 95066

NOTICE: In accordance with subdivision (a) of Section 17920, A Fictitious Name Statement Generally Expires At The End Of Five Years From The Date On Which It was Filed In The Office Of The County Clerk, Except, As Provided In Subdivision (b) Of Section 17920, Where It Expires 40 Days After Any Change In The Facts set Forth In The Statement Pursuant To Section

PUBLIC NOTICE

17913 Other Than A Change In The Residence Address Of A Registered Owner. A New Fictitious Business Name Statement Must Be Filed Before The Expiration. The Filing Of This Statement Does Not Of Itself Authorize The Use In This State Of A Fictitious Business Name In Violation Of the Rights Of Another Under Federal, State, Or Common Law (See Section 14411 ET SEQ., Business And Professions Code). I declare that all information in this statement is true and correct (A registrant who declares as true information which he or she knows to be false is guilty of a crime.)
/s/ Randy Reynolds
June 7, 14, 21, 28, 2011
1230

NOTICE OF TRUSTEE'S SALE Trustee Sale No. FC27263 11 Loan No. 0211613 Title Order No. 5109007 APN 018 682 37 TRA No.: YOU ARE IN DEFAULT UNDER A DEED OF TRUST DATED 03/22/06. UNLESS YOU TAKE ACTION TO PROTECT YOUR PROPERTY, IT MAY BE SOLD AT A PUBLIC SALE. IF YOU NEED AN EXPLANATION OF THE NATURE OF THE PROCEEDINGS AGAINST YOU, YOU SHOULD CONTACT A LAWYER. On June 14, 2011 at 01:30 PM, MORTGAGE LENDER SERVICES, INC. as the duly appointed Trustee under and pursuant to Deed of Trust Recorded on 04/03/06 as Document No. 2006 0018250 and re-recorded September 22, 2006 as Document No. 2006-0055664 of official records in the Office of the Recorder of SANTA CRUZ County, California, executed by: PEDRO LOMELI AND CARMELA LOMELI, as Trustor, WILL SELL AT PUBLIC AUCTION TO THE HIGHEST BIDDER FOR CASH (payable at time of sale in lawful money of the United States, by cash, a cashier's check drawn by a state or national bank, a check drawn by a state or federal credit union, or a check drawn by a state or federal savings and loan association, savings association, or savings bank specified in section 5102 of the Financial Code and authorized to do business in this state). At: AT THE OCEAN STREET ENTRANCE TO THE ADMINISTRATION BUILDING AT 701 OCEAN STREET, SANTA CRUZ, CA., all right, title and interest conveyed to and now held by it under said Deed

PUBLIC NOTICE

of Trust in the property situated in said County, California describing the land therein: AS MORE FULLY DESCRIBED IN SAID DEED OF TRUST. The property heretofore described is being sold "as is". The street address and other common designation, if any, of the real property described above is purported to be: 1464 PONTE VEDRA COURT, WATSONVILLE, CA 95076. The undersigned Trustee disclaims any liability for any incorrectness of the street address and other common designation, if any, shown herein. Said sale will be made, but without covenant or warranty, expressed or implied, regarding title, possession, or encumbrances, to pay the remaining principal sum of the note(s) secured by said Deed of Trust, with interest thereon, as provided in said note(s), advances, if any, under the terms of the Deed of Trust, estimat-

PUBLIC NOTICE

ed fees, charges and expenses of the Trustee and of the trusts created by said Deed of Trust, to-wit: $235,147.66 (Estimated). Accrued interest and additional advances, if any, will increase this figure prior to sale. The Beneficiary may elect to bid less than the full credit bid. The beneficiary under said Deed of Trust heretofore executed and delivered to the undersigned a written Declaration of Default and Demand for Sale, and a written Notice of Default and Election to Sell. The undersigned caused said Notice of Default and Election to Sell to be recorded in the county where the real property is located and more than three months have elapsed since such recordation. Date: 05/17/11 MORTGAGE LENDER SERVICES, INC. 81 BLUE RAVINE ROAD, SUITE 100, FOLSOM, CA 95630, (916) 962-3453 Sale Information Line: (916) 939-0772

PUBLIC NOTICE

or www.nationwideposting.com Tara Campbell, Trustee Sale Officer MORTGAGE LENDER SERVICES,INC. MAY BE A DEBT COLLECTOR ATTEMPTING TO COLLECT A DEBT. ANY INFORMATION OBTAINED WILL BE USED FOR THAT PURPOSE. NPP0181577 PUB: 05/24/11, 05/31/11, 06/07/11
May 24, 31, 2011
June 7, 2011
NPP0181577

NOTICE OF TRUSTEE'S SALE T.S No. 1176689-02 APN: 018-634-30 TRA: 002072 LOAN NO: Xxxxxx2419 REF: Alvarado, Pete IMPORTANT NOTICE TO PROPERTY OWNER: YOU ARE IN DEFAULT UNDER A DEED OF TRUST, DATED June 09, 2005. UNLESS YOU TAKE ACTION TO PROTECT YOUR PROPERTY, IT MAY BE SOLD AT A PUBLIC SALE. IF YOU NEED AN EXPLANATION OF THE NATURE OF THE

PUBLIC NOTICE

PROCEEDING AGAINST YOU, YOU SHOULD CONTACT A LAWYER. On June 27, 2011, at 1:30pm, Cal-Western Reconveyance Corporation, as duly appointed trustee under and pursuant to Deed of Trust recorded June 16, 2005, as Inst. No. 2005-0040178 in book XX, page XX of Official Records in the office of the County Recorder of Santa Cruz County, State of California, executed by Pete Alvarado and Blanca Alvarado Husband And Wife, will sell at public auction to highest bidder for cash, cashier's check drawn on a state or national bank, a check drawn by a state or federal credit union, or a check drawn by a state or federal savings and loan association, savings association, or savings bank At the ocean street entrance to the administration Building 701 Ocean Street Santa Cruz, California, all right, title and interest conveyed to and now held

PUBLIC NOTICE **PUBLIC NOTICE**

CITY OF WATSONVILLE
PUBLIC HEARING NOTICE
CITY COUNCIL

2010 Urban Water Management Plan Update

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The proposed updates to the Plan will be available for public review on the City's website, http://www.ci.watsonville.ca.us , on May 31, 2011. Comments can be provided up until the date of the Public Hearing to the contact listed below.

Contact Information:
Beau Kayser
320 Harvest Drive
Watsonville, CA 95076
phone: (831) 768-3193
email:bkayser@ci.watsonville.ca.us

Dated: May 24, 2011

/s/Beatriz Vázquez Flores
City Clerk

Americans with Disabilities Act
The City of Watsonville does not discriminate against persons with disabilities. The City Council Chambers is an accessible facility. If you wish to attend this meeting and you will require special assistance in order to attend an/or participate, please call the City Clerk's Office (768-3040) at least five (5) days in advance of the meeting to make arrangements. The City of Watsonville TDD number is 763-4075.

May 31, 2011
June 7, 2011
10807

Online Bill Pay
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- News
- Billing Questions
- Bidding & Purchasing
- Department Information
- Customer Service
- Emergency Preparedness
- Engineering
- Environmental Programs
- Flood Protection
- Graffiti
- Nature Center
- Recycling & Garbage
- Streets New
- Sewer Services
- Science Workshops
- Storm Water
- Test
- Trails
- School Programs
- Utility Ordinance
- Utility Rates
- Water
- Water Wise Landscaping
- Watsonville Airport
- Water Indoor Conservation
- Streets

News

News

2005 Urban Water Management Plan

The City has incorporated a number of resource maximization tools into the management and operation of the water utility. The City's main emphasis is in water conservation as detailed in the Demand Management Measures included elsewhere in this report. City coordination with PVWMA on the basin management plan is aimed at reducing the current overdraft. This will help reduce the amount of water potentially required for basin management through importation from the San Felipe water system.

Click here to view in its entirety, the City of Watsonville's 2005 Urban Water Management Plan.

2010 URBAN WATER MANAGEMENT PLAN

The City of Watsonville is currently preparing its updated Urban Water Management Plan (UWMP). The UWMP is intended to examine the City's water sources, to help plan for long-term water reliability considering various hydrologic events, and to offer strategies for supply development and water use efficiency goals in order to meet future water demands.

The Draft of the 2010 Urban Water Management Plan revises the 2005 Urban Water Management Plan (UWMP). This 2010 Urban Water Management Plan provides information on the present and future water demands and supplies and provides an assessment of the City's water resource needs. The UWMP will act as a guide to maintain efficient use of urban water supplies, describe and evaluate existing and potentially available sources of water supply, to project population and future water demand, to promote conservation programs and policies, and to plan out strategies for responding to water shortages and drought conditions.

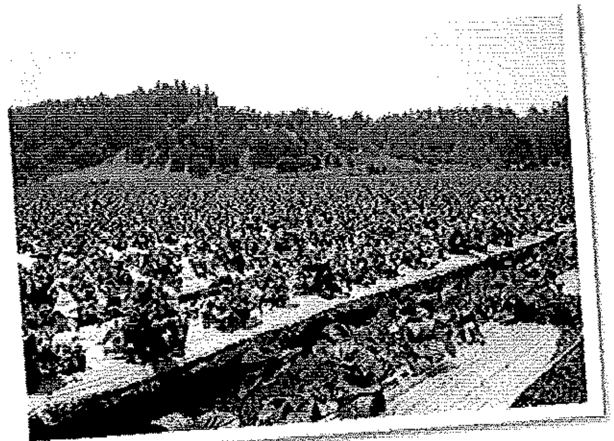
The Draft of the 2010 UWMP is available for your review by clicking on the link below and we welcome your input. Please send your comments to Beau Kayser, at bkayser@ci.watsonville.ca.us

2010 Urban Water Management Plan (Draft)

2010 Urban Water Management Plan - Main Appendix Part 1
2010 Urban Water Management Plan - Main Appendix Part 2

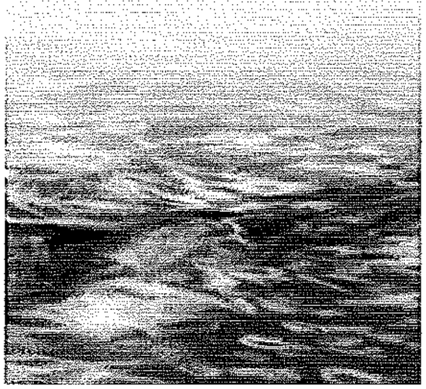
Appendix B – PVWMA Basin Management Plan

Pajaro Valley Water
Management Agency



Revised
Basin Management Plan

February 2002



RMC
Raines, Melton & Carella, Inc.
Consulting Engineers/Project Managers

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Abbreviations

Abbreviation	Definition
$M	Million Dollars
Act	California State Statute establishing the Pajaro Valley Water Management Agency
AF	Acre-foot (feet)
AFY	Acre-feet per year
Agency	Pajaro Valley Water Management Agency
AMBAG	*Association of Monterey Bay Area Governments*
A/P	Capital Recovery Factor
ASR	Aquifer Storage and Recovery
Basin	Pajaro Valley Ground Water Basin
BMP	Basin Management Plan
Board	Board of Directors of the Pajaro Valley Water Management Agency
BOD	Biochemical Oxygen Demand
Bolsa	Bolsa de San Cayetano
Caltrans	California Department of Transportation
CCRWQCB	(Central Coast) Regional Water Quality Control Board
CDS	Coastal Distribution System
CEQA	California Environmental Quality Act
cfs	Cubic feet per second
CIMIS	California Irrigation Management Information Service
City	City of Watsonville
CPUC	California Public Utilities Commission
CVP	Central Valley Project
CVPIA	Central Valley Project Improvements
CWC	California Water Commission
CY	Cubic Yards
DFG	(California) Department of Fish and Game
DMS	Data Management System
DOHS/DHS	(California) Department of Health Services
DWR	(California) Department of Water Resources
EC_w	Electrical Conductivity
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
Ft	Foot (feet)
GIS	Geographic Information Systems
gpm	Gallons per minute
H:V	Horizontal-to-vertical
IDS	Inland Distribution System
LIA	Local-Import Alternative
LOA	Local-Only Alternative
MCFC & WCD	Monterey County Flood Control and Water Conservation District
MCL	Maximum Contaminant Level
MCWRA	*Monterey County Water Resources Agency*
meq/L	milliequivalents per liter
mg/L	milligrams per liter
MG	Million Gallons
MGD	Millions of gallons per day
MPN	Most Probable Number (bacteriological quality)
MPWMD	Monterey Peninsula Water Management District
NA	Not Applicable
ND	No Data
NEPA	National Environmental Policy Act

Abbreviation	Definition
NETWK	Network Model (Modeling program developed by CH2M Hill and Utah State University)
$NH_4 - N$	Ammonia as Nitrogen
NMFS	National Marine Fisheries Service
NO_3	Nitrate
$NO_3 - N$	Nitrate as Nitrogen
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
O & M	Operation and Maintenance
OSHA	(California) Occupational Safety and Health Administration
PG&E	Pacific Gas and Electric Company
psi	Pounds per square inch
PVIGSM	Pajaro Valley Integrated Groundwater - Surface Water Model
PVWMA	Pajaro Valley Water Management Agency
RO	Reverse Osmosis
SAR	Sodium Adsorption Ratio
SBCWD	San Benito County Water District
SCCEPD	Santa Cruz County Environmental Planning Department
SCCFC & WCD	Santa Cruz County Flood Control and Water Conservation District
SCVWD	Santa Clara Valley Water District
SCWD	Soquel Creek Water District
SDWA	Safe Drinking Water Act
SPRR	Southern Pacific Railroad
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	(California) State Water Resources Control Board
TAC	Technical Advisory Committee
TDS	Total Dissolved Solids
TM	Technical Memorandum
TOC	Total Organic Carbon
TSS	Total Suspended Solids
TU_a	Turbidity Units
µg	micrograms
USBR	United States Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
USSCS	U.S. Soil and Conservation Service
Valley	Pajaro Valley
WC 2000	Water Conservation Plan 2000
WWTF	(City of) Watsonville Wastewater Treatment Facility
Yr	Year

Executive Summary

This Revised Basin Management Plan (BMP) identifies a Recommended Alternative to balance the groundwater basin and eliminate seawater intrusion in the Pajaro Valley.

The Recommended Alternative includes the following elements:

- Completion of Harkins Slough Project;
- Water Conservation efforts of 5,000 acre-feet per year (AFY);
- Completion of the remainder of the Coastal Distribution System (CDS);
- Construction of an import water pipeline to convey 13,400 (AFY) of Central Valley Project (CVP) water plus five supplemental wells;
- Acquisition of 22,300 AFY of Central Valley Project (CVP) water (to allow reliable delivery of 13,400 AFY);
- Development of out-of-basin banking for assigned CVP water;
- Development of 4,000 AFY of recycled water from the Watsonville Wastewater Treatment Plant; and
- Watershed management programs that would include water resources monitoring, water metering, nitrate management, wells management, and recharge area protection.

These improvements would be implemented by 2007. The imported water volume stated above includes an allowance for potential water sales to users along the pipeline alignment.

The annualized cost of the Recommended Alternative is $13.9 million.

The estimated capital cost of the Recommended Alternative is $130.6 million, in Spring 2001 dollars. The annual O&M cost is estimated to be $4.4 million. The cost estimate includes annual administration costs and annual average water banking costs for out-of-basin banking. On an annualized basis, the cost of the Recommended Alternative is $13.9 million.

These costs are expressed in 2001 dollars. Inflation, which will occur between 2001 and actual project construction will increase these costs.

Table ES-1: Recommended Alternative Cost Estimate (Phase 1 and 2)

Project Element	Cost Estimate ($ Millions)
Coastal Distribution System	$34.4
Conservation and Watershed Management Programs	$1.7
Harkins Slough Project with Harkins Slough Recharge Basin and Supplemental Wells and Connection[a]	$6.6
Recycled Water Project (4,000 AFY)	$19.2
54-inch Import Water Project with Out-of-Basin Banking	$87.3
Construction Cost Subtotal	**$149.1**[b]
Financial & Bond Sale Cost @ 1.0%	$1.5
Recycled Water Grant (Title XVI)	($20.0)
Total Capital Cost	***$130.6***
Annualized Capital Cost at 6% for 30 years	$9.5
Annual Operations & Maintenance Costs	$4.4
Total Annual Cost	**$13.9**

Footnotes:

a. Includes $460,000 CalFed Grant. This project is complete except for three supplemental wells and associated piping.
b. Subtotal reflects sum of individual project elements before rounding.

Notes:

1. Spring 2001 construction cost.
2. Capital recovery factor (A/P) for 6% at 30 years is 0.07265.
3. Cost estimates include a Construction Contingency of 20%, Engineering/Legal/Admin/Permits Contingency of 17.5%, and Environmental and Permitting Contingency of 5%.

To recover the $13.9 million in annualized costs, a differentiated flat rate is recommended, with one rate for users that pump groundwater and a higher rater for users that receive delivered water.

California law requires that charges for water and other services be based on the cost of the service being provided. For the Recommended Alternative, the recommended basis for establishing the cost of service for delivered project water and for augmented groundwater is:

1. Recipients of delivered project water will pay the incremental cost of providing delivered project water to their properties as established by the incremental cost of constructing, operating and maintaining the Distribution System,

2. All water users, including recipients of delivered project water, pay a proportionate share of all remaining costs associated with the Recommended Alternative.

Based on the estimated costs of the Recommended Project, as presented in Section 6, the proposed rate structure would be:

Augmentation Charge	$158/AF
Delivered Water Charge	$316/AF

Rate increases would be gradual over the next six years.

The Augmentation Charge would be increased on an incremental basis, assuming a successful election in March 2002. On this basis, the Augmentation Charge would be increased gradually from its current level of $50/AF to $158/AF[1].

Upon completion of the project and delivery of project water, in approximately six years, the Delivered Water Charge would be applied to those water users receiving delivered water. That is, those water users who stop pumping and receive delivered water would move to the higher rate when they receive delivered water.

The Recommended Alternative was developed from a range of alternatives that represent a diversity of approaches.

Development of a Recommended Alternative was originally undertaken in the Draft BMP 2000, published in May 2000. However, public review of that draft document indicated the need to investigate a wider range of alternatives for basin management, and in particular, to focus on strategies with a greater reliance upon development of local water supplies.

This Revised BMP was prepared in response to those concerns. Four separate basin management strategies are presented in this document, including one that relies entirely on development of local water supplies, and another that relies heavily on imported supplies. The remaining two strategies include the original management alternative presented in the Draft BMP 2000 and a modified version of that alternative which reduces its scope and cost. These four strategies are:

- **BMP 2000 Alternative.** This strategy is similar to the one identified in the draft BMP 2000 document published in May 2000. Modifications to this Alternative between the BMP 2000 document and this Revised BMP were limited to updating individual cost estimates.
- **Local-Only Alternative.** This strategy demonstrates the costs and implications associated with developing *only* local water supplies and storage projects within the Pajaro basin. The Local-Only Alternative was developed based on recommendations from local stakeholders, and information about this alternative is extracted from *Local-Only Water Supply Alternative Evaluation* (RMC, 2001).
- **Modified Local Alternative.** This strategy builds upon the projects that comprise the Local-Only Alternative and maximizes potentially feasible local projects. It supplements the local projects with the minimum quantity of imported water needed to balance supply with current demand. The concept behind this alternative was developed based on recommendations from local stakeholders.

[1] These rates are expressed in current dollars and would increase in the future with the overall rate of inflation.

- **Modified BMP 2000 Alternative.** This strategy presents a modification of the BMP 2000 alternative that reduces the size of the import pipeline. The size reduction is accommodated through in-basin storage with groundwater injection/extraction and elimination of the inland distribution system. Other project components were also modified from the original BMP 2000 alternative to maximize their cost effectiveness.

All four of these strategies have a common basis that includes increased levels of water conservation and development of Harkins Slough, recycled water, supplemental wells, and the Coastal Distribution System (CDS). Each of the four strategies builds upon these common elements and includes project elements necessary to balance the groundwater basin and eliminate seawater intrusion.

The Recommended Alternative and associated rate structure were developed with extensive public involvement.

In May 2000 the Draft BMP 2000 document was published outlining a range of alternatives to balance the groundwater basin and stop seawater intrusion. Public comment on that document indicated that a wider range of alternatives should be considered before recommendations were made. The wider range of alternatives needed to include strategies that used a greater degree of local water supplies. In response to this concern, PVWMA prepared the Draft Revised Basin Management Plan, which was released for public and stakeholder review in August 2001.

From August to December 2001 public workshops and public hearings were held to present, discuss and receive comments on the range of alternatives and rate structures that should be implemented. In addition, written comments from the public at large and regulatory agencies were received. With these comments and feedback available, the PVWMA Board of Directors developed the above-described Recommended Alternative and recommended rate structure to fund the improvements.

The Recommended Alternative uses the Modified BMP Alternative as a basis and adds several enhancements to address the concerns and issues raised by water users, the public at large, and regulatory agencies. The enhancements include an allowance of imported CVP water for potential water sales to interested users along the import pipeline alignment, and the use of out-basin water banking in the near term rather than the ASR wells provided in the Modified BMP Alternative. It was found to be more cost effective in the near term to use out-of-basin banking than meet the regulatory treatment requirements associated with ASR.

The Recommend Alternative also includes potential future development of several local water supply projects. Although these projects do not appear viable at this time, future conditions may make them more attractive. These potential projects include Watsonville Slough, College Lake, and Murphy Crossing projects.

The need for the project is due to the adverse impacts of excessive groundwater pumping in the Pajaro Valley.

Numerous studies conducted over the past fifty years have documented that the Pajaro Valley groundwater basin is in an overdraft condition, i.e., the amount of water withdrawn exceeds the amount of water replenishing the basin. Today, groundwater pumping provides approximately 69,000 AFY toward the total PVWMA area water demand of 71,500 AFY. Existing well data maintained by the United States Geological Survey (USGS) and the PVWMA indicate that areas of depressed groundwater levels are expanding in the Pajaro Valley groundwater aquifers and that the groundwater elevations regularly fall below sea level.

This trend has caused seawater intrusion in the PVWMA service area because the ocean pushes seawater inland to raise the water table until equilibrium is reached at sea level. Well data collected since 1998 indicate that seawater intrusion (evidenced by chloride levels exceeding 100 mg/L) is more extensive than previously reported, and chloride levels ranging from 200 mg/L to 8,500 mg/L have been observed in a number of deeper wells. The extent of seawater intrusion is illustrated on the following page in Figure ES-1.

Future increases in water demand will make current situation worse.

Overdraft of the groundwater basin and seawater intrusion are problematic at the current level of water demand. Projected increases in urban and agricultural water use will cause further problems if this situation is not rectified. Urban water use has increased by 86% in since 1964, and the current urban water use of 12,200 AFY is projected to increase an additional 32% (3,900 AFY) to approximately 16,100 AFY by the year 2040. If the current trend in cropping patterns continues towards more water-intensive crops such as strawberries and raspberries, agricultural water use could increase from 59,300 AFY to 64,400 AFY by the year 2040.

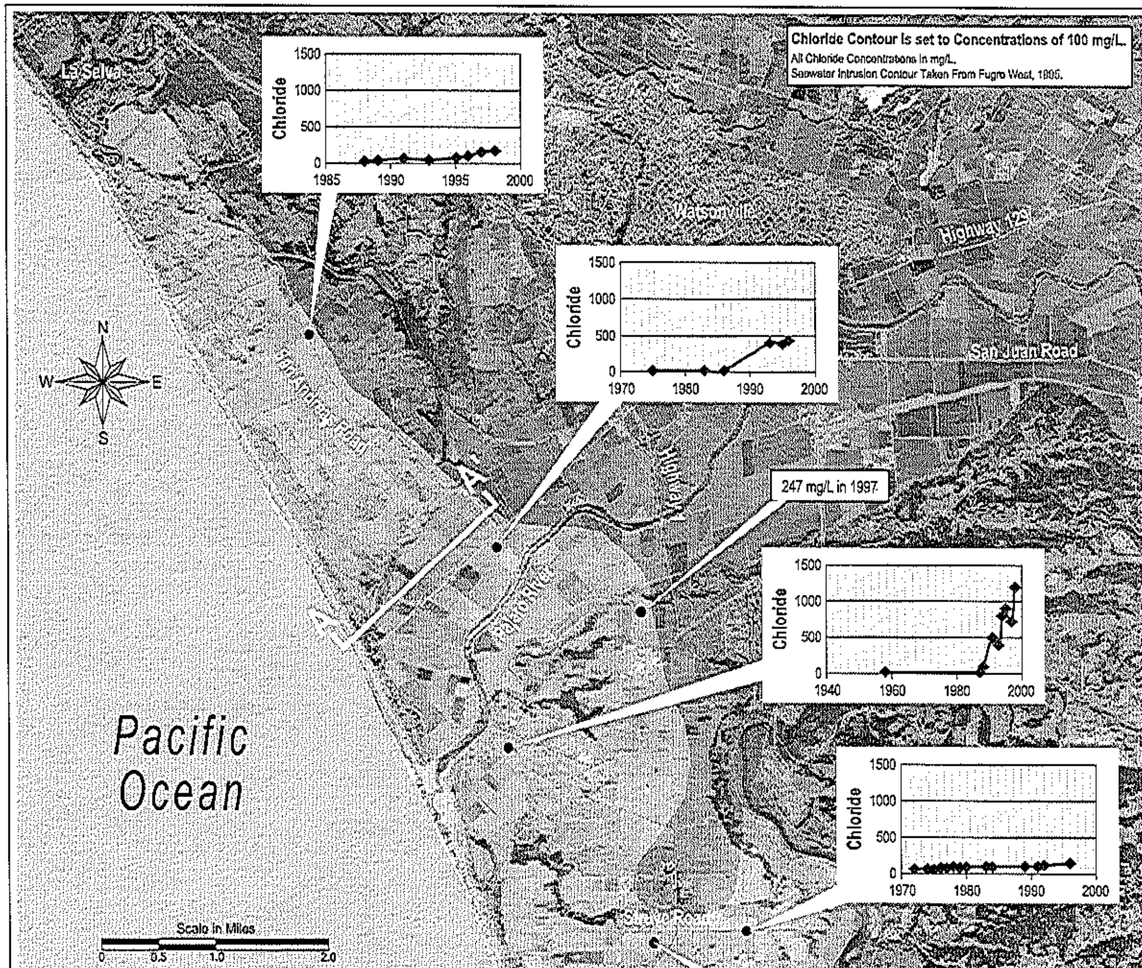
Solving this situation will require a combination of management practices and additional water sources.

To eliminate the overdraft conditions and seawater intrusion, water demand must be brought into balance with sustainable water supplies. This balancing of demand with sustainable supply will require a combination of water conservation, modified pumping practices and development of new water sources.

To develop and assess a range of scenarios, the magnitude of the problem was defined.

By modeling current 'baseline' conditions, the sustainable yield of the basin (the maximum amount of groundwater that can be extracted from the aquifer system without causing adverse effects) can be estimated. With this estimate in hand, alternative strategies to balance the basin can be developed.

The sustainable yield of the Pajaro Valley groundwater basin was estimated using the Pajaro Valley Integrated Ground and Surface Water Model (PVIGSM). This complex model simulates groundwater conditions in the Pajaro Valley groundwater basin using geologic and hydrologic conditions, current pumping conditions, and other basin characteristics. The modeling approach involved incremental reductions of groundwater pumping estimates until stable groundwater levels were observed (i.e., recharge = demand) and seawater intrusion was eliminated.

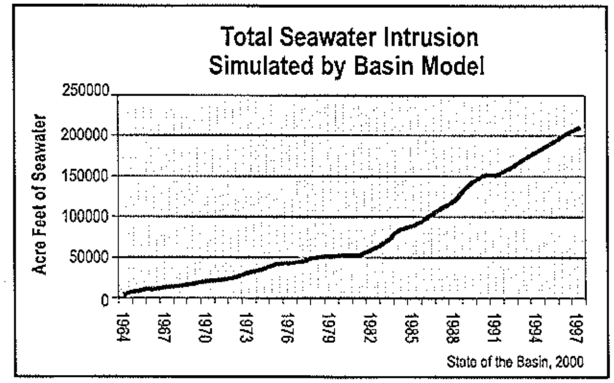


PVWMA Monitoring	Wells	Chloride Concentration (mg/l)		
Period	Well Count	Average Minimum	Average	Average Maximum
Predrought	166	60	70	80
Drought	186	330	420	500
Postdrought	198	370	450	550

Taken From State of the Basin, PVWMA, 2000

Source: Modified from PVWMA, July 2001.

Summary of Seawater Intrusion Within PVWMA Boundaries



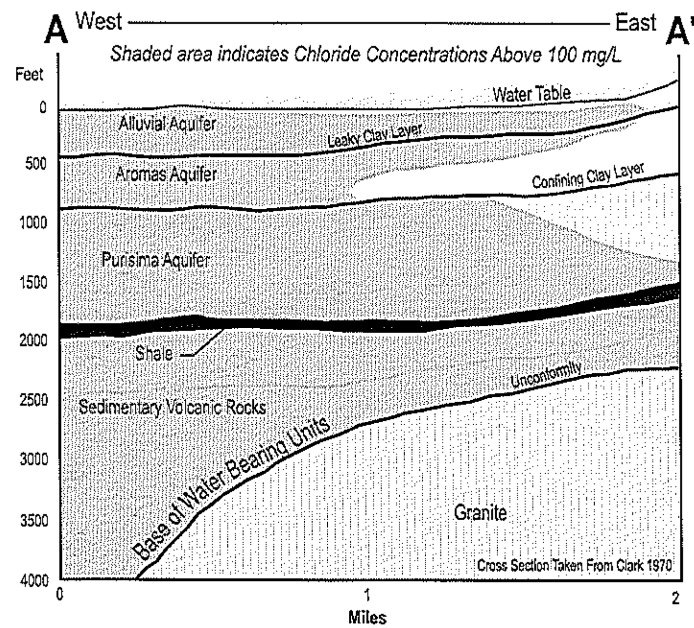


Figure ES-1: Location of Area Impacted by Seawater Intrusion

Model results indicate that, under current pumping practices, a 65% reduction in *basin-wide* groundwater pumping (45,000 AFY) is necessary to eliminate seawater intrusion. Under this scenario, the sustainable yield of the groundwater basin is approximately 24,000 AFY (69,000 AFY – 45,000 AFY), or approximately one third of the current average annual demand on groundwater supplies.

However, the basin sustainable yield could be doubled if pumping in the coastal areas was eliminated. Therefore, every proposed solution considered in this document includes stopping groundwater pumping at the coast and replacing it with water that would originate from other areas. The PVIGSM showed that this modification to current pumping practices would create a hydrostatic barrier that would prevent seawater intrusion. This scenario necessitates a dependable supplemental water supply and construction of a coastal distribution system to provide coastal agricultural users with water. The basin sustainable yield estimated for this scenario is 48,000 AFY. This estimate assumes a 100 percent reliable supply with very little variation in year-to-year availability of water.

The basin yield would be less if the total irrigation demand were reduced because there would be less basin recharge. Thus, the Local-Only alternative, which would significantly reduce total irrigation, would result in a lower sustainable yield from groundwater. As a result of this influence, the actual basin yield would be approximately 42,000 AFY for the Local-Only alternative.

Management measures that do not involve the construction of new projects can deliver significant benefits.

The following management measures have been identified to reduce water demand, increase the yield of the groundwater basin, and maintain optimal water quality:

- Demand management options to reduce water demand;
- Pumping management options to increase the sustainable yield of the groundwater basin; and
- Watershed management options to protect water resources.

Demand Management. Demand management measures include options such as water conservation, water pricing, and land retirement. The PVWMA developed Water Conservation 2000 (WC 2000) to serve as a guidance document for achieving cost effective increases in water conservation. This plan identified cost-effective opportunities that would result in the conservation of approximately 4,500 AFY in agriculture water use and 500 AFY in urban water use. Water pricing is one of the options considered in WC 2000 for promoting water conservation. The PVWMA could either increase its current flat rate charge of $50/AF, or implement a tiered water pricing system in which the price of water increases as the amount of water consumed exceeds certain threshold values. A third option available is land fallowing. This option involves the acquisition, or leasing of agricultural land and elimination of irrigated agriculture on that land. It should be noted that the latter two options have extensive socioeconomic impacts and would have to be investigated in greater detail before they could be implemented.

Pumping Management. As stated previously, the PVIGSM simulation of groundwater levels and seawater intrusion in the Pajaro Valley groundwater basin indicates that coastal groundwater pumping reductions would be more effective at preventing seawater intrusion than basin-wide pumping reductions. Provided that a supplemental water supply is available to coastal users, elimination of coastal pumping would nearly double the basin sustainable yield.

Watershed Management. Groundwater quality and stability could be enhanced by implementing watershed management measures that would monitor water resources, reduce nitrate pollution, protect key areas of recharge, meter water use, and specify a well management protocol. These management plans would help to preserve water resources in the Pajaro Valley and would provide data for future evaluation of basin conditions.

Additional water supply, storage and distribution projects will be required in order to balance the basin and eliminate seawater intrusion.

As shown in Table ES-2, water conservation and pumping management alone will not satisfy the water demand within the Pajaro Valley, and development of additional water supplies is essential to balancing the groundwater basin. Although basin balance would be achieved by developing 16,000 AFY of supplemental supply, PVIGSM results indicate that elimination of approximately 18,500 AFY of pumping along the coast is required to eliminate seawater intrusion.

Table ES-2: Required Additional Water Supplies, Assuming Water Conservation

Optimization Option	Balancing Current Conditions (AFY)	Balancing 2040 Conditions (AFY)
Agricultural Demand	59,300	64,400
Urban Demand	12,200	16,100
Total Demand	**71,500**	**80,500**
Corralitos Filter Plant	(1,100)	(1,100)
Other Surface Water Diversions	(1,000)	(1,000)
Total Groundwater Demand[a]	**69,000 (rounded)**	**78,000 (rounded)**
Current Basin Sustainable Yield	(24,000)	(24,000)
Future Increased Yield Due to Pumping Management at Coast and Reliable Supplemental Supply Projects[b]	(24,000)	(24,000)
Water Demand without Conservation	**21,000**	**30,000**
Increased Agricultural Conservation (Achieved by 2010)[c]	(4,500)	(4,500)
Increased Urban Conservation (Achieved by 2010)[c]	(500)	(660)
Required Additional Supply[d]	**16,000**	**25,000 (rounded)**

Footnotes:

a. Values rounded to two significant figures or to the nearest thousand to represent the values significant accuracy.
b. The amount achieved if supply is 100% reliable. With less reliable supply, the amount of increased yield would be lower. The amount of increased groundwater yield of the Alternatives (except Local-Only Alternative) developed in Section 5 would be 24,000 AFY given their level reliability.
c. Conservation to be achieved over several years, but is included in both Current Conditions and 2040 Conditions to show impact on levels of demand for both conditions.
d. This value represents the supplemental supplies required to meet the overall water balance in the basin assuming 100% supply reliability. However, PVIGSM results indicate that elimination of approximately 18,500 AFY of pumping along the coast is required to eliminate seawater intrusion.

The quality of the additional water supplies is also important.

Although Table ES-2 provides a breakdown of the *quantity* of additional water supplies required to balance the basin, it does not address the water *quality* requirements for these supplies. The water supplied to balance the basin must be suitable for its intended uses. Specific water quality parameters of concern for agricultural irrigation include:

- Salinity,
- Sodium hazard,
- Chloride and sodium toxicity, and
- Pathogens (such as *Phytophthora).*

The tolerance of crops to various water quality constituents can vary by crop and soil type, and different varieties of the same crop can exhibit markedly different growth responses to waters of similar quality. Crop tolerance to (1) constituents in the irrigation water, (2) soil conditions, and (3) prevailing climate are important factors in assessing the suitability of a particular water for irrigation. In order to minimize health impacts and optimize crop yield, the stated water quality objectives are 500 mg/L TDS, 140 mg/L chloride, and an adjusted SAR of 3.0. Only water supplies that meet these standards, or can be treated or blended to meet these standards, are considered viable supplies in the Revised BMP.

The Revised BMP identified and assessed a wide range of additional water supply sources.

Listed below are the projects that were analyzed in the Revised BMP. They were combined in various ways to develop the range of alternatives presented above. Analysis of these projects allowed an exhaustive assessment of the role that local water and out of basin supplies could play in an overall strategy to balance the groundwater basin and stop seawater intrusion. Table ES-3 identifies which water supply projects were selected for the given strategies and reiterates the issues associated with each project. Locations of these project components are shown in Figure ES-2, and brief descriptions of each project are provided below:

Coastal Distribution System (CDS). This project is necessary to eliminate coastal pumping and optimize the basin without affecting current agricultural practices in coastal areas. The CDS will deliver water to those areas where coastal pumping will be eliminated, and will consist of nearly 26 to 30 miles of pipeline delivering water to over 200 agricultural parcels. (See Figure 4-2).

Harkins Slough Project w/ Supplemental Wells and Connection. This project involves seasonal percolation of diverted Harkins Slough water into the Harkins Slough recharge basin for storage until the irrigation season, when it will be extracted and delivered to the CDS for distribution. This project also includes the construction of additional water supply wells to supplement the deliveries of extracted Harkins Slough water. The construction of the Harkins Slough diversion structure and recharge basin was completed in Fall 2001. The expected yield from Harkins Slough is approximately 1,100 AFY, with additional water being provided by the supplemental wells. (See Figure 4-1).

Murphy Crossing with Recharge Basins. The Murphy Crossing Project involves the diversion of water from the Pajaro River between December and May for direct irrigation use and for storage in the underlying aquifer at four recharge basins. During the summer irrigation season, the stored water would be extracted and used for irrigation purposes. The expected yield for the Murphy Crossing Project is approximately 1,600 AFY, including both direct use and underground storage. However, *this project cannot be implemented until environmental concerns brought forth by the Department of* Fish and Game (DFG) and the National Marine Fisheries Service (NMFS) are addressed. (See Figure 4-6).

Watsonville Slough with North Dunes Recharge Basin. The Watsonville Slough Project would expand on the Harkins Slough Project by diverting water from Watsonville Slough between December and May for storage in the groundwater aquifer. Diverted water would be filtered and stored in the shallow groundwater aquifer at the proposed North Dunes Recharge Basin. The expected yield for the Watsonville Slough Project is approximately 1,200 AFY. Implementation of this project will require the PVWMA to obtain a water rights permit, and a likely mitigation measure for this permit could be restoration of Watsonville Slough. (See Figure 4-7).

College Lake, Pinto Lake Diversion. The College Lake Project would increase the total storage *capacity of the lake from approximately* 1,400 AF to approximately 2,000 AF via construction of a new headgate/weir structure. Diversion of water to the lake from the Pinto Lake drainage channel would increase total flow into the lake. Water would remain in College Lake until needed to meet irrigation demands. (See Figure 4-8).

The expected yield for the College Lake Project is approximately 1,800 AFY. Although the PVWMA submitted a water rights application for the College Lake Project to the SWRCB in 1995 and completed CEQA evaluation in May 1999, protests by DFG and NMFS have slowed the permitting process. This project cannot be implemented until the concerns regarding steelhead trout raised by these agencies are addressed and a water rights permit for the Pinto Lake diversion is secured.

Expanded College Lake Project w/ Pinto Lake, Corralitos Creek, Harkins Slough, and Watsonville Slough Diversions, and Aquifer Storage and Recovery. This project would build upon the College Lake project discussed above, and would increase the total storage capacity of College Lake to 4,600 AFY via construction of an earthen dam and saddle dam and additional diversions from Corralitos Creek, Harkins Slough and Watsonville Slough. This project would also involve the use of Aquifer Storage and Recovery (ASR), injecting surface water through wells into the groundwater aquifers for later extraction and delivery for irrigation purposes. (See Figure 4-9).

The expected yield for the Expanded College Lake Project is approximately 6,700 AFY. In order to implement this project, the PVWMA would have to (1) coordinate with DFG and NMFS to address environmental concerns, (2) coordinate with the Division of Safety of Dams to secure the necessary permits for dam construction, (3) secure a water rights permit for Corralitos Creek, and (4) coordinate with the Regional Water Quality Control Board (RWQCB) to establish water quality requirements for use of ASR.

Recycled Water (4,000 AFY) with Blending Facility. This project involves the construction of additional treatment processes and a blending facility at the Watsonville Wastewater Treatment Facility (WWTF) for production of recycled water suitable for irrigation purposes. Water quality data indicate that the recycled water salinity concentrations and TDS values exceed irrigation water quality objectives; therefore, a blending facility or additional treatment will be required to reduce these concentrations. The expected yield of the Recycled Water Project is approximately 4,000 AFY. Implementation of this project will require continued coordination efforts between the PVWMA and the City of Watsonville, as well as additional permits for the WWTF operations. (See Figure 4-3).

Recycled Water Project, Southeast Dunes Recharge Basin (6,000 AFY). This project includes the construction of the recycled water treatment facilities and blending facility described above, along with the Southeast Dunes Recharge Basin for underground storage of recycled water in the shallow groundwater aquifer during low irrigation demand periods. Stored water would then be extracted during the irrigation season. Water quality concerns are as described in the previous project; however, the Regional Water Quality Control Board may impose additional levels of treatment due to concerns over recharge consisting of recycled water. The expected yield of this project is 6,000 AFY. Implementation of this project will require various funding mechanisms and coordination with jurisdictional agencies. (See Figure 4-4).

Recycled Water Project, Harkins Slough Recharge Basin, North Dunes Recharge Basin (7,700 AFY). This project combines the Recycled Water Project and blending facility with the Harkins Slough and North Dunes Recharge Basins to provide underground storage of recycled water in the shallow groundwater aquifer. Water would then be extracted during the irrigation season via extraction wells constructed at both recharge basins. Water quality concerns are the same as described for the other recycled water projects. The expected yield of this project is approximately 7,700 AFY. Funding and permitting will also be the main implementation issues for construction of this project. (See Figure 4-5).

Inland Distribution System. This project involves construction of the Inland Distribution System (IDS) to provide a supplemental supply of water to agricultural users located east of Highway 1. The purpose of the larger distribution system is to provide a greater reduction in overall groundwater pumping during periods of high availability of supplemental water supplies, providing a greater reduction in total basin pumping, and thus allowing a greater amount of groundwater to remain in storage. The increased amount of groundwater left in storage is then pumped during periods of time when the surface supplies are less than adequate to meet the irrigation needs of the IDS, with the pumped groundwater serving to supplement the available surface supplies. The IDS will deliver water to those areas where coastal pumping will be eliminated, and will consist of nearly 20 miles of pipeline. (See Figure 4-11).

Import Water Project. This project involves the construction of a 23-mile import pipeline for transport of CVP water to the proposed CDS. The PVWMA currently has a future CVP entitlement of 19,900 AFY and an existing contract for 6,260 AFY (acquired from Mercy Springs Water District) from the United States Bureau of Reclamation (USBR). Additional CVP water could be purchased as needed from other water contractors (See Figure 4-10).

However, contracting for the entitlement of 19,900 AFY requires resolution of issues relating to Title 34 – Central Valley Project Improvement Act (CVPIA). The CVPIA restricted the USBR from entering into new long-term water supply contracts until it fulfills various environmental requirements. Since the USBR is not expected to fulfill these requirements for several years, negotiations for a new CVP contract for PVWMA's 19,900 AFY entitlement have been delayed. Alternatively, the PVWMA could purchase additional supplies similar to its purchase of the Mercy Springs Water District CVP contract.

The Draft BMP 2000 evaluated three alternatives for construction of the import pipeline: 42", 54" and 60"- diameter pipelines. These projects and an Out-of-Basin Water Banking program are discussed below:

60-inch Import Water Project w/ Inland Distribution System (IDS) and Supplemental Wells. This project would involve the construction of a 60" import pipeline to support an initial maximum flow rate of 75 cfs, along with an IDS and supplemental wells to provide in-lieu recharge and dry weather supply, respectively. The larger diameter pipeline provides greater flexibility to adapt to potential increases in future water needs. The expected yield for this project is approximately 10,300 AFY.

54-inch Import Water Pipeline with Aquifer Storage and Recovery. This project would involve the construction of a 54" import pipeline to support a maximum flow rate of 75 cfs, and would use ASR (injection/extraction wells) to store and recover CVP water from underground aquifers in the basin. Prior to injection, the CVP water would be filtered for compliance with water quality requirements. The expected yield for this project is approximately 11,900 AFY.

42-inch Import Water Pipeline with Aquifer Storage and Recovery. This project is similar to the 54" pipeline project described above except that the smaller pipeline diameter would only support a maximum flow rate of 40 cfs. The expected yield for this project is approximately 6,900 AFY.

Out-of-Basin Banking Option. An Out-of-Basin Water Banking program would establish a basis for the PVWMA to partner with another CVP contractor to allow PVWMA CVP water supplies to be delivered to another CVP contractor during wet years, and during dry years, the CVP contractor would provide a portion of their CVP water to the PVWMA. This option increases the reliability of the CVP supply, and minimizes the need for additional local storage facilities and the size of delivery pipelines. Out-of-Basin Banking is contingent on developing and negotiating an agreement with one or several CVP contractors/agencies. The expected yield for an Out-of-Basin banking option could be equivalent to either the in-basin in-lieu recharge or the in-basin ASR options.

Bolsa de San Cayetano, Pajaro River Diversion. This project would provide surface storage of 5,000 AF for Pajaro River diversions and would capture limited runoff from a 723-acre drainage area. The expected yield of this project is 5,000 AFY; however, there are significant seismic hazards associated with this project and implementation would require considerable effort with regard to permitting and environmental coordination. (See Figure 4-12).

Seawater Desalination. This project would involve the construction of a desalination (reverse osmosis) plant for treatment of Monterey Bay seawater to provide agricultural irrigation water. The quality of water and yield of this plant would be dependent on the design of the treatment system. Although this project would produce a highly reliable water supply, implementation of this project is inhibited by its high cost of operation, particularly the cost of energy, and the difficulty in securing a discharge permit for the brine discharge.

Table ES-3: Projects Selected for Each Basin Management Strategy

Project	BMP 2000	Local-Only	Modified Local	Modified BMP	Issues and Comments
5,000 AF Water Conservation	♦	♦	♦	♦	To be achieved by 2007
Harkins Slough Project	♦	♦	♦	♦	Nearly complete.
Coastal Distribution System	♦	♦	♦	♦	Necessary to eliminate coastal pumping to maximize groundwater yield.
Recycled Water Project (4,000 AFY)	♦			♦	Blending facility required to meet water quality requirements; additional permits required.
Recycled Water Project (6,000 AFY)			♦		Blending facility required to meet water quality requirements; additional permits required; additional treatment for recharge of recycled water.
Recycled Water Project (7,700 AFY)		♦			Blending facility required to meet water quality requirements; additional permits required; additional treatment for recharge of recycled water.
Murphy Crossing Project	♦				Protests from DFG; additional studies requested by NMFS.
Watsonville Slough Project		♦	♦		Water rights permit; restoration of the slough probably required.
College Lake Project			♦		Protests by DFG and NMFS; water rights permit required.
Expanded College Lake Project		♦			*Same issues as above two projects; plus* water rights permit required for Corralitos Creek. Injection may require reverse osmosis treatment.
60" Import Water Project	♦				Implementation requires resolution of Measures D and K and acquisition of CVP contracts.
54" Import Water Project				♦	Implementation requires resolution of Measures D and K and acquisition of CVP contracts; requires filtration for injection.
42" Import Water Project			♦		Implementation requires resolution of Measures D and K and acquisition of CVP *contracts; requires filtration for injection.*
Additional 5,000 AFY Water Conservation via Land Fallowing		♦			Requires the equivalent of 2,200 acres of basin-wide land fallowing, or approximately 800 to 1,000 acres of fallowing near the coast.
Bolsa de San Cayetano Project					Significant seismic, environmental and *cost issues eliminated this component.*
Seawater Desalination					Permitting difficulties for disposal of brine; cost-prohibitive.

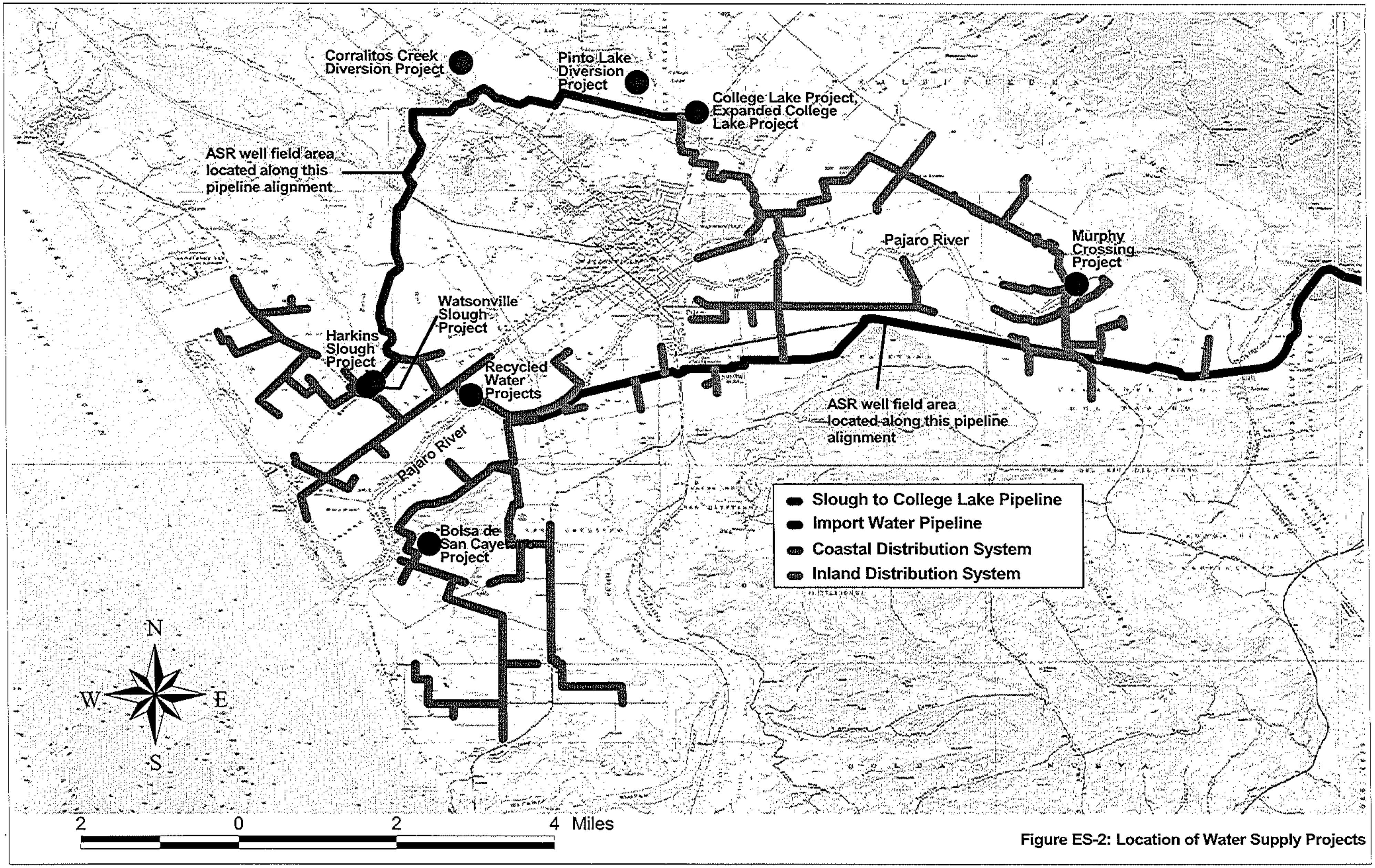


Figure ES-2: Location of Water Supply Projects

Several criteria were used to assess each basin management strategy.

To further differentiate between the four basin management strategies, each alternative was evaluated based on the following non cost criteria:

- **Can Meet Existing and Future Water Needs**. This criterion evaluates the ability of the selected alternative to provide the infrastructure and water supply needed to meet existing and future demands. This is a key element for a given strategy because population growth and agricultural crop changes in the Pajaro Valley are expected to significantly increase water demand.
- **Limited Dependence on Out-of-Basin Water Supplies**. This criterion evaluates the dependence of the selected alternative on out-of-basin supplies. Strategies that mainly rely on the development of water supplies that will be directly controlled by the PVWMA are considered to be 'locally sustainable,' although the effects of a drought may be greater than for an import alternative.
- **Minimizes Regulatory Hurdles.** This criterion evaluates the likelihood of being able to implement the selected alternative without having to overcome significant regulatory or permitting hurdles. An example of such a hurdle would be obtaining a permit for percolation of recycled water since it is unclear whether the RWQCB and other regulatory agencies would allow recycled water percolation without advanced treatment (e.g. reverse osmosis) beyond Title 22 levels.
- **Meets Water Quality Goals**. This criterion evaluates the ability of the selected alternative to provide a water supply of suitable quality for its intended users. For example, alternative strategies that rely heavily on recycled water are expected to have the lowest water quality while alternative strategies that rely more on CVP water are expected to have the highest water quality.
- **Economic Impact**. This criterion evaluates the impact to the local economy that would result from the selected alternative. For example, strategies that have higher costs or require fallowing of significant amounts of farmland would have the greatest economic impacts.

Cost was another criterion used to compare the four basin management strategies. In terms of cost per acre-foot to meet current water demands, the Modified BMP 2000 alternative was found to be the most cost-effective with estimated cost of $198/AF. The Local-Only alternative has the highest unit cost at $259/AF. Furthermore, the Local-Only alternative has significantly higher cost risks than the Modified BMP alternative. These costs risks are related to the cost of meeting regulatory requirements for groundwater recharge with recycled effluent and for the surface water diversions that comprise the Local-Only alternative. For example, if the Department of Health Services requires higher levels of treatment for groundwater recharge with recycled effluent, the unit cost of the Local-Only Alternative could rise by as much as $30/AF, which would result in a cost of $289/AF. (The unit costs in this paragraph assume a uniform flat water rate.)

The unit costs presented in the previous paragraph relate to the cost of meeting today's water demand in the PVWMA service area. The costs of meeting future demands would inherently be greater since additional supplies would have to be developed. The costs for meeting future demands need further development, but would include additional projects to provide increased supply, as well as a pro rata share of the project costs to balance the groundwater basin at today's conditions. As do existing water users, future water users benefit from the projects that balance the basin at today's conditions.

A summary comparison of each basin management strategy with respect to the criteria identified above is provided in Table ES-4.

Table ES-4: Summary Comparison of the Basin Management Strategies

Comparison Criteria	BMP 2000	Local - Only	Modified Local	Modified BMP
Total Yield (AFY)	64,000	56,000	64,000	64,000
Capital Costs ($ Million)[a]	$162	$128	$148	$138
Adjusted Total Annualized Costs ($ Million)[b]	$14.5	$14.6	$13.7	$12.6
Cost per AF[c] ($/AF)	$226	$259	$215	$198
Cost per AF + PVWMA Delivery Charge to Those Receiving Delivered Water ($/AF)[d]	$318	$351	$307	$290
Can Meet Future Water Demands?	√		√	√
Limited dependence on out-of-basin supplies?		√	√	
Minimizes significant regulatory/implementation hurdles?	√			√
Meets Water Quality Goals?	√		√[e]	√
Requires Land Fallowing or Other Measures with Significant Economic Impact?		√		

Footnotes:

a. Includes pro rata share of costs to balance basin at today's conditions and costs of additional water supplies
b. Annualized costs included annualized capital cost, operation & maintenance costs
c. Unit cost is applied to all water users based on first quarter, 2001 construction costs (assumes uniform flat rate)
d. Includes delivery charge of $92/AF for those customers receiving delivered water
e. Water quality goals are met only during certain times of the year

Conclusions

Conclusions that can be drawn from the comparison of Basin Management Strategies presented in Table ES-4 include:

- The Local-Only alternative has the lowest capital cost, but high operations costs, does not meet water quality goals, does not provide the ability to meet future water needs, and is the most costly alternative on a cost per acre foot basis.
- The BMP 2000 alternative has the highest capital cost and is the second most costly alternative on a cost per acre-foot basis.
- The Modified Local alternative is the second least expensive on a cost per acre-foot basis, relies heavily on local supplies, but cannot consistently meet water quality objectives.

- The Modified BMP alternative is the least costly on a cost per acre-foot basis, meets the water quality goals, and provides flexibility to meet future demands. For these reasons it formed the basis of the Recommended Alternative.

In developing the Recommended Alternative, the Modified BMP alternative was enhanced to include additional CVP water supply to allow greater flexibility in stopping seawater intrusion and balancing water demands during peak conditions. (These changes are described in Section 6.)

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1 Purpose of the Revised BMP

Pumping of groundwater to meet water demand within the Pajaro Valley Water Management Agency's (PVWMA) service area has caused a significant drop in groundwater elevations, resulting in seawater intrusion. These impacts indicate that current groundwater pumping practices are in excess of the sustainable yield of the groundwater basin, and must be corrected. Continued over pumping of the groundwater basin will lead to continued seawater intrusion, rendering an ever increasing portion of the groundwater basin unusable for agricultural irrigation and potable uses.

The purpose of the Revised Basin Management Plan (BMP) is to present and evaluate basin management strategies and to select a Recommended Alternative that will enable the PVWMA to:

- Balance water demand within the PVWMA service area with sustainable water supplies;
- Prevent seawater intrusion in the area served by the PVWMA; and
- Initiate long-range programs to protect water supply and quality within the basin.

The management strategies evaluated in this plan include a range of potential projects dealing with development of local surface water supplies, recycling of treated water from Watsonville Wastewater Treatment Facility (WWTF), storage of water in the groundwater aquifers (groundwater banking) for dry years, storage of water for delivery during irrigation demand, and importation of water from the Central Valley Project (CVP). Also included are possible non-structural projects such as demand management measures, modification of pumping practices, and land fallowing.

Each strategy was developed as a concept initiated by the public and/or the PVWMA. A full evaluation of all potential projects was conducted, both inside and outside the PVWMA service area. The resulting strategies are presented in this document, and are considered to be the best scenarios for each concept.

- **BMP 2000 Alternative.** A recommended alternative was previously identified in the original draft BMP 2000 document. This strategy involved the implementation of several projects, including importation of water, storage of water in the groundwater aquifers (banking) via in-lieu recharge, development of local water supplies, and water conservation. However, public review of that document indicated the need to further assess the merits of other management alternatives. This strategy is included in the Revised BMP for comparison purposes.

- **Local-Only Alternative.** This strategy focuses solely on the development of local water supplies and implementation of demand reduction measures to balance the basin. It does not include any projects that involve importation of water from outside sources, but does develop storage of local supplies in both College Lake and in the groundwater aquifers through percolation and aquifer storage and recovery[1] (ASR).

- **Modified Local Alternative.** This strategy consists of a small import water project (42-inch pipeline) with ASR and local water supply projects including the Harkins Slough Project, a Watsonville Slough Project with North Dunes Recharge Basin, a College Lake Project with Pinto Lake Diversion, and a Recycled Water Project with the Southeast Recharge Basin. This alternative is a modification of the Local-Only Alternative eliminating land retirement and incorporating a minimum diameter import pipeline.

[1] Aquifer storage and recovery consists of injection and extraction wells used to bank water during above normal water years and provide supplemental supply during below normal water years.

- **Modified BMP Alternative.** This strategy consists of an import water project with ASR and local water supply projects including the Recycled Water Project and the Harkins Slough Project. This alternative is a modification of the BMP 2000 Alternative eliminating the Murphy Crossing Project and the Inland Distribution System. This alternative evaluates ASR in conjunction with CVP supply and a reduced import pipeline size.

These strategies build upon the 1993 BMP and incorporate several of the local water supply projects that were recommended in that Plan. Since completion of the 1993 BMP, the PVWMA has conducted studies and evaluations of local water supply projects, published a number of studies, including the draft BMP 2000, and is completing construction of the Harkins Slough Project. In addition, the PVWMA has completed extensive groundwater evaluations and modeling that have been used to quantify the extent, magnitude, and character of the overdraft situation. This information was used in the development and assessment of the strategies presented herein.

Following completion of the Draft Revised BMP, the PVMWA proceeded with public workshops and outreach effort to engage the public and stakeholders of the considered strategies. The public was encouraged to comment on the proposed projects and strategies so that the PVWMA could finalize a recommended strategy that is responsive to the concerns and needs of its water users. A companion draft Environmental Impact Report (EIR) was also completed in September 2001 and was available for public review and comment. The Final EIR is scheduled for certification by the PVWMA Board of Directors in February 2002.

The Modified BMP 2000 Alternative was selected as the basis for the Recommended Alternative based on guidance from the PVMWA Board of Directors. The PVWMA Board of Directors identified the Modified BMP 2000 Alternative with minor enhancements as the Recommended Alternative after taking into account the public and stakeholder input, engineering and cost evaluations, environmental impacts, and direction from PVWMA staff. The Recommended Alternative is summarized below and is described in detail in Section 6.

- **Recommended Alternative.** This alternative consists of an import water project with out-of-basin banking, and local water supply projects that include the Recycled Water Project and the Harkins Slough Project. In addition, five supplemental wells are to be constructed along the import pipeline alignment. Flexibility is provided to allow sale of imported water to users along the pipeline alignment, if there is interest by these growers. This alternative also includes recommendations to enhance and develop existing and new watershed management programs.

The Revised BMP includes an implementation section (Section 7) identifying schedules and important tasks, and a water rate section (Section 8) describing the recommended funding plan. Following completion, the Revised BMP will be presented to the PVWMA Board of Directors for approval and adoption of a Recommended Alternative strategy. The Final EIR will also be presented to the Board of Directors for its certification.

1.1 Organization of the Revised BMP

The Revised BMP is organized into eight major sections as follows:

Section 1 – Purpose of the Revised BMP. This section describes the purpose of the Revised BMP and its relationship to the 1993 BMP and the draft BMP 2000. Section 1 also presents the organization of this report.

Section 2 – State of the Basin. This section describes the current state of the groundwater basin that provides nearly all of the water used in the PVWMA service area. It describes the degree of overdraft that has occurred in the basin and how this has caused seawater intrusion. This section also describes the sustainable yield of the groundwater basin under current irrigation, pumping, and water demand conditions.

Section 3 – Management Measures. This section describes the options available to minimize water demand as well as options than can be used to increase the sustainable yield of the groundwater basin. These options include water conservation and land retirement. This section also describes watershed management programs that could be implemented to protect water resources in the Pajaro basin.

Section 4 – New Water Supply Projects. This section describes the new water supply projects that could be used in conjunction with measures from Section 3 to balance the basin. These projects include new surface water supplies, recycled water, importation of water from outside the basin, and water storage options.

Section 5 – Basin Management Strategies. This section combines the projects described in Sections 3 and 4 in different combinations to develop alternative Basin Management Plans. The alternatives presented range from total reliance on local water supplies to major reliance on imported water supplies. A total of four strategies are presented and compared on non-cost and cost bases.

Section 6 – Recommended Alternative. This section details the Recommended Alternative including water conservation, import water project with out-of-basin banking, water recycling project, Harkins Slough Project, and various watershed management programs. The Recommended Alternative was identified based upon guidance from the PVWMA Board of Directors and public input. In addition, this section includes a discussion of the selection process and the outreach efforts completed by the PVMWA during development of the Revised BMP.

Section 7 – Implementation. This section identifies schedules and outlines important implementation tasks of the Recommended Alternative.

Section 8 – Potential Rate Plan for Recommended Alternative. This section identifies a differential flat rate structure as the recommended potential rate structure to be implemented to recover project costs for the Recommended Alternative. This section also includes discussion on rate limitations, other potential rate structures, and the public process utilized to identify the recommend rate plan.

2 State of the Basin

This section of the Revised BMP summarizes the groundwater basin conditions within the PVWMA service area. The purpose of this section is to present:

1. The current state of the basin;
2. Underlying assumptions for the Pajaro Valley Integrated Groundwater Surface Water Model (PVIGSM) development; and
3. Results of the basin sustainable yield analyses for existing and future conditions.

Most of the data, references, and conclusions are taken from the PVWMA State of the Basin Report distributed by the Agency in April 2001 and the PVIGSM Technical Memoranda (TM) finalized in June 2000 (Montgomery Watson/AT Associates, 1999-2000). The State of the Basin Report and the PVIGSM Technical Memoranda provide a more thorough presentation of the Pajaro Valley groundwater basin geology, hydrology, and hydrogeology.

As documented in numerous groundwater studies conducted over the past 55 years, the Pajaro Valley groundwater basin is in an overdraft condition. An overdraft condition occurs when the amount of water withdrawn exceeds the amount of water replenishing the basin. The rate of seawater intrusion in the groundwater basin has also been increasing recently. In general, a combination of both overdraft conditions and seawater intrusion has limited the fresh groundwater supply needed to sustain the long-term agricultural and urban economy of the Pajaro Valley.

The first step in developing and assessing scenarios to alleviate the basin overdraft and seawater intrusion is to develop an understanding of the magnitude of the problem. By modeling the current 'baseline' conditions, the sustainable yield of the basin (the maximum amount of water that can be extracted from a groundwater basin without causing adverse effects) can be estimated. With this estimate of sustainable yield in hand, alternative strategies to balance the basin can be developed.

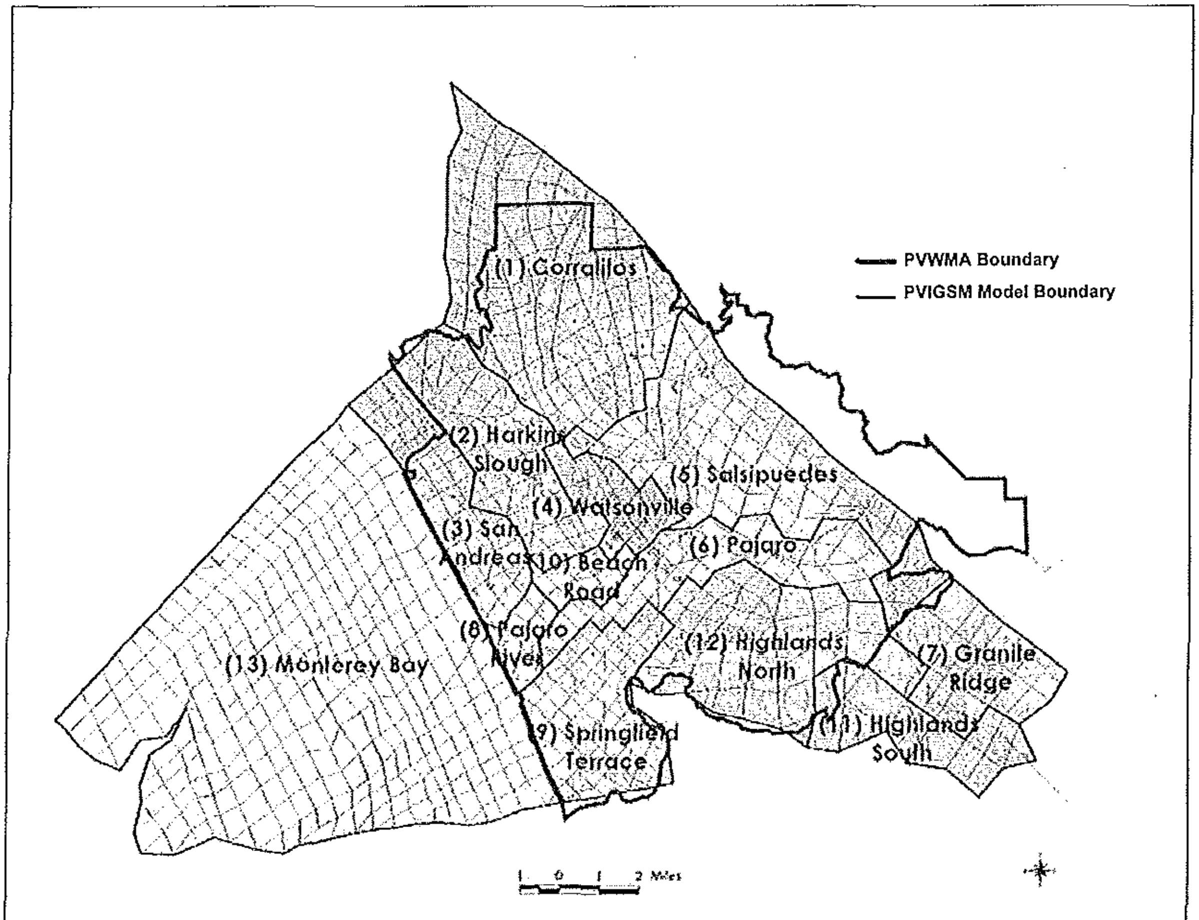
The PVIGSM was developed to assess the behavior of the groundwater basin under current baseline conditions and to assess the merits of alternative strategies to balance the basin. It is a dynamic finite element model that simulates the balance of groundwater in the Pajaro Valley basin using geologic and hydrologic conditions, current pumping conditions, water supply and demand conditions, and other basin characteristics. The model uses numerical algorithms to solve coupled differential equations and creates a mass balance within the model grid. The PVIGSM was developed to assist in:

- Gaining knowledge of the historical conditions of the groundwater basin;
- Evaluating the present state of the groundwater basin;
- Estimating the sustainable yield of the basin; and
- Evaluating the impact of potential alternative water supply scenarios on the integrated surface water and groundwater system.

2.1 Basin Boundaries

This section describes the hydrologic boundaries of the Pajaro Valley groundwater basin used in the development of the PVIGSM, the political boundaries of the PVWMA, and the relationship between the two. The boundaries of the PVIGSM model area were generally drawn along the lines of hydrogeologic features in order to make the model as accurate as possible. These boundaries are not exactly the same as the boundaries of the PVWMA. Figure 2-1 shows the boundaries of both the model and the PVWMA service area.

Figure 2-1: PVWMA Service Area and PVIGSM Model Area



Notes:

1. Total Model Area (less Monterey Bay) = 96,500 Acres
2. PVWMA Area = 79,600 Acres

Results from the model were adjusted to account for the area of the model outside of the PVWMA service area. Because of the high degree of overlap between the two areas, the adjustments were modest and did not affect the validity of the model results.

The total model area is approximately 146,700 acres, of which 96,500 acres are on-shore lands. The PVWMA service area of 79,600 acres lies generally within the on-shore model area except for a mountainous area on the eastern boundary that has little arable land and is of little consequence to the hydrogeology of the service area.

Political and model boundaries are described below:

Westerly Boundary: The western boundary of the Pajaro Valley groundwater basin extends far offshore under the Pacific Ocean. There are no known faults or other physical boundaries that prevent seawater intrusion when groundwater levels are low. The boundary condition was set to simulate constant head uniformly increasing from the coast to offshore, thereby simulating the density gradient due to seawater intrusion.

The PVWMA jurisdictional boundary follows the coastline and parallels the Pajaro Valley groundwater basin.

Easterly Boundary: The San Andreas Fault trends along the eastern edge of the Pajaro Valley. Impermeable rocks east of the fault act as a barrier to groundwater flow into or out of the Pajaro Valley groundwater basin, creating a well-defined geologic boundary for the model. The boundary condition for modeling purposes was set to no groundwater flow and a small amount of simulated surface flow from small watersheds.

The PVWMA jurisdictional boundary parallels the fault line following the Santa Clara and Santa Cruz County border. Although the PVWMA jurisdictional boundary was politically based, it reasonably follows the Pajaro Valley groundwater basin.

Northerly Boundary: The northern boundary is set at the watershed divide. Boundary conditions for the model were set to general head conditions from the Soquel-Aptos basin.

In general, the northern PVMWA boundary is a political boundary. At this boundary, the groundwater basin is shared with areas outside of PVMWA jurisdiction. There is no definitive geologic basis for the northern PVWMA jurisdictional boundary except for those areas where it follows the watershed divide.

Southerly Boundary: The relatively impermeable clays found in Elkhorn Slough to the south of the Pajaro Valley prevent north-south groundwater flows, creating a well-defined geologic barrier. Inland of the Slough, the groundwater can move either north or south depending on the pumping or hydrologic conditions; the groundwater boundary is not well-defined. Boundary conditions for the model were set to general head in the North Monterey County area and constant head at the Elkhorn Slough area.

The PVWMA jurisdictional boundary has both a physical and political basis extending up Elkhorn Slough and to the south of Carneros Creek. In the Elkhorn Slough area, the PVWMA jurisdictional boundary was drawn to follow the groundwater divide. Inland of the slough, the boundary follows the surface water divide.

2.2 Basin Geology

This section describes the shape and structure of the Pajaro Valley groundwater basin and water-bearing formations. A basic understanding of the local basin geology is necessary to appreciate how the Pajaro Valley groundwater basin, although quite complex and composed of many hydrogeologic units, is geologically interconnected and functions as a single groundwater basin. The basin geology will dictate how current groundwater pumping and irrigation practices affect groundwater levels throughout the basin.

The fundamental understanding of the geologic structure of the basin has not changed significantly since the State Water Resources Control Board (SWRCB) first evaluated the basin in 1953, although the amount of information available regarding basin geology has increased in the past 48 years. As part of the development of the State of the Basin Report, recent well logs and geophysical data were reviewed, and a Geographical Information System (GIS) was used to prepare visual representations of the available geologic data, including cross sections of the basin and maps of the aquifer and aquicludes. This was done to confirm that the model accurately represents the basin geology of the Pajaro Valley.

The water-bearing units in the Pajaro Valley include the alluvial, dune sand, terrace deposits, and the various layers of the Aromas sands and Purisima formation. Table 2-1 summarizes the sediment layers underlying the Pajaro Valley and briefly describes their water-bearing characteristics. Figure 2-2 shows the geologic units exposed at the surface in the Pajaro Valley.

Table 2-1: Water Bearing Units of the Pajaro Valley (Youngest to Oldest)

Formation	General Character	Water-Bearing Properties
Dune Deposits	Unconsolidated, well sorted, fine to medium grained quartzose sand. In part, actively drifting.	Largely unsaturated, but where saturated yields water to wells in small quantity, unconfined.
Alluvium	Unconsolidated gravel, sand, silt, and clay. Underlies the alluvial plain and extends into adjoining stream canyons.	Permeable; yields moderate quantities of water to wells.
Terrace and Pleistocene Eolian Deposits	Cross-bedded gravel, sand, silt, and clay. Marine origin near La Selva Beach. Non-marine elsewhere.	Permeable where sufficiently thick; yields moderate quantities of water to wells.
Aromas Red Sands	Semi-consolidated, quartzose brown to red sand with some clay layers. Deposited in an eolian environment and by meandering and braided streams.	Permeable; yields moderate quantities of water to wells. Main producing aquifer.
Purisima Formation	Poorly indurated sand, silt, clay, and shale; some gravel. Extensive shale beds in lower part of formation. Mostly marine in origin, three subunits locally: upper member is a poorly indurated fine sand with silt and clay layers, some gravel; middle member is a poorly indurated medium to fine sand with silt and clay layers, some gravel; lower member is a poorly indurated sand with and shale layers.	Moderately permeable. Lies at considerable depth beneath the valley area, so tapped by few wells. Water bearing properties are largely unknown, but upper and middle members probably will yield moderate quantities of water.

The majority of wells producing usable water have been developed in the Alluvium and Aromas sands formations in the upper 1,000 feet of the groundwater basin. The geology in this upper stratum is quite complex and is composed of a variety of alluvial materials that mix and intersperse with the Aromas sands. These alluvial materials generally comprise the upper 100 to 200 feet of the basin and vary greatly in composition.

The upper part of the Aromas sands formation is found beneath the alluvium, roughly 100 to 200 feet below sea level, and is the most intensively pumped. The lower part of the Aromas sands formation extends to approximately 900 feet below sea level near the mouth of the Pajaro River. The Aromas sands formation slopes upward to the north, and both its lower and upper parts can be observed at the surface to the north in the Soquel-Aptos area. The Aromas sands thin out toward the northern part of the Pajaro

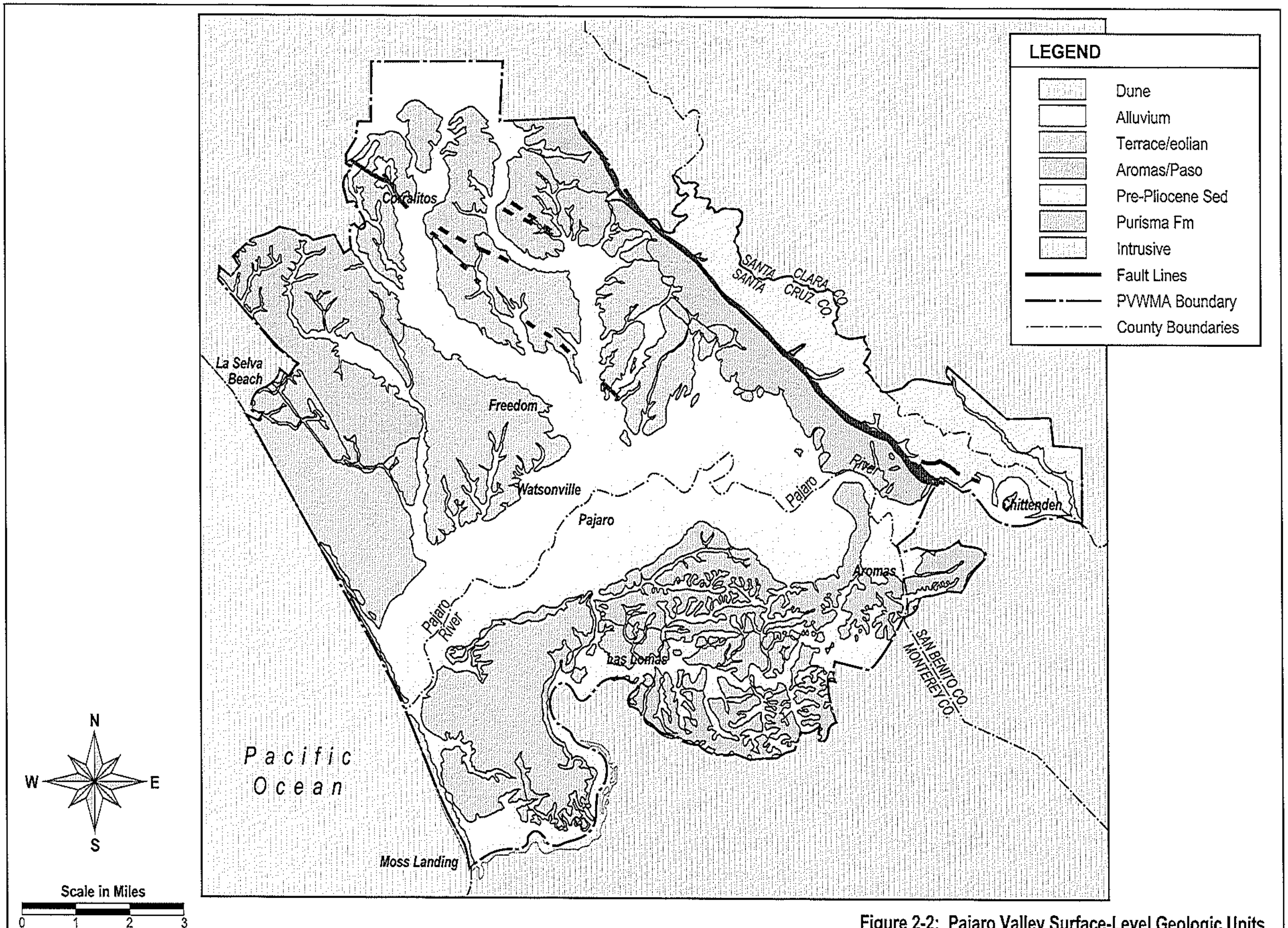


Figure 2-2: Pajaro Valley Surface-Level Geologic Units

Valley and interlace with terrace deposits and other more recent sediments. The Aromas sands formation contains aquifers separated vertically by layers of discontinuous clays that reduce the flow of water both vertically and horizontally. The water-producing zones within the Aromas sands formation can vary greatly in their ability to transmit water. The clay layers between the alluvial material and Aromas aquifers tend to be thin, however thick clay layers are present between the Aromas and Purisima, which account for the significant age difference of water in these two formations (Hanson, 1999).

The primary confining clays are thickest in the middle of the Pajaro Valley and trend roughly parallel to the Pajaro River; they thin inland toward Watsonville and the mountains. As one moves into the Corralitos area, the clay layers become thinner and discontinuous. It should be noted that in the upper part of the aquifers in and around Corralitos, one continuous clay layer creates a perched water region. This perched water table is above the main aquifer, as indicated by water level data. Near the coast, in both the San Andreas and Springfield Terrace areas, these clays are either absent, thinly layered, or discontinuous. Therefore, recharge from streamflow or deep percolation of rainfall can still reach the primary aquifer units in the Aromas sand layers through breaches in the clay, but is constrained by the presence of these less permeable layers.

2.3 Basin Hydrology

This section describes the hydrologic state of the basin and summarizes the hydrological data set that was used to develop the PVIGSM.

2.3.1 Basin Surface Waters

The Pajaro River is the largest coastal stream, measured by annual flows, between San Francisco Bay and the Salinas River. It contributes substantial surface inflow in the Pajaro Valley groundwater basin. The total drainage area of the Pajaro River above the Chittenden gauging station is approximately 1,200 square miles. Annual stream flow, as recorded at the Chittenden gauging station averaged 124,640 AF, with a minimum of only 766 AF in 1997 and a maximum of more than 653,889 AF in 1983 (PVWMA, April 2001).

Salsipuedes Creek is the largest tributary of the Pajaro River within the PVWMA. Salsipuedes Creek receives 11,350 AF of flow from Corralitos Creek and 4,700 AF from the College Lake Watershed. Corralitos Creek drains the northern region of PVWMA through a network of streams, which include Brown, West Branch, Rider Creeks, and an unnamed tributary that drains Pleasant Valley and the eastern side of the Calabasas Hills. The College Lake Watershed drains the northeastern region of the PVWMA service area through a network of streams, which include Green Valley, Casserly, and Hughes Creeks. Together Corralitos Creek and the College Lake Watershed drain approximately 57 miles, which is approximately half of the PVWMA service area.

The small streams that drain the Pajaro Valley have two distinct areas that contribute to flow in the surface water system. In mountainous regions, the streams are underlain by the Purisima formations, while in the lowlands streams are underlain by the Aromas or younger alluvial material. The Purisima is more consolidated and contains more fine-grained sediments than the Aromas or the alluvial fill. Therefore, the mountain and lowland reaches of the streams are distinguished by a ten to twenty-fold difference in mean amounts of runoff, which they contribute to the surface water system (AMBAG, July 1984). A single drainage can contain flow in the mountain region and be completely dry in the lowland region. The lowland region does not contribute flow to the surface water system except in large storm events or winter storm patterns that deliver frequent precipitation over a short amount of time.

College Lake is a seasonal water body in a natural depression created by the Zayante Fault located to the north of the intersection of Holohan Road and Highway 152, near the St. Francis Cemetery. The Lake captures runoff from an 11,000-acre watershed (CH2M Hill, February 1999). The College Lake Reclamation District was formed in the early 1900s by landowners impacted by the flooding of the natural depression. The Reclamation district owns and operates the existing pumps that drain the lake. Under existing conditions pumping commences in April and is completed by May. The lakebed is then planted with 2 to 3 rotations of row crops before it fills with winter runoff.

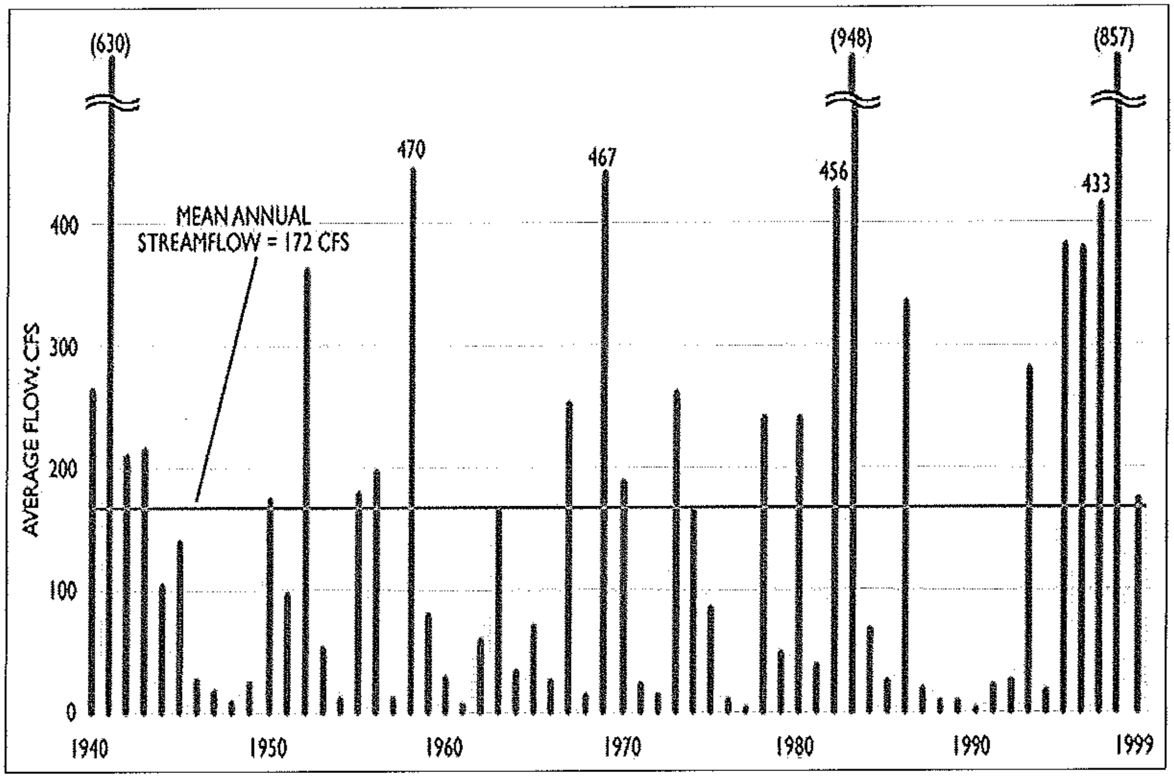
A network of sloughs drains the northwestern region of the PVWMA service area. These sloughs include Harkins, Hansens, West Branch, Galligans, Struve, and Watsonville Sloughs. Harkins Slough has the largest drainage area of all the sloughs and therefore has the largest annual average flux of 3,000 AF. The upper reaches of Harkins Slough originate in Larkin Valley and remain dry throughout most of the year only flowing during and following storm events. In this region of the sloughs, the channel is heavily overgrown and is mostly contained within a ditch along Larkin Valley Road. The lower portions of Harkins Slough are flat with wide flood planes that are mainly contained in a north-south trending valley located in the western region of the PVWMA service area.

Watsonville Slough has an annual average flux of 2,000 AF and receives flow from the Hansens, Struve, and West Branch Slough. Just before Shell Road, Harkins Slough enters Watsonville Slough as a tributary. In this area, the sloughs are generally shallow, open channels with broad floodplains that store, convey, and drain precipitation and irrigation. Slough bottomlands typically contain water year-round, but the slough system experiences great seasonal variation. Water balance indicates that monthly outflows to the Pajaro River Lagoon may range from 1,800 AF in January to less than 100 AF in July with the yearly total averaging 5,000 AF (AMBAG, June 1999).

Carneros Creek enters the southeastern boundary of the PVWMA service area and flows on an east-west trend through the area south of the Pajaro River and discharges into Elkhorn Slough. In large part, this creek and Elkhorn Slough define the southern boundary of the PVWMA service area. Carneros Creek has an annual average discharge of 2,800 AF, which is the largest source of freshwater to the Elkhorn Slough Watershed.

Historic streamflow data for the Pajaro River show wide fluctuations from year to year. Records are available from 1940 to the present. Figure 2-3 shows annual streamflow values at Chittenden gage on the Pajaro River. Flow on the Pajaro can be used as a proxy for the variation of flows in the local streams because the same storm events are also providing inputs to the local surface water system. The annual average surface runoff through these streams and sloughs, excluding the Pajaro River, is 24,070 AF (AMBAG, July 1984).

Figure 2-3: Annual Streamflow Pajaro River at Chittenden



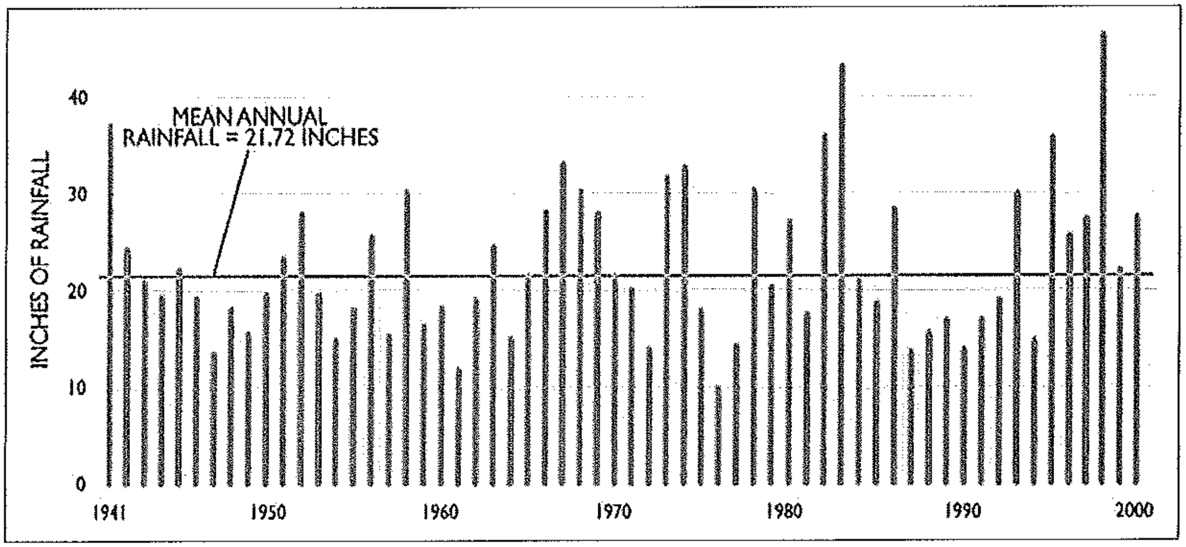
Source: USGS website, http://www.usgs.gov.

2.3.2 Basin Rainfall

The mean annual precipitation varies significantly within the Pajaro Valley, primarily due to the influence of the coastal mountain range. Rainfall is greater at higher elevations and generally decreases from north to south, from the Corralitos area to the area around Elkhorn Slough in northern Monterey County. Mean annual precipitation in the Santa Cruz Mountains on the northern and eastern boundaries of the PVWMA ranges from about 35 to 40 inches. The mean annual precipitation within the Valley itself ranges from more than 40 inches in the foothills of the Santa Cruz Mountains to 16 inches near the coast. The average rainfall for the City of Watsonville is approximately 21.7 inches for a 60-year period of record.

Long-term hydrology data reveal a wide variation in the annual total rainfall. Like streamflow, precipitation records are available from 1879 to the present. The streamflow and precipitation data sets were used in the State of the Basin report to describe the long-term climatic trends and to evaluate the hydrologic parameters used in the PVIGSM. Figure 2-4 shows that the annual precipitation values at the Watsonville precipitation gage vary significantly from year to year.

Figure 2-4: Annual Rainfall in Watsonville, CA



Source: USGS website, http://www.usgs.gov

The model includes data from five rainfall monitoring stations and four streamflow gauging stations. Figure 2-4 indicates that the hydrologic period 1964–75 was relatively normal, followed by the 1976-77 drought. The 1978–81 hydrology appears to be normal, while the 1982–86 hydrology appears to be above normal. The period 1987–92 was dry and the basin was undergoing an extended drought of approximately similar magnitude to the 1976–77 drought, but longer in duration.

2.3.3 Basin Recharge

The primary sources of recharge to the Pajaro Valley groundwater basin are 1) infiltration of rainfall, 2) seepage of streamflow from the Pajaro River and its tributaries, and 3) percolation of irrigation water. The variation in precipitation and streamflow influences how and when the Pajaro Valley groundwater basin is recharged. Groundwater recharge in winter is the result of complex interactions between soils, geology, land cover, land slope, land use, and other physical conditions.

Early season rains and crop irrigation saturate the soil with water, making late-season storms more effective in recharging groundwater supplies. Generally, mild storms of extended duration or relatively frequent storms provide the greatest opportunity for groundwater recharge. Conversely, intense or infrequent storms do little to recharge groundwater. Intense storms result in high runoff while infrequent, widely distributed storms are utilized by native vegetation and soils do not become saturated, preventing deep percolation into the aquifers.

Because Pajaro River and other local streamflows are not regulated, the majority of groundwater recharge associated with streamflow typically occurs only during the winter or when streams are flowing. Runoff from a large storm event can flow through the Pajaro River and its tributaries relatively quickly, limiting the opportunity for groundwater recharge.

Although there is a large amount of groundwater storage in the Pajaro Valley groundwater basin, the amount of water that can recharge the aquifer is limited by the Valley's geologic conditions. Even in very wet years, the Pajaro River and creeks such as the Corralitos and Salsipuedes provide only a limited percentage of water to groundwater storage in the basin because of the presence of the clay layers. Recharge to the aquifers beneath the clay layers generally takes place in the eastern portions of the Basin, where clay layers are not so prominent.

2.3.4 Modeling Approach and Results

In order to define the present state of the basin, a long-term hydrologic period that contains a sequence of various rainfall conditions is required. This provides a good basis to evaluate the state of the basin during critical drought conditions, when water supplies are stressed to the limit, as well as wet conditions, when water supplies are more available and may operate under less stressful conditions.

The hydrologic period used for PVIGSM model calibration was 1964 – 1997. This hydrologic period was selected due to the availability of a complete set of data, including rainfall, streamflow, groundwater level, and cropping/land use data. Although hydrologic data are available after 1997, 1997 is the latest year that complete land use and cropping information are available. This hydrologic period contains a reasonable distribution of normal, above normal, and below normal conditions. This same hydrologic period was also used to evaluate current conditions, referred to as baseline conditions, and the effects of alternative management and project strategies on the groundwater system. The model runs for these evaluations are initiated with the existing conditions, and the 1964 – 1997 monthly hydrologic cycle is repeated once to create a 68-year hydrologic record for use in evaluating project scenarios.

Although the model period is represented by the 1964 to 1997 hydrologic data, the PVWMA is able to extrapolate the model results to provide estimates of water use for water years 1998, 1999, and 2000. Such extrapolations of the model results assume the cropping and land use, as well as cultural practices such as irrigation efficiencies and numbers of crop rotations, are the same as was experienced in 1997.

2.3.5 Key Points

Key points of this section include:

- Primary sources of recharge to the Pajaro Valley groundwater basin are: 1) infiltration from rainfall, 2) seepage of streamflow from the Pajaro River and its tributaries, and 3) percolation of irrigation water.

- The Pajaro River is the most substantial source of surface inflow to the Pajaro Valley groundwater basin.

- The period of rainfall data used to calibrate the model was 1964 to 1997 because this period contained a representative distribution of normal, wet, and dry years.

- The mean annual precipitation within the Pajaro Valley varies significantly with location. Areas near the coast receive notably less rainfall than inland areas near the mountains.

2.4 Basin Groundwater Levels

This section describes the groundwater levels of the Pajaro Valley groundwater basin, building on discussions of geology, hydrology, and water use in the preceding sections. Information on long-term and recent groundwater levels simulated in the PVIGSM is confirmed with water-level data from the PVWMA database. The groundwater levels are used to describe patterns of groundwater flow, changes in groundwater storage, and the potential for seawater intrusion in the Pajaro Valley aquifers.

2.4.1 Background Groundwater Level Information

Groundwater levels in the basin vary annually depending on weather conditions, recharge, groundwater pumping, and other factors. However, the Pajaro Valley groundwater levels have generally been in a decreasing trend due to excessive groundwater pumping. The decrease in groundwater levels is not uniform since hydrologic conditions and other factors affect groundwater levels. This is confirmed by existing well data maintained by the PVWMA.

Historically, groundwater levels were higher than today in inland areas, and artesian conditions existed at the coast. That is, groundwater levels were high enough in past years that groundwater surfaced in some of the coastal areas. Under such conditions seawater intrusion was prevented. By the 1940s, following the major development of groundwater resources to support a growing agricultural industry, some wells were still artesian, but only during winter months. By the 1970s, water levels west of Watsonville were consistently below sea level from approximately May to December, often never recovering to levels above sea level, once again documenting the conditions necessary for the occurrence of seawater intrusion.

The trend has been for water to move from the unconfined recharge areas near the Agency's northern boundary, east of Watsonville, and north Monterey County, toward the large pumping trough that forms in the center of the valley near Watsonville, or toward the coast at the north end of the basin. In the south, water typically moves from north Monterey County northeastward toward Pajaro Valley and westward toward the coast. In the northern part of Pajaro Valley, water moves southeast from the Soquel/Aptos area into the north part of the Pajaro Valley area, then south toward Watsonville and southwest toward Monterey Bay.

Unfortunately, the trend has also been for a significant flow, over the entire observed period, of seawater from the ocean toward the inland pumping trough that forms in the center of the valley.

2.4.2 Modeling Approach and Results

Well log data was used to create contour maps of simulated groundwater levels. Groundwater level contours for fall 1987, 1992, and 1998 are shown in Figure 2-5; a contour elevation of 0 indicates mean sea level. All three of these contour maps show a trough of low water levels extending from the coast, inland to the mountains, centered on the Pajaro River channel. The groundwater levels in the southeast region of the Basin decreased significantly between 1987 and 1998. Comparing these contour maps indicates that the zones of suppressed groundwater levels have generally expanded.

2.4.3 Key Points

Key points of this section include:

- Groundwater levels in inland wells are declining over time, indicating that more water is removed annually from the basin than is replaced.
- Declining groundwater levels is a recent trend. Historically, coastal areas of the Pajaro Valley were artesian and inland areas maintained higher groundwater levels.
- Well data indicate depressed groundwater levels are expanding in the Pajaro Valley groundwater aquifers and regularly fall below sea level, resulting in seawater intrusion.
- Current wells levels at the coast are consistent with historic levels, but water in many wells is becoming increasingly salty due to seawater intrusion.

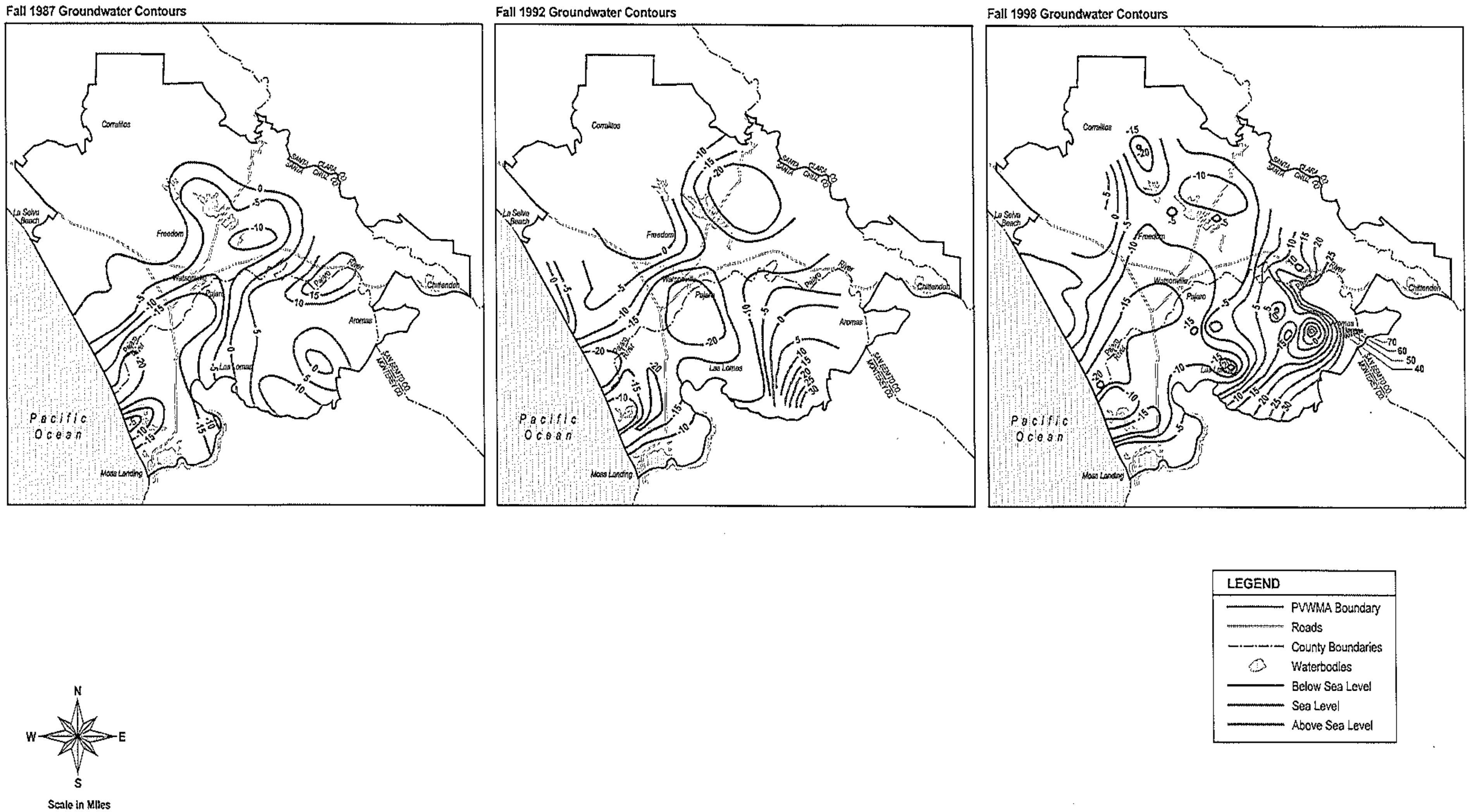


Figure 2-5: Groundwater Levels in the Pajaro Valley

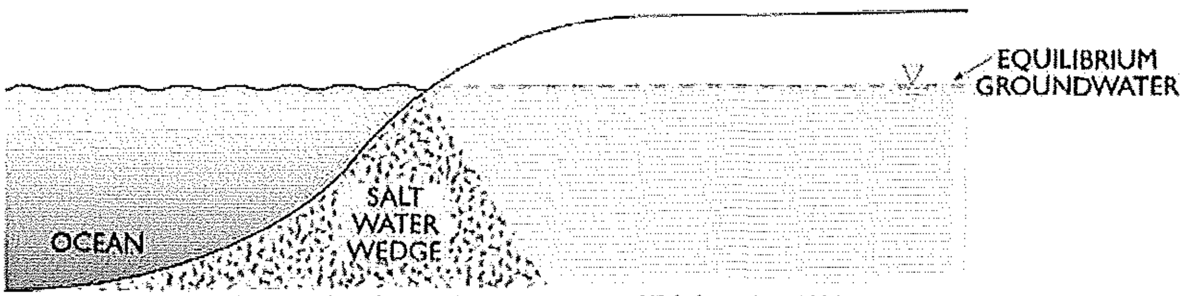
2.5 Seawater Intrusion

This section presents an introduction to the principles of seawater intrusion and their relevance to the Pajaro Valley.

2.5.1 Principles of Seawater Intrusion

When groundwater levels near the coast fall below mean sea level, there is a natural physical tendency for seawater to penetrate into the groundwater basin. The ocean pushes the more dense seawater inland to raise the water table until it is equal to mean sea level. This is depicted in Figure 2-6.

Figure 2-6: Seawater Intrusion



Note: Modified from Environmental Engineering by Peavy, Rowe, and Tchobanoglous 1985.

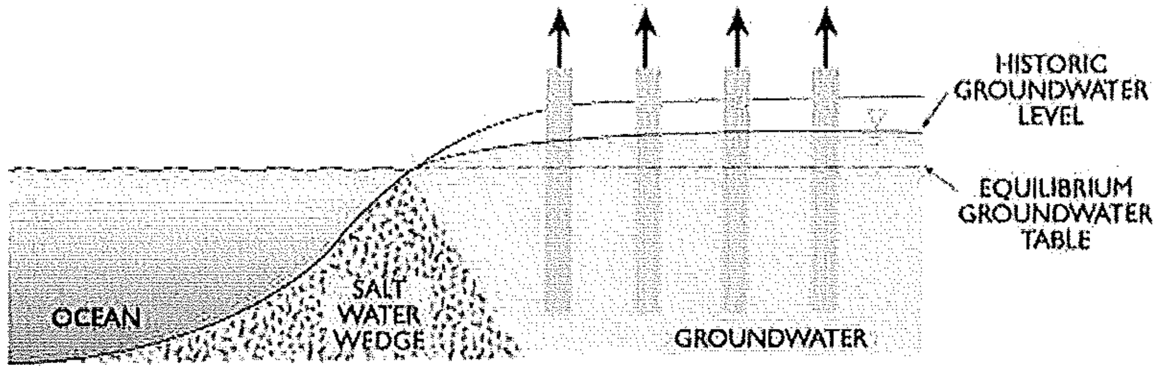
Groundwater pumping in excess of groundwater recharge can enhance this natural tendency. As seawater encroaches into the fresh groundwater basin, water quality is degraded and wells have to be abandoned. This is depicted in Figure 2-7. If fresh water is not available for recharge, or if the groundwater table is reduced to elevations below sea level, seawater will be drawn inland until equilibrium is restored. Unlike freshwater levels in the groundwater basin that vary with the season and climatic trends, the ocean is a constant source of recharge and the elevation varies only marginally with the tide. When inland pumping causes the water level to drop (see Figure 2-7a), pressure throughout the aquifer decreases (see Figure 2-7b) and equilibrium is restored via seawater intrusion (see Figure 2-7c). Thus, pumping throughout the basin causes seawater intrusion along the coast.

2.5.2 Seawater Intrusion in the Pajaro Valley

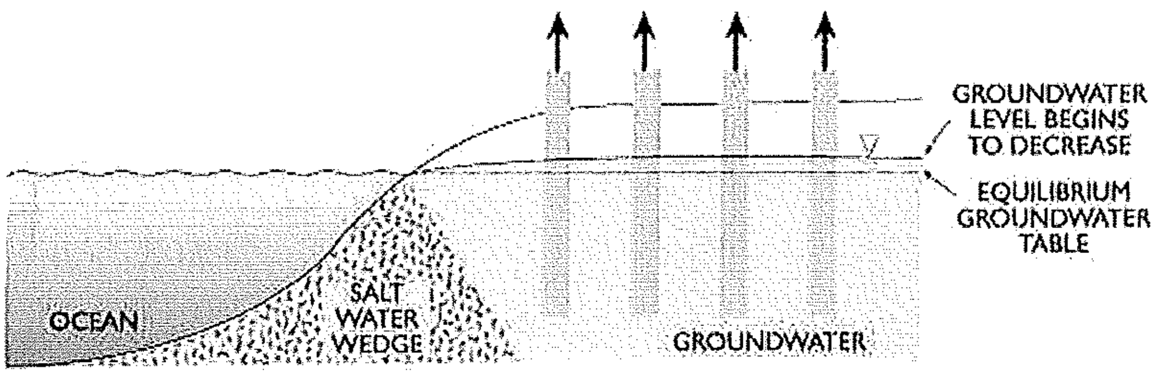
The Pajaro Valley groundwater basin includes confined and unconfined aquifers and semi-confined transition zones between the two, as described in the basin geology section. In the Pajaro Valley, groundwater levels and pressure in confined aquifers is influenced both by the ocean and by the groundwater level in inland areas. The Pajaro Valley groundwater basin is connected to the ocean, and there are no seismic faults or barriers to prevent seawater intrusion.

The average concentration of chloride in seawater is 19,000 mg/L. Chloride levels exceeding 142 mg/L will likely result in increasing problems for agricultural irrigation (California Regional Water Quality Control Board, 1995). Increasing chloride concentration in groundwater well samples is an indication of seawater intrusion. Chloride is useful for monitoring seawater intrusion because it is chemically stable

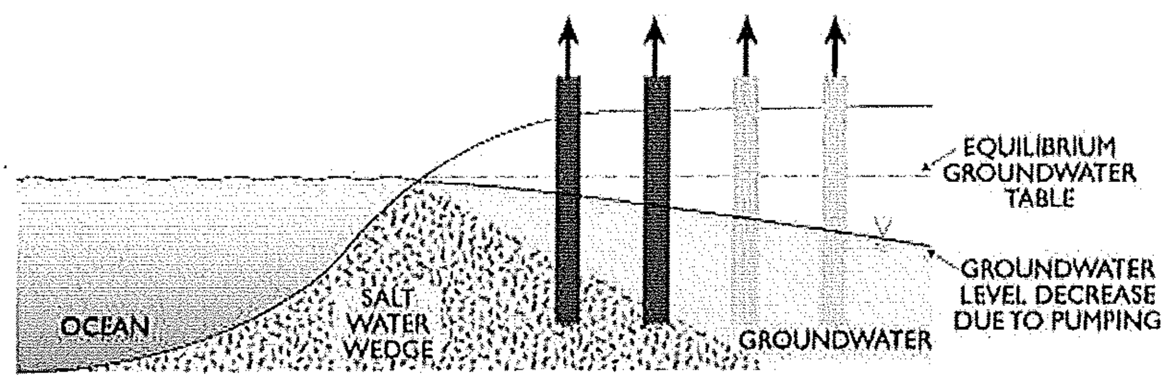
Figure 2-7: Seawater Intrusion Equilibrium



a) Historic Conditions: groundwater levels above equilibrium level. No wells and no seawater intrusion.



b) Initial stage: excessive pumping results in long-term decreases in groundwater levels. Wells are not yet impacted by seawater intrusion.



c) Current stage: continued pumping above sustainable yield decrease groundwater levels and the salt wedge expands inland trying to reach equilibrium. Wells closest to coast are impacted by seawater intrusion.

and moves at the same rate as the intruding water. The horizontal migration of seawater occurs slowly over time as seawater mixes with the fresh water as it moves inland. Initially, chloride concentrations increase gradually. However, as the bulk of the seawater plume moves inland, chloride concentrations can rise rapidly. Other chemical changes also occur over this mixing zone, and can assist in interpreting the sources of the observed chlorides. Based on background chloride concentrations in groundwater from inland groundwater recharge areas, it has been determined that chloride levels exceeding 100 mg/L in coastal wells indicate seawater intrusion (U.S. Geological Survey, 1974).

Well data from 1998 generally indicate that inland seawater intrusion is more extensive than previously reported. In the La Selva Beach area, the size of the existing intruded area has tripled compared to conditions in late 1979. The intruded area extends approximately 0.75 miles inland and is 2 miles wide. The intrusion zone near the mouth of the Pajaro River extends inland approximately 1.5 miles and is approximately 3 miles wide. Figure 2-8 shows the coastal area that has been impacted by seawater intrusion, along with the changes in chloride concentrations versus time for selected wells.

A number of deeper wells have shown substantial increases in chloride concentrations in recent years indicating that the volume of fresh water displaced in the intruded area is increasing. Chloride levels are generally highest in the deeper confined aquifers consisting of Aromas Sand and the Purisima, with values ranging from 200 to 8,500 mg/L. In contrast, shallow wells tend to have lower chloride levels (50 to 500 mg/L), and a number of neighboring shallow wells show marked differences in chloride levels.

The data indicate that seawater is intruding along the coast in the middle and lower portions of the Aromas sands and that poor-quality water is present in the deeper zones. This implies that as intrusion moves inland and wells are lost to seawater impacts, the option of drilling deeper for better water is probably not a viable option.

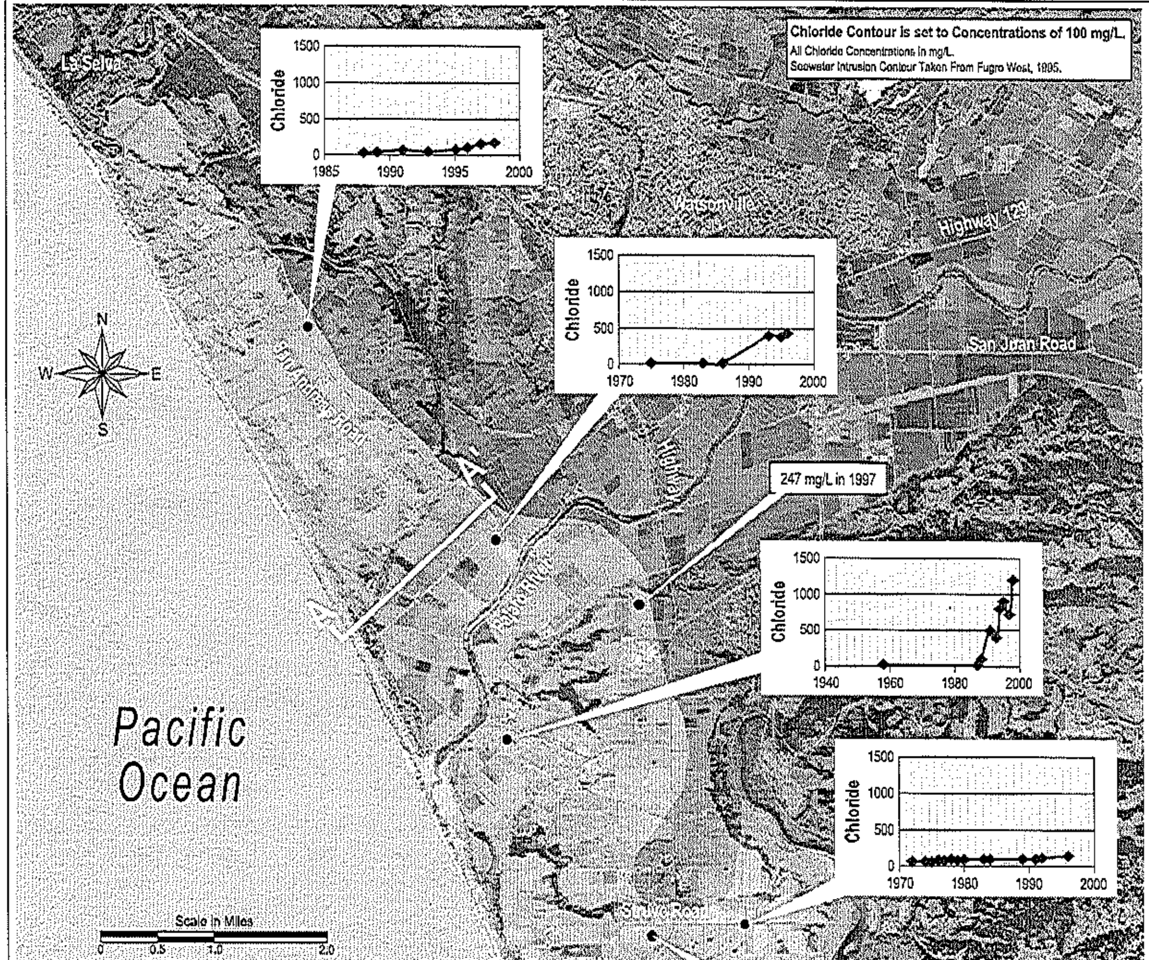
Water quality impacts due to seawater intrusion and other groundwater contaminants are discussed in Section 2.9.

2.5.3 Key Points

Key points of this section include:

- In those areas that have relatively stable water levels, the stability is provided in part by seawater intrusion, the inland migration of seawater that replaces freshwater. The relative stability of the groundwater levels near the coast masks the overdraft conditions.

- The chloride levels in groundwater wells indicate the extent of seawater intrusion in the Pajaro Valley groundwater basin is expanding.

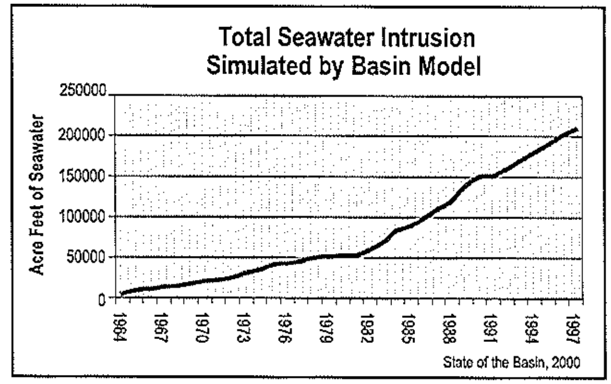


PVWMA Monitoring	Wells	Chloride Concentration (mg/l)		
Period	Well Count	Average Minimum	Average	Average Maximum
Predrought	166	60	70	80
Drought	186	330	420	500
Postdrought	198	370	450	550

Taken From State of the Basin, PVWMA, 2000

Source: Modified from PVWMA, July 2001.

Summary of Seawater Intrusion Within PVWMA Boundaries



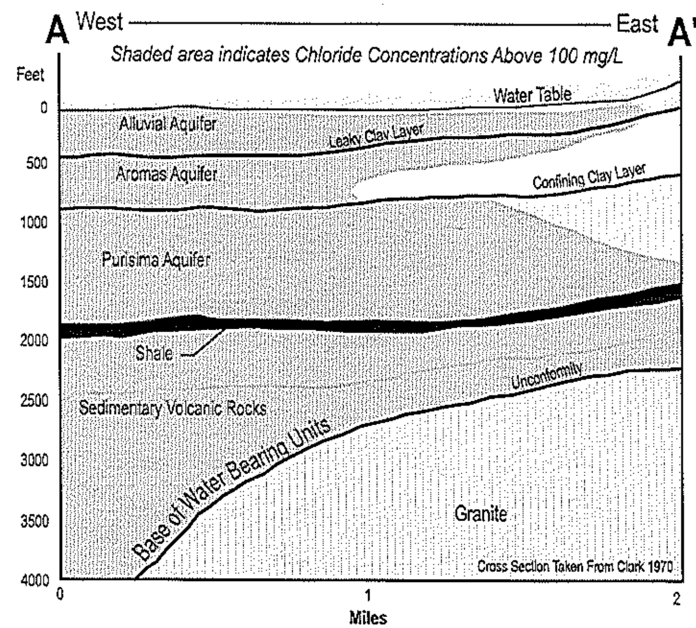


Figure 2-8: Location of Area Impacted by Seawater Intrusion

2.6 Land Use

The primary land uses within the Pajaro Valley are agricultural, native vegetation, native riparian and urban land uses such as commercial, industrial, and residential. Native vegetation and agricultural land are the major designations throughout the basin, while urban use is primarily located within or adjacent to the City of Watsonville.

2.6.1 Historic Land Use

The Department of Water Resources (DWR) conducts land use surveys for all California counties. Surveys are typically performed approximately every seven years and consist of aerial surveys followed by field verification. Data from these surveys were collected for Monterey and Santa Cruz Counties for 1966, 1975, 1982, 1989, and 1997. Data within the PVWMA boundary are presented in Table 2-2.

Table 2-2: Summary of Land Use (Model Area)

Land Use Type	Acreage				
	1966	1975	1982	1989	1997
Total Agricultural Acreage	30,448	33,409	31,516	34,463	34,650
Urban Acreage	4,757	6,688	8,018	8,384	12,860
Native Vegetation	61,301	56,409	56,972	53,659	48,996

Source: Modified from PVIGSM Technical Memoranda (Montgomery Watson/AT Associates, 1999-2000).
Note: Acreages shown are for modeled area, which is greater than the PVWMA service area. In 1997, approximately 30,200 acres of irrigated agricultural land were within the PVWMA service area.

Historic Urban Land Use:

Urban land use increases shown in Table 2-2 have generally resulted from the conversion of native vegetation land, not agricultural land. As shown, urban land use increases consistently from only 4,800 acres in 1966 to nearly 12,900 acres in 1997. This increase reflects general population growth trends throughout the State of California over the last several decades.

Historic Agricultural Land Use:

DWR land use data were analyzed to determine historical land use changes in the basin. As shown in Table 2-2, between 1966 and 1975, agricultural land use increased by approximately 3,000 acres in the Pajaro Basin area. From 1975 to 1989, agricultural land use in the Basin increased by approximately 1,100 acres. However, from 1989 to 1997, agricultural land use in the Pajaro Basin increased by less than 200 acres (Montgomery Watson/AT Associates, 1999-2000).

An understanding of the historical land use conditions and cropping patterns is necessary to develop an understanding of the historic water use patterns. These data are also utilized to develop and calibrate the PVIGSM. Table 2-3 shows how total acreage breaks down by crop type, and the changes in crop types planted in the Pajaro Valley Model Area over the last 30 years. Since the PVIGSM requires crop mix acreage for each year of the historic record utilized in the model, the annual crop mix acreage has been estimated by linear interpolation between each survey year.

Table 2-3: Summary of Agricultural Land Use (Model Area)

Crop Type	Acreage				
	1966	**1975**	**1982**	**1989**	**1997**
Strawberry	1,754	4,372	5,974	6,514	7,004
Irrigated Fallow	4,384	3,911	3,133	3,906	4,182
Vine (bushberries, grape, etc)	22	0	505	1,512	1,652
Vegetable Row Crops	14,612	13,038	10,442	13,020	13,940
Field Crops	647	1,170	1,724	908	644
Deciduous	7,516	8,578	7,434	5,729	3,892
Pasture	1,175	1,780	1,004	894	1,227
Nursery	237	392	910	1,386	1,476
Nursery-indoor	101	168	390	594	633
Total Agricultural Acreage	**30,448**	**33,409**	**31,516**	**34,463**	**34,650**

Source: Modified from PVIGSM Technical Memoranda (Montgomery Watson/AT Associates, 1999-2000).
Note: Acreages shown are for modeled area, which is greater than the PVWMA service area. In 1997, approximately 30,200 acres of irrigated agricultural land were within the PVWMA service area.

2.6.2 Current Land Use

Land use within the Pajaro Valley is primarily agricultural. Figure 2-9 shows the 1997 breakdown for the land uses within the PVWMA service area. The 1997 data were used as input parameters for the PVIGSM Baseline Conditions.

2.6.3 Future Land Use

Future land use in the PVMWA service area is under the jurisdiction of County and City planning documents. The adopted Santa Cruz County General Plan, Local Coastal Plan, and the City of Watsonville General Plan presents limited information on the future land use within the PVMWA area. The Monterey County General Plan expired in 2000, and is presently being updated. Regions of native vegetation are potential areas for urban or agriculture development. According to topographic maps, a majority of the designated native vegetation areas include steep sloped terrain, which is likely to be unsuitable for agriculture.

Future Urban Land Use:

As shown in Table 2-2, urban land use in the Pajaro Valley has increased from approximately 4,800 acres in 1966 to 12,900 acres in 1997. Native vegetation, however, still remains the predominant land use, and the amount of native vegetation represents potential land for urban build-out, except as constrained by the General Plans of Monterey, Santa Cruz and San Benito Counties, and the City of Watsonville. Additionally, agricultural land could be rezoned for urban development. However, considering current policies to protect agricultural land it is assumed that minimal agricultural acreage would be rezoned to urban land use.

Urban population growth will affect the Pajaro Valley by causing the conversion of more native vegetation to urban land (new development) and/or by increasing population density on existing urban land (infill). While studies have been undertaken to project the urban population of the Pajaro Valley in the future, it is undetermined whether the majority of the growth will be infill or new development. Without this correlation between population growth and urban land use increase, and in the absence of an updated General Plan for Monterey County, a projected urban land use cannot be determined. Population studies are discussed in Section 2.7.3 "Future Water Use."

Figure 2-9. Land Use in the PVWMA Service Area

Future Agricultural Land Use:

Based on the historic data in Table 2-3 and Section 2.6.1, the total agricultural land area has remained relatively constant from 1989 onward. For the purposes of land use projections, it is assumed that agricultural land use will remain constant. However, there have been significant shifts in the types of crops grown in the valley. Most apparent are the increases in nursery, strawberry, and vine crops. Detailed economic and marketing surveys have not been conducted and therefore it is not certain whether the shift to high water use crops will continue. For the purposes of the Revised BMP, it is assumed that approximately 2,000 acres of deciduous crops will be converted to berry crops by 2040, equally distributed between strawberry and raspberry crops.

2.6.4 Key Points

- Land use surveys indicate that both agricultural and urban land use increased significantly in the past 30 years.
- Agricultural development has leveled off in recent years, but urban acreage has increased.
- Urban development has come primarily from conversion of native vegetation land, with a small increase due to conversion of agricultural land. However, future urban growth due to conversion of agricultural land is expected to be low.
- Over the past three decades, there has been a shift in the agricultural crop mixes planted in the Pajaro Valley. There has been a general increasing trend in growing strawberries, vines, and bushberries (all relatively high users of water), with a corresponding decrease in deciduous crops.

2.7 Water Use

The purpose of this section is to describe the methodology used for estimating the amount and location of current and projected water use. There are two main categories of water use. Agricultural water use consists of irrigation water only. Urban water use, for the purposes of this document, includes all household water consumption as well as commercial and industrial water use. Because agriculture is the main source of livelihood within the Pajaro Valley, commercial and industrial water use is relatively low. Therefore, urban water use is considered to be a function of population.

2.7.1 Historic Water Use

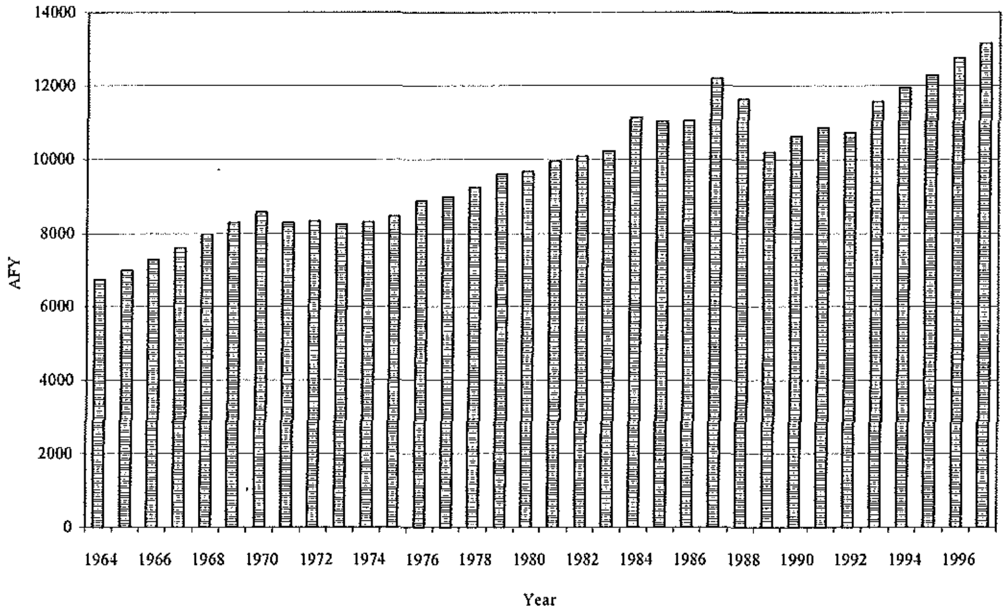
The water use within the PVWMA service area is made up of both urban and agricultural water use. Historic urban water use is based heavily on historic data, while historic agricultural water use is based on PVIGSM model simulations.

Historic Urban Water Use:

The urban water use in the Pajaro Valley consists of the municipal, commercial, and industrial water use within the City of Watsonville service area and the unincorporated and rural areas (i.e. all non-agricultural water use).

The urban water use estimates are taken from City of Watsonville groundwater production records plus *historic urban acreage multiplied by average water duties for unincorporated areas. Figure 2-10 is a plot* of historic urban water use, indicating a steady increase from approximately 7,000 AF in 1964 to an estimated 13,000 AF in 1997, an increase of approximately 86 percent over 34 years.

Figure 2-10: Pajaro Valley Historic Urban Water Use



Source: Modified from PVIGSM Technical Memoranda, Montgomery Watson/AT Associates, 1999-2000.

Historic Agricultural Water Use:

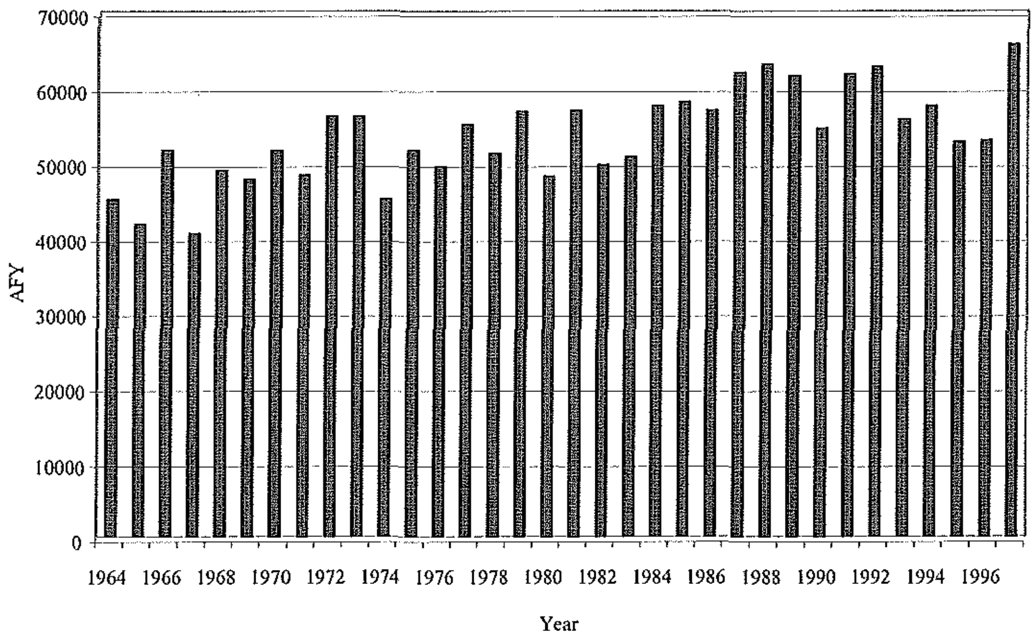
In the past, it was not required that wells in the PVWMA service area be metered. A metering program was established by the PVWMA in 1993, with actual metering being initiated in 1995. Since historical groundwater pumping records from the metering program are not available prior to 1995, the PVIGSM was used to estimate historic agricultural water use. In order to simulate water use patterns, historic crop type data were collected from the DWR crop surveys for the PVIGSM model area. Each agricultural acre was assigned a total demand based upon the approximate water application rates for its crop type, from low water use for deciduous crops to high water use for berry crops.

Water use factors were estimated by the consumptive use methodology. This method uses irrigated acreage, effective rainfall, minimum soil moisture, crop evapotranspiration, irrigation efficiency, cultural practices, and marketing factors to estimate the agricultural water use requirements. The crop water use factors were applied to the historic land use and cropping acreages to estimate the historic annual agricultural demand for the model period.

The model was then run with current (1997) cropping and irrigation patterns and historic hydrologic data records. The location, capacity, and depth of agricultural production wells were also simulated in the model based on the cropping patterns and geology described in the previous sections and from PVWMA well information. Figure 2-11 shows the model-simulated annual variation of the agricultural water pumped during the historic hydrologic period of 1964-97.

As indicated in the figure, there has been an increasing trend in the agricultural water use estimates, due to the buildup in the irrigated acreage and crop changes. The agricultural water use is estimated to have been approximately 45,000 AF in 1964, and 66,000 AF in 1997. A shift in the cropping patterns is likely the primary cause for the increase in groundwater use, but higher irrigation efficiencies and increasing awareness of conservation programs have helped to reduce the unit water use during recent years. The net effect, however, has been an increase in the volume of groundwater being pumped for irrigation purposes.

Figure 2-11: Pajaro Valley Historic Annual Agricultural Water Use



Source: Modified from PVIGSM Technical Memoranda, Montgomery Watson/AT Associates, 1999-2000.

2.7.2 Current Water Use

With the exception of approximately 1,000 AFY of surface water diversion by farmers and 1,100 AFY of surface water diversion at the Corralitos Creek Filter Plant (1997-2000 average) for City of Watsonville water users, the water needs of the Pajaro Valley are met by groundwater pumping. Estimated average current water use is within the PVWMA service area is approximately 71,500 AFY.

Current Urban Water Use:

Current urban water use is assumed to be consistent with recent estimates. The urban water use for the baseline condition is based on the monthly average urban water use during the 1994 – 97 hydrologic period (see Figure 2-10). The baseline urban water use is estimated to be approximately 12,200 AFY.

Current Agricultural Water Use:

The agricultural water use for the baseline condition was determined by a method similar to that used for historic estimations. Existing land use patterns and cultural practices such as crop rotations and conservation practices were held constant. The historic hydrologic data were used in the model to determine how much of the agricultural water demand was provided by the natural hydrologic cycle and how much groundwater pumping would have been required to meet the crop water needs. This analysis forms the basis for understanding the agricultural water pumping required for existing cropping patterns, assuming a replication of historic hydrologic conditions. The selected hydrologic data set accounts for average, wet, and dry years, as discussed in Section 2.7.1. The average water use resulting from this simulation, 59,300 AFY, is the baseline agricultural water use in the PVIGSM model.

2.7.3 Future Water Use

Future water use was determined based on available and adopted land use data, historic trends, and growth projections. All water use was projected to the year 2040.

Future Urban Water Use:

Future urban water use was estimated on the basis of population projections. The PVWMA service area population is largely concentrated in the City of Watsonville, which had a 2000 population of 44,300 (U.S. Census Bureau website). Unincorporated areas of the PVWMA service area include the communities of Pajaro, Aromas, Freedom, Corralitos, and Los Lomas. These unincorporated communities have a combined estimated 2000 population of 38,700 (Montgomery Watson, November 1993). Hence, the total population in the PVWMA service area was estimated to be 82,900 in 2000.

The PVWMA service area spans parts of Monterey and Santa Cruz counties. County General Plans are the preferred source for population projections. However, it is difficult to use these as a source of population projections for the Pajaro Valley. The Monterey County General Plan was last updated in 1982 and contained population projections through the year 2000, whereas the Santa Cruz County General Plan was last updated in 1994 and only included population estimates through 1995. Given the above-described shortcomings in the General Plans, population was projected using Association of Monterey Bay Area Governments (AMBAG) projections. AMBAG projects population to 2020 for urban centers, including Watsonville. Although the 2000 AMBAG population for the City of Watsonville is a forecast from 1997, it is very close to the actual 2000 Census data.

Table 2-4 shows the method by which PVWMA population was projected to the year 2040. The baseline urban population described above (82,900) was projected forward using the percent growth estimated by AMBAG for Watsonville. The PVWMA growth rate from 2000 to 2005 was assumed to be consistent with AMBAG 2005 to 2010 estimates as AMBAG population projections for 2005 to 2010 included annexation of lands by the City of Watsonville. The growth rate from 2020 to 2040 was assumed to remain consistent with the AMBAG projected growth from 2015 to 2020. According to the analysis, the total urban population could increase by approximately 49 percent to 109,600 people in 2040. However, this does not consider potential PVWMA measures, such as water pricing, which could limit urban growth through economic pressure.

Although future population increases will be guided by adopted land use, potential future urban water use was determined as a function of future urban population. The existing Pajaro Valley population (82,900) and the existing urban water use (12,200 AFY) yield a water use of 131 gpd per capita[1]. Using this water use estimate, a projected population of 109,600 people in 2040 could result in an urban water use of approximately 16,100 AFY, which is an increase of 3,900 AFY.

[1] 131 gpd per capita is an equivalent per person water use including commercial and industrial use. Future projections using this value assume that commercial and industrial water use is scaled uniformly with population growth.

Table 2-4: PVWMA Population Projections and Urban Water Use

Year	AMBAG Watsonville[a]	PVWMA Population[b,c,d]	Urban Water Use[e]
2000	43,620	82,921	**12,200**
2005	50,495	85,197	12,535
2010	51,881	87,536	12,879
2015	53,816	90,800	13,359
2020	55,875	94,274	13,870
2025	No data	97,881	14,401
2030	No data	101,626	14,952
2035	No data	105,514	15,524
2040	No data	109,551	**16,118**

Footnotes:

a. Watsonville population projections taken from AMBAG website: http://www.ambag.org/popchart.html

b. The annual growth rate was calculated based on AMBAG projections and applied to the projected PVWMA population. Growth rate for 2020 to 2040 was assumed to be equivalent to the change from 2015 to 2020.

c. The year 2000 PVWMA population estimate was based on 2000 Census Data from the U.S. Census Bureau and estimated population of unincorporated areas from the 1993 Basin Management Plan (Montgomery Watson, 1993).

d. The relatively large increase in AMBAG population estimate from 2000 to 2005 is a result of annexed areas by the City of Watsonville. Therefore the 5-year growth rate of the PVWMA population from 2000 to 2005 was estimated according to the AMBAG 2005 to 2010 growth rate.

e. Urban water use factor of 131 gpd per capita was used to determine urban water use.

Future Agricultural Water Use:

Future agricultural water use was determined based upon the projected future agricultural land use as described in Section 2.6.3. As stated previously, this Revised BMP assumes that approximately 2,000 acres of deciduous crops will be converted to berry crops by 2040. The water demands for these crops are higher, approximately 2.8 AF/acre for strawberries and 3.7 AF/acre for raspberries, compared to approximately 0.7 AF/acre for deciduous crops (Bogenholm, 1998). Assuming conversion of 1,000 acres each to strawberry and raspberry crops, a 5,100 AFY increase in water use is estimated based on water application rates for these crops. On this basis, the projected agricultural water demand within PVWMA's service area increases from 59,300 AFY to 64,400 AFY by 2040. The impact of demand management measures on agricultural water use is discussed in Section 3.1.

2.7.4 Key Points

Key points of this section are summarized in Table 2-5.

Table 2-5: Current and Future Water Demand and Groundwater Pumping

Water Usage	Current Demand (AFY)	2040 Demand (AFY)
Agricultural	59,300	64,400
Urban	12,200	16,100
Total Demand	**71,500**	**80,500**
Corralitos Filter Plant	(1,100)	(1,100)
Other Surface Water Diversions	(1,000)	(1,000)
Total Groundwater Pumping[a]	**69,000 (rounded)**	**78,000 (rounded)**

Footnotes:

a. Total Groundwater Pumping values are rounded to two significant figures or to the nearest thousand to represent significant accuracy.

- Water use in the PVWMA area is expected to increase by 9,000 AFY by 2040. This is a significant increase considering the current basin imbalance and water issues. Even if future water use were to increase by only half of this projection, the PVMWA would still face a significant increase of 4,500 AFY.

- The Pajaro groundwater basin extends beyond the PVMWA boundary and is a shared basin with other local water agencies. Therefore, PVWMA groundwater supply is impacted by water use outside of the PVMWA boundary but within the Pajaro groundwater basin. The Soquel Creek Water District is once such agency that draws water from the Pajaro groundwater basin. Therefore, increases in groundwater pumping by the Soquel Creek Water District could impact the PVWMA groundwater supply.

2.8 Basin Sustainable Yield

Previous sections described the current and historical conditions in the Pajaro Valley groundwater basin and how the basin operates as an integrated system that includes geology, hydrology, and groundwater. Building on those basin conditions, this section presents results of the PVIGSM analysis of the basin sustainable yield, also referred to as "safe yield." Basin sustainable yield is defined as the long-term amount of groundwater, which can be extracted from the aquifer system without causing an adverse impact on the quantity and/or quality of the groundwater basin.

2.8.1 Discussion

The available data and technical analyses presented in previous sections confirm that suppressed groundwater levels and seawater intrusion have adversely impacted the quantity and quality of Pajaro Valley groundwater. Therefore, the sustainable yield of the Pajaro Valley groundwater basin must not only balance supply with demand, but must also eliminate seawater intrusion and long-term decreases in groundwater levels.

2.8.2 Determination of Sustainable Yield

Yield with Current Pumping Practices:

Modeling has shown that seawater intrusion is not uniform and that some areas along the coast are more impacted than others. These results indicate that, under current pumping practices, a 65 percent reduction in basin-wide groundwater pumping (45,000 AFY) is necessary to eliminate seawater intrusion throughout the coastal area. This pumping reduction would also cause groundwater levels to rise throughout the basin. Therefore, with basin-wide pumping reductions, the sustainable yield of the groundwater basin is approximately 24,000 AFY (69,000 – 45,000 AFY). This yield is only one third of the current average annual demand on groundwater supplies.

Yield with Modified Pumping Practices and Dependable Supplemental Supplies:

The PVIGSM was also used to investigate how pumping patterns could be modified to increase the sustainable yield of the basin. One alternative evaluated by the model was the elimination of coastal pumping. In this coastal scenario, the same volume of groundwater is extracted as with the basin-wide reduction scenario, but all pumping would be eliminated at the coast. Without pumping at the coast, recharge would eventually restore the groundwater table to its equilibrium at mean sea level, between the inland pumping zone and Monterey Bay.

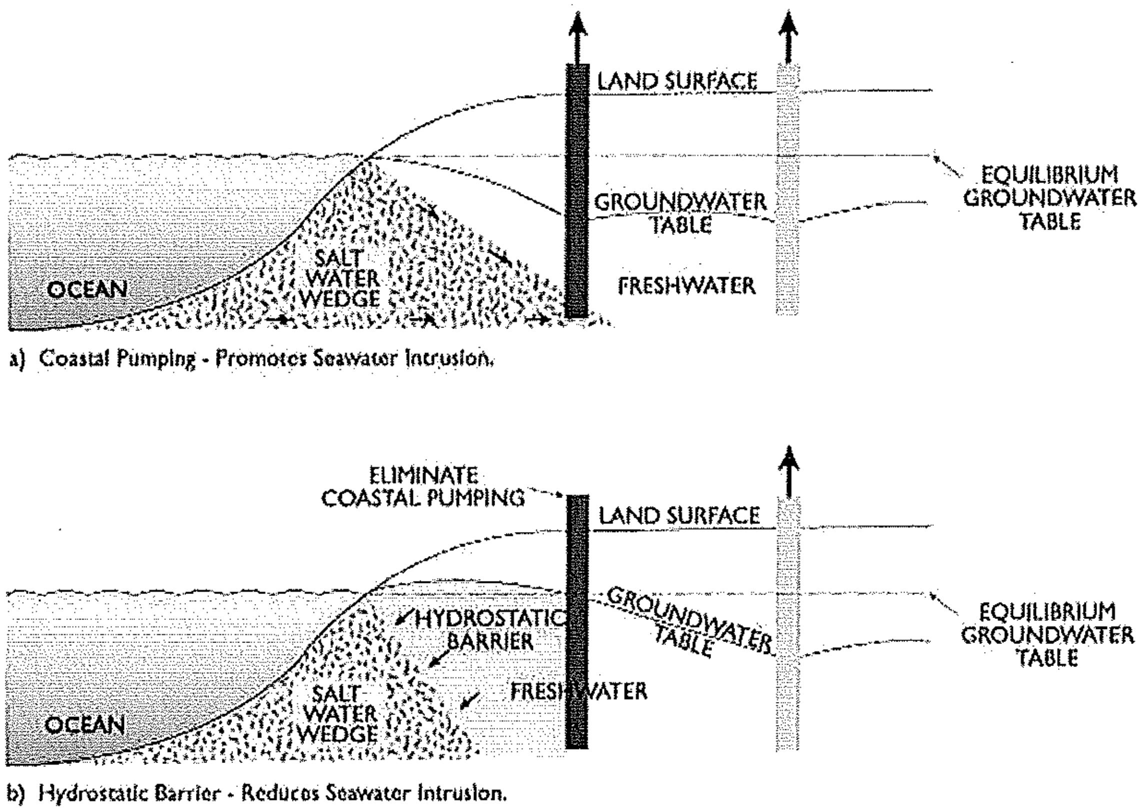
The presence of the hydrostatic barrier, as shown in Figure 2-12 (b), reduces seawater intrusion. This barrier would also result in an overall increase in the basin sustainable yield to 48,000 AFY, if a 100% dependable supplemental water supply is used to meet water demand. Should highly variable sources be used, sustainable yield would decrease because supplemental pumping would be required to provide reliability to users in dry weather years. Extremely dependable sources, on the other hand, will result in a higher basin sustainable yield because they minimize the need for supplemental pumping in dry weather years.

Recommended Pumping Practices:

Because the sustainable yield of the basin with the elimination of coastal pumping is double that of the basin-wide reduction scenario, this Revised BMP assumes that coastal pumping will be eliminated as part of the PVWMA Basin Management Strategy. However, this necessitates a supplemental water supply and the construction of a distribution network to supply coastal agricultural users with water. The supplemental water supply projects and coastal distribution system are discussed in Section 4.

With the current groundwater demand of 69,000 AFY and a basin sustainable yield of 48,000 AFY, 21,000 AFY would still be needed to balance the basin. With a projected future groundwater demand of 78,000 AFY, 30,000 AFY would still be needed to balance the basin. This is summarized in Table 2-6.

Figure 2-12: Seawater Intrusion with Coastal Versus Inland Pumping



Note: Modified from Environmental Engineering by Peavy, Rowe, and Tchobanoglous 1985.

2.8.3 Key Points

Key points of this section include:

- A 65% basin-wide pumping reduction would result in a sustainable yield of approximately 24,000 AFY. Eliminating groundwater pumping at the coast with 100% reliable supplemental supplies would result in a sustainable yield of approximately 48,000 AFY.
- This report assumes coastal pumping will be eliminated, and this necessitates a supplemental water supply and coastal distribution network.
- The current PVWMA groundwater pumping demand of 69,000 AFY requires additional supplies totaling 21,000 AFY. The projected demand for the year 2040 requires additional supplies totaling 30,000 AFY.

Table 2-6: Identification of Required Supplemental Supplies

Optimization Option	Current Conditions (AFY)	2040 Conditions (AFY)
Agricultural Demand	59,300	64,400
Urban Demand	12,200	16,100
Total Demand	**71,500**	**80,500**
Corralitos Filter Plant	(1,100)	(1,100)
Other Surface Water Diversions	(1,000)	(1,000)
Total Groundwater Pumping[a]	**69,000 (rounded)**	**78,000 (rounded)**
Basin Sustainable Yield with Coastal Pumping Reductions and Reliable Supplemental Supply[b]	(48,000)	(48,000)
Required Additional Supplies	**21,000**	**30,000**

Footnote:

a. Total Groundwater Pumping values are rounded to two significant figures or to the nearest thousand to represent significant accuracy.

b. This value represents a 100% reliable supplemental supply. If supplemental supply projects were hydrologically dependent, the basin sustainable yield would be less due to increased groundwater pumping during below normal water years.

2.9 Water Quality

Water resources in the Pajaro Valley include both surface waters and groundwater. Currently, groundwater is the predominant source for users. However, since surface waters are potential sources in the future, it is important to understand the current state of general water quality in the Basin.

2.9.1 Constituents of Concern

Previous studies and surveys have identified the following as primary parameters of concern for irrigation water quality in the Pajaro Valley (RMC, May, 2001):

- Nitrates;
- Salinity;
- Sodium;
- Toxicity from chloride and sodium; and
- Crop pathogens, primarily *Phytophthora*.

CCRWQCB Irrigation Water Quality Guidelines. The Central Coast Regional Water Quality Control Board (CCRWQCB) Basin Plan has developed water quality objectives for irrigation supplies. The guidelines for the parameters of concern are shown in Table 2-7.

Agricultural practices in the Pajaro Valley may diverge somewhat from these guidelines through the use of different indicators or slightly modified ranges of acceptability. Overall, however, the Pajaro Valley growers are in general agreement regarding the water quality required to sustain agricultural production in the Pajaro Valley. The following sections summarize the identified parameters of concern and associated adverse impacts, as they are relevant to the Pajaro Valley.

Nitrates. Nitrate contamination is a major concern in drinking water sources in the Pajaro Valley groundwater basin. Water high in nitrates is a threat to human and animal health, as it can cause acute illness and can have adverse long-term health impacts resulting from prolonged exposure. Nitrate is generally expressed as NO_3 (nitrate) or NO_3-N (nitrate-nitrogen). The EPA has set a Maximum Contaminant Level (MCL) at 10mg/l NO_3-N (EPA website). Because nitrates are contained in fertilizers in relatively high quantities and agriculture is the main source of livelihood in the Pajaro Valley, nitrates are routinely added to Basin soils. Nitrates are highly soluble and can easily leach into groundwater. They may also be found in surface waters due to agricultural runoff. The transport of nitrates in groundwater is generally limited by aquitards that separate the various aquifers.

Salinity. Electrical conductivity (EC_w) and total dissolved solids (TDS) are measures of the total salt content of the irrigation water. The salt tolerance of an agricultural crop is normally expressed as the decrease in yield associated with a given level of soil salinity. The University of California and others have studied crop salt tolerance and developed general relationships between irrigation water salinity, soil salinity and crop yield. In general, irrigation water with a salinity value of less than 500 mg/L TDS is the objective for delivery to local farmers. Some crops, such as strawberries, have a lower salt tolerance and may require additional on-site water management measures to reduce salinity-related crop impacts.

Table 2-7: CCRWQCB Irrigation Water Quality Guidelines

	Water Quality Guidelines			
Problem and Related Constituent	**Units**	**No Problem**	**Increasing Problems**	**Severe**
Salinity				
EC of irrigation water	mmho/cm	<0.75	0.75 - 3.0	>3.0
Permeability				
EC of irrigation water	mmho/cm	>0.5	<0.5	<0.2
SAR, adjusted	-	<6.0	6.0 – 9.0	>9.0
Specific ion toxicity from root absorption				
Sodium (evaluate by adjusted SAR)	-	<3	3.0 – 9.0	>9.0
Chloride	mg/L	<142	142 - 355	>355
Boron	mg/L	<0.5	0.5 – 2.0	2.0 – 10.0
Specific ion toxicity from foliar absorption (sprinklers)				
Sodium	mg/L	<69	>69	--
Chloride	mg/L	<106	>106	--
Miscellaneous				
$NH_4 - N$	mg/L	<5	5 – 30	>30
$NO_3 - N$	mg/L	<5	5 – 30	>30
HCO_3 (only with overhead sprinklers)	mg/L	<90	90 – 520	>520
PH	-	Normal range	6.5 – 8.4	--

Source: Regional Water Quality Control Board, 1994.

Sodium. The adjusted Sodium Adsorption Ration (SAR) is a measure of the sodium hazard to crops and soils due to irrigation water. In addition to sodium concentrations, the adjusted SAR considers the impact of irrigation water salinity and bicarbonates. Bicarbonates in irrigation water are potentially harmful to the soils because they may precipitate calcium from the cation exchange complex in the form of relatively insoluble calcium carbonate. As exchangeable calcium is lost from the soil, the relative proportion of sodium is increased with a corresponding increase in the sodium hazard.

Irrigation water that is high in sodium may also lead to a reduction in soil permeability, especially when applied to fine-textured (clayey) soils that already experience drainage problems. Soils of this type are found along the Pajaro River near the ocean. Applying irrigation water with an adjusted SAR below 6.0 does not usually affect the permeability of a soil.

Chloride and Sodium Toxicity. Irrigation water supplied with high levels of chloride and sodium can cause root and foliar absorption.

Crop yield may be impacted from root absorption when the adjusted SAR exceeds 3.0, or when the chloride concentration exceeds 142 mg/L. The toxic affects from these constituents usually occur on woody perennial plants. Annual crops are usually tolerant to these constituents, except for strawberries which, based on limited data, are considered to be relatively sensitive. Soil conditions and irrigation management may affect these threshold levels. Even though few data exist to fully assess the potential impact, these threshold levels should be considered when considering the potential hazard to crop production from root absorption of these constituents.

Crop damage can occur from foliar absorption of sodium and chloride associated with sprinkler irrigation. Irrigation with impact heads allows the irrigation water to come into contact with the crop foliage whereas drip irrigation applies water directly to the soil. As with root absorption, annual crops are generally tolerant to foliar absorption, but strawberries would be considered somewhat sensitive. Because drip irrigation is the prevalent method of irrigating strawberries in the Pajaro Valley, potential crop damage from foliar absorption is not expected to be an issue. Additionally, the water quality guidelines to minimize potential root absorption impacts are similar in nature to the guidelines that minimize foliar absorption; therefore, any measures implemented to protect crops from root absorption will simultaneously reduce the potential for foliar absorption.

Pathogens. Current agricultural practices in the Pajaro Valley include the use of the soil fumigant methyl bromide to control weeds and pathogens, including *Phytophthora. Phytophthora* are of concern because it can cause crown rot and root rot, which greatly reduce the plants' ability to absorb water and nutrients (CH2M Hill, April 1999). *Phytophthora* has been eliminated from commercial strawberries, raspberries, and apple orchards in the Pajaro Valley through the use of methyl bromide. However, it is expected that this fumigant will be banned by the year 2005.

Phytophthora can be readily controlled by crop cultural/management approaches, such as:

- Planting crops on well drained soils and using raised beds to facilitate drainage;
- Periodic land leveling to avoid low areas within the field where drainage may become a problem;
- Using resistant varieties/rootstocks;
- Planting disease-free nursery stock;
- Careful irrigation management to avoid excessively wet soil conditions and plant moisture stress; and
- Maintenance of soil pH above 7.0.

Vegetable row crops produced in the Pajaro Valley do not seem to be impacted by Phytophthora-related production problems, and PVWMA vegetable crop growers have not identified Phytophthora contamination as a concern.

Pajaro Water Quality Guidelines. Due to the adverse impacts associated with poor water quality discussed above, it is important that Pajaro citizens have access to water that meets certain standards. For optimal crop yield and minimal health impacts, water must not exceed the threshold values of 10 mg/L NO_3-N, 500 mg/L TDS, 142 mg/L chloride, or an adjusted SAR of 3.0. Although measured in different units, these standards are similar to the guidelines put forth by the CCRWQCB.

2.9.2 Current Water Quality in the Pajaro Valley

Following is a description of water quality in the Pajaro Valley as it relates to the parameters of concern discussed in the previous section. The surface waters described below are generally of usable quality for irrigation and, in some instances, are of higher quality than groundwater supplies. However, most of the surface waters within then Pajaro Valley do experience seasonal water quality concerns. Unless otherwise noted, the source of this information is the 1999 AMBAG Watershed Water Quality Management Plan. Brief discussions are provided for:

- The Pajaro River;
- Corralitos Creek;
- Harkins/Watsonville Slough;
- College Lake; and
- Pajaro Valley Groundwater.

Pajaro River. Pajaro River water is a potential usable water supply. However, seasonal water quality concerns include nitrates, salinity, chloride, and *Phytophthora*. Nitrate concentrations vary depending upon location. The lowest nitrate levels are consistently at the furthest upstream monitoring stations, while nitrate levels near the coast have been measured at very high levels. Nitrates also vary seasonally from 0.5 to 10.2 mg-N/L, with the highest concentrations occurring in the late spring through summer months. Thus, in low flow conditions, nitrates level can approach the health related maximum of 10 mg-N/L. High salinity is indicated by elevated TDS levels in the lower Pajaro River, where the waters are subject to tidal flux. Salinity levels further upstream can also be quite high, particularly during low flow conditions. The Pajaro River at the Chittenden gauging station has reported higher levels of sodium than other surface water streams within the Pajaro River watershed. Chloride concentration is a potential problem as chloride is the constituent most likely to increase with growing urbanization. *Phytophthora* are also present in the Pajaro River.

Corralitos Creek. Corralitos Creek water is a potential usable water supply that has some seasonal water quality concerns. Like the Pajaro River, nitrate concentrations in Corralitos Creek vary seasonally, ranging from 0.5 to 9.7 mg-N/L. Higher salinity is suggested by slightly elevated TDS values. Adjusted SAR is generally acceptable. *Phytophthora* are present in Corralitos Creek.

Harkins/Watsonville Slough. Water quality parameters of concern for Watsonville and Harkins Slough water include nitrates and the presence of *Phytophthora*. Elevated levels of nutrients, including nitrates, are found in the slough system, and are suspected to contribute to the eutrophication problems that the sloughs experience. In addition, water flow and circulation have been modified through channelization, and construction of dikes and roads. This creates stagnant and slow-moving circulation conditions that can exacerbate the existing water quality issues. Conductivity and adjusted SAR are generally acceptable during winter months. *Phytophthora* are present in the Watsonville Slough System. However, similar to other surface waters with the basin, these water quality concerns are seasonal in nature. Therefore, diversions for the slough would provide usable supply for irrigation.

College Lake. Although College Lake water quality data are limited, available data suggest that contaminant concentrations vary seasonally. During the first storm events of the season, runoff collected in College Lake exhibits the highest values of TDS, nitrates, and other pollutants. Nitrate concentrations and salinity have exceeded the MCL and target delivery concentrations, respectively, during this initial flush. Dilution occurs through the rainy season. College Lake water is a potential useable supply as seasonal dilution typically improves water quality to meet the irrigation water quality objective. *Phytophthora* are present in College Lake.

Pajaro Valley Groundwater. Groundwater quality within the major aquifers of the Pajaro Valley is influenced by factors related to hydrology, geochemistry, well construction, groundwater pumping, and land use. Seawater intrusion leads to high levels of salinity within some of the coastal groundwater aquifers. Well data generally indicate that regions of high salinity have been expanding over the past decades. High chlorides are found at the deepest levels of the Aromas sands formation at the coast. This limits the ability to drill to the deeper Purisima formations to obtain fresh water as seawater intrusion degrades the upper aquifers. Also of concern is groundwater quality in the Murphy Crossing area, which is of relatively poor water quality as TDS concentrations and other constituents exceed the irrigation water quality objective.

Nitrate contamination has been identified as a problem in areas of high residential septic-tank density and in some areas recharged by the Pajaro River. In addition, since nitrate contamination is generally associated with surface sources of pollutants, areas with shallow perched water table aquifers or unconfined aquifers are generally more susceptible to long-term increases in nitrate levels. Nitrate concentrations in excess of drinking-water standards have been observed from a large number of irrigation wells.

Phytophthora are not present in the groundwater. Infiltration testing suggests that percolation of water into the groundwater basin is an efficient *Phytophthora* removal mechanism (CH2M Hill, April 1999).

In summary, the water quality in the Pajaro Valley is highly variable. However, taking into account these variations, and in conjunction with varying levels of treatment, most of these water sources could be used as irrigation water sources in the future.

2.10 Watershed Management Issues

Water quality is not a static problem. Hydrologic processes cycle water through various media, from precipitation to surface water to groundwater. Poor quality water is not necessarily contained within boundaries; often, water is the mechanism through which pollutants are transported. Applied irrigation water may be transported as runoff to surface waters or may percolate to groundwater. Groundwater may move into surface water bodies, and seawater may intrude into the fresh groundwater aquifers. Water is rarely confined to a single location. Thus, water quality issues that affect one water body also become a threat to neighboring water bodies.

Although the Pajaro Valley groundwater basin contains numerous aquifer layers that are generally separated by clay layers, water transport between these layers is still feasible. Groundwater in different confined aquifer layers is under varying amounts of pressure and groundwater will move from areas of high pressure, to areas of lower pressure. Water can move vertically between aquifers, through naturally occurring gaps in intervening clays, or along the casings of wells that penetrate more than one aquifer zone. Additionally, abandoned wells with perforations at multiple aquifer elevations provide a transport channel through which water can move. Thus, poor-quality water may migrate between formations. This increases the concerns associated with seawater intrusion, as aquifers that underlie intruded aquifers can be affected.

Due to poor water quality, the Pajaro River and several tributaries have been listed by the State Water Resource Control Board as water quality-impaired streams for a number of different parameters, including nutrients, sediment, and pesticides (AMBAG, June 1999). Section 303(d) of the Clean Water Act requires the development of a Total Maximum Daily Load (TMDL) for any water body that is listed as water quality-impaired. A TMDL is a maximum value of pollutant loading to a water body, determined on a source-by-source basis. High priority TMDLs are set to be completed in 2001 and the medium priority TMDLs are to be established by 2003 (AMBAG, June 1999). The TMDLs will be used to initiate basin-wide corrective actions.

2.11 Description of Problem to be Solved

The major problem in the Pajaro Valley is an imbalance of water use and sustainable water supplies. This imbalance then results in a decrease in groundwater elevations, which causes seawater intrusion in the coastal region.

2.11.1 Current and Future Basin Deficit

Under current basin management conditions (i.e. rate of well pumping, well locations, and irrigation practices), the basin sustainable yield is approximately 24,000 AFY. With average groundwater use estimated to be approximately 69,000 AFY, the basin deficit is 45,000 AFY as shown in Table 2-8. Under projected 2040 future water use and assuming current sustainable yield, the basin deficit would increase to 54,000 AFY. To balance the basin and eliminate seawater intrusion, this deficit must be eliminated. There are three strategies that can be implemented to attain basin balance:

1. Optimize current water supplies by increasing their yield, or by decreasing demand for them;
2. Develop new, additional water supplies to meet total demand; or
3. Use a combination of the above to balance demand and supply.

Table 2-8: Current and Future Basin Water Use and Current Sustainable Supply

Demand	Current Conditions (AFY)	Future Conditions (AFY)
Agricultural Demand	59,300	64,400
Urban Demand	12,200	16,100
Total Demand	**71,500**	**80,500**
Corralitos Filter Plant	(1,100)	(1,100)
Other Surface Water Diversions	(1,000)	(1,000)
Total Groundwater Pumping[a]	**69,000 (rounded)**	**78,000 (rounded)**
Current Basin Sustainable Yield[b]	(24,000)	(24,000)
Current Basin Deficit[c]	**45,000**	**54,000**

Footnotes:

a. Total Groundwater Pumping Demand values are rounded to two significant figures or to the nearest thousand to represent significant accuracy.

b. Current sustainable yield assumes continuation of existing basin wide pumping practices.

c. Excludes potential effects of increased conservation measures. See Section 3 for description.

2.11.2 Water Quality Requirements

The water supplied to solve the basin balance problem must be suitable for its intended uses. Specific water quality parameters of concern for irrigation include salinity, sodium hazard, chloride and sodium toxicity, and pathogens. The tolerance of crops to various water quality constituents can vary by crop type, and different varieties of the same crop can exhibit markedly different growth responses to waters of similar quality. Crop tolerance to constituents in the irrigation water, soil conditions and prevailing climate are important factors in assessing the suitability of a particular water for irrigation. The Revised BMP irrigation water quality objective is summarized in Table 2-9.

Table 2-9: Revised BMP Irrigation Water Quality Objectives

Constituent	Units	Revised BMP Objective
TDS	mg/L	500
Adjusted SAR	-	3.0
NO3 – N	mg/L	10
Chloride	mg/L	140

3 Management Measures

In order to protect and enhance groundwater and surface water resources in the Pajaro Valley, there are management measures that can be undertaken by the PVWMA that do not involve the construction of new projects. This section presents various measures that can be used to lessen water demand, increase the yield of the groundwater basin (the predominant current water supply), maintain optimal water quality, and protect and enhance surface water resources. These include:

- Demand management options to reduce water demand;
- Pumping management options to increase the sustainable yield of the groundwater basin;
- Watershed management options to ensure groundwater recharge; and
- Well management options to maintain water quality.

The PVWMA recently undertook a significant public based process that resulted in publication of Water Conservation 2000 (WC 2000). Many of the measures and strategies discussed in the following sections are also included in WC 2000 (CH2M Hill & RBSmith, February 2000), which was received by the PVWMA Board of Directors in February 2000.

3.1 Demand Management Options

Demand management measures include options such as water conservation, land fallowing and tiered water pricing. These measures can be employed as alternatives to, or in conjunction with, new water supply projects to help solve the overdraft and seawater intrusion problem.

This section identifies and describes the potential demand management options that were evaluated as part of this Revised BMP. Also presented are the goals, implementation issues, cost estimates (as appropriate) and potential impacts associated with each option.

3.1.1 Water Conservation

PVWMA developed WC 2000 to serve as a guidance document to achieve cost-effective increases in water conservation. The WC 2000 incorporates water conservation programs from around the state that are applicable in the Pajaro Valley. Under the WC 2000, conservation would be achieved through voluntary actions without restrictions or enforced land use changes. The plan identifies cost-effective conservation opportunities of approximately 4,500 AFY of agricultural conservation and 500 AFY of urban conservation. Correcting on-farm irrigation system deficiencies, improving irrigation scheduling techniques, and conducting mobile laboratory evaluations are all methods that can be effective in increasing agricultural water conservation. The WC 2000 proposed agricultural conservation program calls for the following actions:

- Evaluate the PVWMA water metering program;
- Submit annual grower water conservation plans;
- Prepare the PVWMA annual report of water use and conservation;
- Provide records of historic pumping;
- Continue grower education and demonstration projects;
- Install CIMIS weather stations;
- Provide irrigation scheduling technology/assistance;
- Institute mobile irrigation laboratory program;
- Seek financial assistance to fund the PVWMA water conservation program;
- Seek financial assistance for irrigation system improvements; and

- Continue ongoing public education program.

Urban conservation can be achieved through water audits, a landscape water conservation ordinance, and toilet and washing machine rebate programs. The WC 2000 proposed urban conservation program calls for the following actions to conserve a projected 500 AFY:

- Conduct residential water audits;
- Conduct commercial, industrial, and institutional audits;
- Offer high efficiency washing machine rebates;
- Institute commercial toilet rebate program;
- Create and maintain demonstration gardens;
- Report previous water use on billings;
- Distribute conservation notices;
- Implement conservation pricing;
- Conduct large landscape water audits and retrofit program; and
- Draft and approve landscape water conservation ordinances.

The cumulative cost of implementing the above conservation plan to PVWMA is approximately $2,130,000 over seven years, or $3,029,000 over 10 years (CH2M Hill & RBSmith, February 2000), and does not include costs to farmers to implement such conservation measures. The present worth values shown in Table 3-1 were calculated assuming uniform annual expenditures over the seven and ten year periods. For the purposes of the Revised BMP, it was assumed that these water conservation practices would be implemented over a seven year time period. Excluded from the costs presented in Table 3-1 are the costs attributable to the farmer or owner.

Table 3-1: Conservation Present Worth Analysis

Conservation Plan	Cumulative Cost	Uniform Annual Cost	Present Worth
7-Year	$2,130,000	$304,000	$1,700,000
10-Year	$3,029,000	$303,000	$2,200,000

Notes:
1) Adapted from *Water Conservation 2000* (CH2M Hill and RBSmith Consulting, February 2000).
2) Present worth costs are based on a 30-year lifetime, 6% interest.
3) Costs presented in Table 3-1 exclude on-farm or other owner costs.

Additional water conservation program spending by the PVWMA would not necessarily result in additional voluntary conservation savings. To achieve higher levels of conservation, the PVWMA would need to implement mandatory conservation measures requiring enforced land use changes or significant capital investment by farmers. The PVWMA Board of Directors has determined that such an approach would be inconsistent with the mission, goals, and objectives of the PVWMA.

Conservation also has a number of indirect benefits, with respect to erosion control, surface runoff, and leaching of nitrates and other pollutants into the groundwater. However, irrigation improvements that significantly reduce deep percolation will also reduce recharge of the aquifers.

The PVWMA and the City of Watsonville are actively implementing water conservation measures identified in WC 2000. For additional details on conservation, refer to the *Water Conservation 2000* document (CH2M Hill and RBSmith Consulting, February 2000).

3.1.2 Water Pricing

The PVWMA currently imposes an augmentation charge for water use within PVWMA area. The augmentation charge is levied via metering of wells providing agricultural and urban water supplies within its service area. With some renovation of the metering program, alternative water pricing programs could be used to promote demand reduction in several ways. These include raising flat rates and implementing tiered water pricing.

Currently, the PVWMA augmentation charge is a flat rate of $50 per acre-foot. One option for managing water demand is to raise the augmentation charge to promote water conservation. This would encourage users not to waste water.

Another option is to implement tiered water pricing. Tiered water pricing is an incremental pricing system in which the price of water increases as the amount of water consumed exceeds certain threshold values. This management mechanism can promote conservation and/or alter water use practices. The plan would set varying levels of water pricing associated with water application rates for various crop types, which may promote conversion to crop types with lower water uses. Crops with a low water application requirement would fall into a low pricing tier, while crops with higher application rates would fall into a higher tier. Under the tiered structure, wasteful or high-use irrigators incur significantly higher water costs.

An increase in water rates or a tiered water structure would provide an incentive for conservation and would minimize wasting of water. Both methods of water pricing were considered for implementation. A recommended rate structure is discussed in Section 9.

3.1.3 Land Fallowing

The land fallowing option involves the acquisition or leasing of agricultural land and retirement of that land from production or development. Fallowing the land from production would reduce groundwater pumping by reducing water demand. Acquiring the land would stop property owners from pumping groundwater from the basin. As applied in the Pajaro Valley, the estimated capital cost to acquire agricultural land is approximately $20,000 to $30,000 per acre. This cost does not include the additional impacts of lost taxes, production, and jobs to the economy of the Valley.

Model analyses indicate that the most effective location for land fallowing from the standpoint of basin management would be within the coastal area. Eliminating coastal area pumping would allow for formation of a hydraulic groundwater barrier adjacent to the Pacific Ocean, minimizing seawater intrusion.

The cost of land fallowing would be significant. For example, fallowing 1,000 acres of land in the coastal area at a cost of $20,000 to $30,000 per acre would cost between $20 and $30 million. The removal of 1,000 acres of irrigated agriculture in the coastal area would reduce demand by approximately 2,000 AFY. Alternatively, land could be leased instead of purchased. This would allow for agricultural production during wet years when additional water supplies may be available. This option would cost approximately $1,500 per acre per year of demand reduction and associated economic impacts to the Pajaro Valley. (Note: The land lease unit cost of $1500 is assumed to be the Pajaro Valley average. However, in the coastal area the annual cost to lease land is approximately $2500 to $3000 per acre.) This makes land fallowing a costly option in the Revised BMP.

3.2 Pumping Management

The PVIGSM simulation of groundwater levels and seawater intrusion in the Pajaro Valley groundwater basin indicates that coastal groundwater pumping reductions would be more effective at preventing seawater intrusion than basin-wide pumping reductions. As discussed in Section 2.8, the elimination of coastal pumping creates a hydrostatic barrier that results in a sustainable yield of up to 48,000 AFY, doubling the sustainable yield of the basin. This assumes that 100% dependable supplemental supplies (i.e. supply from desalination or water recycling) are available to augment pumping. This pattern of pumping management optimizes the basin yield, but necessitates the construction of a distribution network to supply coastal users with the water they need. This also calls for a supplemental water supply to serve the coastal distribution system.

The sustainable basin yield is a function of the interrelationship between yield, water conservation, irrigation recharge, and reliability of water supply. These relationships become significant with alternatives that rely heavily on high levels of water conservation and on water sources with low reliability. High levels of water conservation can affect the sustainable yield because the amount of recharge to the groundwater basin is reduced. Surface water sources with low reliability can require additional groundwater pumping to meet demand during low water years. Therefore, the sustainable yield of the basin would be less than 48,000 AFY if land fallowing, high levels of conservation, or less reliable water supplies are implemented.

3.3 Summary of Demand and Demand Management

Although there are several options available to optimize the groundwater basin, they are insufficient by themselves to balance demand without providing an additional sustainable supply, as shown in Table 3-2.

Assuming 5,000 AFY of water conservation measures and an increase in basin yield of 24,000 AFY with coastal pumping restrictions, a basin wide overdraft of 16,000 AFY would still remain under current conditions. However, based on PVIGSM results, approximately 18,500 AFY of coastal pumping reductions are required to eliminate seawater intrusion. Therefore, to eliminate seawater intrusion approximately 18,500 AFY of supplemental supplies must be delivered to the coastal area. The strategy to eliminate seawater intrusion is to provide 18,500 AFY of supplemental supply to the coastal area while maintaining basin balance.

Future water use in the Pajaro Valley is projected to increase the required supplemental supply from 16,000 to 25,000 AFY (an increase of 9,000 AFY) by 2040. This overdraft will have to be met with new water supplies if a balance between demand and supply is to be achieved. Land fallowing via land leases could be used to bring about a basin balance, however, its annual unit cost of $1,500 per acre of land (plus economic impacts) precludes its use on a wide scale.

Water conservation and land fallowing are management options that reduce the amount of irrigation, which in turn reduces the amount of groundwater recharge and basin yield. Furthermore, water supplies with low reliability result in excessive groundwater pumping during dry years, which adversely affects (lowers) the sustainable yield of the groundwater basin. Model results showing this relationship can be found in *PVIGSM Technical Memoranda* (Montgomery Watson/AT Associates, May 2000). Examples of water sources with low levels of reliability would be sloughs and small streams, whereas an example of a high reliability source would be recycled water.

Table 3-2: Identification of Required Supplemental Supplies with Conservation

Optimization Option	Balancing Current Conditions (AFY)	Balancing 2040 Conditions (AFY)
Agricultural Demand	59,300	64,400
Urban Demand	12,200	16,100
Total Demand	**71,500**	**80,500**
Corralitos Filter Plant	(1,100)	(1,100)
Other Surface Water Diversions	(1,000)	(1,000)
Total Groundwater Demand[a]	**69,000 (rounded)**	**78,000 (rounded)**
Current Basin Sustainable Yield	(24,000)	(24,000)
Future Increased Yield Due to Pumping Management at Coast and Reliable Supplemental Supply Projects[b]	(24,000)	(24,000)
Water Demand without Conservation	**21,000**	**30,000**
Increased Agricultural Conservation (Achieved by 2010)[c]	(4,500)	(4,500)
Increased Urban Conservation (Achieved by 2010)[c]	(500)	(660)
Required Additional Supply[d]	**16,000**	**25,000 (rounded)**

Footnotes:

a. Values rounded to two significant figures or to the nearest thousand to represent the values significant accuracy.
b. The amount achieved if supply is 100% reliable. With less reliable supply, the amount of increased yield would be lower. The amount of increased groundwater yield of the Alternatives (except Local-Only Alternative) developed in Section 5 would be 23,000 AFY given their level reliability.
c. Conservation to be achieved over several years, but is included here to show impact on current levels of demand.
d. This value represents the supplemental supplies required to meet the overall water balance in the basin assuming 100% supply reliability. However, PVIGSM results indicate that elimination of approximately 18,500 AFY of pumping along the coast is required to eliminate seawater intrusion.

3.4 Watershed Management

In addition to the implementation of measures and projects to increase sustainable water supply for the Pajaro Valley, it is important to protect and monitor watershed conditions within the Pajaro Valley. Non-point source (NPS) pollution is likely to be the most significant threat to the water quality in the Pajaro Valley watersheds. NPS pollutants originate from a wide range of sources that are not required to have an NPDES Permit. In general, these pollutants come from sources over which water users have some level of control (e.g. fertilizer and pesticide runoff, animal waste management, paint, oil, anti-freeze poured directly into storm drains, etc.). Therefore, programs that promote and educate the public on the control of such pollutant sources can be very effective.

The SWRCB and RWQCBs are empowered by the State's Porter-Cologne Water Quality Control Act to regulate water pollution, including NPS pollution. Through cooperative efforts, the SWRCB, RWQCBs, and other organizations have developed management measures for control of NPS pollution. In 1988, the California NPS Management Plan was adopted. The plan identifies sources and potential management measures for prevention and control of NPS pollution.

Watershed management is a key aspect in protecting ground and surface water supplies, water quality, and ensuring continued beneficial use of water. A complete Watershed Management Plan is not included in the Revised BMP. However, the framework for developing key programs that would be included in a Watershed Management Plan is discussed in the following sections. Included herein are potential management measures and monitoring programs that could be implemented to protect water supplies for future beneficial use, including environmental protection and enhancement.

3.4.1 Water Resource Monitoring Program

Water resource monitoring is a key aspect in understanding and evaluating basin conditions. Data collected is often used to evaluate contaminant transport, groundwater flow, surface water recharge, and other water resources aspects. Ultimately monitoring provides the data and information for management of water resources within the basin. The Pajaro Valley consists of groundwater and surface water resources that are interconnected within the basin. This section identifies the current groundwater and surface water monitoring programs and identifies potential enhancements to the programs that may be implemented.

Groundwater Monitoring:

Groundwater monitoring programs are typically implemented to provide data for evaluation of basin conditions. In addition, monitoring programs are used to track groundwater contaminants and ultimately provide data and information that can be used to implement programs and strategies to protect groundwater supplies. This section highlights the current groundwater monitoring program and provides a general framework for development of an enhanced groundwater monitoring program.

Data collected under the current PVWMA groundwater monitoring program includes:

- Water quality data;
- Groundwater elevation data; and
- Geologic and hydrogeologic data.

These data, in conjunction with other basin features, provide the framework for understanding basin characteristics such as groundwater recharge and pollutant transport. These data also provide a mechanism for identifying water quality issues such as seawater intrusion, nitrate contamination, and contaminant movement within the groundwater system.

PVWMA's current groundwater monitoring program consists of monthly well sampling and analysis of select wells (Note: Some wells monitored under the program are sampled on a biannual or annual basis). The monitoring program covers sampling of selected production wells and monitoring wells throughout the basin. Water purveyors in the basin such as the City of Watsonville, Aromas Water District, Pajaro Sunny Mesa, and California State Water Company also provide additional well data. In all, PVWMA tracks approximately 170 wells throughout the basin and maintains a database and geographical information system (GIS) to manage, analyze, and summarize data.

Well monitoring includes measurement of groundwater levels and collection of water samples for analysis. Wells in the basin are screened at various intervals with some wells screened in multiple aquifers. Well logs provide screening data and depth for the wells within the monitoring program. The majority of the groundwater wells are screened within the Aromas aquifer, the main production aquifer in the basin.

The collected data are compiled and summarized in an annual water resources report, which is completed at the end of each calendar year. The annual report includes water quality data, evaluates the extent of the seawater intrusion, water table contours, and discusses other groundwater areas of concern. In addition, the report includes results from any hydrogeologic studies that have taken place over the water year. The extent of overdraft and seawater intrusion in the Pajaro Valley has been demonstrated in these annual reports and the need for programs and projects to improve these conditions is well documented.

Implementation of demand management and development of supplemental water supply projects will improve groundwater conditions and eliminate further seawater intrusion. It will therefore be important to monitor groundwater level and quality data to measure the effectiveness of these programs. Because of the significant future changes in overall water supply and groundwater pumping, an enhanced groundwater-monitoring program is needed. Potential enhancements to the groundwater monitoring program include:

- Monitoring Network – Expanding the monitoring network by installing new monitoring wells to provide a good basis for determining the movement of seawater intrusion;
- Water Quality Analysis – Monthly sampling and analysis of groundwater quality, investigation of aquifer screening levels, isotope analysis, water dating analysis;
- Groundwater Level Measurement – Monthly tracking of groundwater levels;
- Aquifer Transport Study – Developing an increased understanding of recharge of the aquifers and contaminant transport;
- Groundwater Modeling Updates – Continue updating of the PVIGSM, including updated land and crop use data available approximately every seven years from the Department of Water Resources, and modeling of contaminant transport;
- Database Management – Upgrading existing database. Developing tools for management and reporting of data including GIS compatibility; and
- Annual Reporting – Expanded analysis of collected data, seawater intrusion front, contaminant migration, documenting observed changes in groundwater levels and groundwater migration.

In addition to the development of an enhanced groundwater monitoring program, PVWMA is also pursuing potential funding opportunities, including state and federal grants, to help offset the cost of the enhancements to the monitoring program.

Surface Water Monitoring:

The current surface water monitoring includes sampling and analysis at approximately 25 sites within the PVWMA service area. Surface water monitoring spans the wet weather season and samples are taken on a biweekly schedule. Water quality data are managed in a database application. The USGS also maintains several gage stations within the Pajaro Valley providing flow data for select surface water in the basin.

Potential enhancements to the surface water monitoring program include:

- Water Quality Analysis – Continued monitoring of water quality of surface waters;
- Flow and Level Monitoring – Measurement of river, creek, and slough flows and measurement of lake levels;
- Modeling Updates – Continue updating of the PVIGSM and modeling of contaminant transport;
- Database Management – Maintaining and upgrading existing database. Developing tools for management and reporting of data; and
- Annual Reporting – Summarizing collected data, constituent issues, documenting observed changes in water quality levels and surface water flows.

In addition to water quality and flow monitoring, reporting, and management, the program should step up efforts to track, meter, and monitor surface water diversions. These tasks are key to protecting and managing water supplies. Surface water diversions could affect natural recharge to the groundwater basin and limit natural dilution of potential constituent concentrations of concern. In addition to the Corralitos Creek Filter Plant diversions, other surface waters are diverted for agricultural purposes. Such diversions over 10 AFY are required by the PVWMA to be metered under Ordinance 93-2 (Amended by Ordinance 96-2).

3.4.2 Recharge Area Protection Program

Groundwater resources in the Pajaro Valley result from stream recharge, percolation of rainfall, deep percolation of irrigation water, and inflow into the groundwater basin from adjoining groundwater systems. The protection of areas within the basin that serve to recharge the groundwater aquifers is critical to providing a reliable, long-term groundwater supply. Recharge areas are protected by the Counties of Santa Cruz and Monterey. For example, the Santa Cruz County General Plan and Local Coastal Plan limits or constrains development within identified recharge areas in order to protect groundwater supplies. In addition, new development must meet County policies for stormwater runoff in recharge area. PVWMA does not have a formal policy or ordinance protecting high recharge areas.

PVWMA could implement a basin-wide management measure to enhance groundwater stability through the protection of key areas of recharge. This effort could begin with a public outreach program designed to inform area residents and decision makers of the importance of protecting groundwater recharge areas.

Because clay layers inhibit deep percolation through much of the central and western portions of the Pajaro Valley, deeper aquifers rely on undeveloped areas of native vegetation or agricultural lands generally located in the eastern portions of the Valley to provide recharge through surface water infiltration and rainfall. As these or other areas in the Pajaro Valley are subject to impervious development, infiltration of precipitation would be reduced, thus reducing recharge of the underlying aquifers. Basin yield would decrease, and the negative pressure within the deep aquifers would cause the seepage of lower-quality water from above through semi-confined layers that would otherwise act as barriers.

3.4.3 Nitrate Management Program Framework

This section briefly summarizes nitrate issues and concerns in the Pajaro Valley and provides a framework for development of a nitrate management program. A complete nitrate management program is not included in the Revised BMP, as the major focal point of the document is to address seawater intrusion and the need for water supply management and projects. However, a program should be developed in the near future to address nitrate issues, as nitrates are a potential public health and agricultural concern.

As previously discussed in Section 2.9.2, groundwater nitrate contamination has been documented as a problem within the Pajaro Valley. Elevated nitrate concentrations in excess of the drinking water standard of 10 mg/L N (nitrogen) are typically observed in wells west of Highway 1, in the wells east of the City of Watsonville and in other localized areas within the PVWMA boundary. Nitrate concentrations in the basin are shown in Figure 3-1. Because agriculture is the major land use in the Pajaro Valley, elevated nitrate concentrations are likely due to fertilizer application and agricultural practices. However, other sources of nitrogen contamination include septic tank drain fields and animal facilities. In addition, nitrate concentrations occur naturally in groundwater due to biologic activity or decomposition of geologic deposits, but natural concentrations of nitrate rarely exceed the Primary Drinking Water Standard of 10 mg/L N.

The SWRCB and RWQCB, in conjunction with other stakeholders, have developed guidance for implementation of watershed management measures, including nitrate management. A "three-tiered approach" is the recommended implementation strategy for controlling pollution and protecting water supplies. The "three-tiered approach" recognizes that the most effective management is achieved through voluntary implementation of management measures. Tier 1 is therefore based on outreach and education programs that promote and encourage voluntary implementation of management measures to reduce contamination. Tiers 2 and 3 of the approach include increasing regulatory action to ensure implementation of management measures.

Currently, PVWMA is a member and participant on the Monterey County Water Resource Agency (MCWRA) Nitrates Committee, which is tasked with addressing agricultural and urban nitrate issues. The committee has coordinated and sponsored public outreach events to educate the community on nitrates management. PVWMA has co-sponsored and participated in these events. In addition, the committee has developed pocket guides for management of agriculture nitrates on which the PVWMA co-sponsored and participated. However, increased efforts are necessary to protect water resources within the Valley.

PVWMA should develop a nitrate management program promoting voluntary implementation of the management measures. Because the major sources of nitrate contamination in the Pajaro Valley are due to agricultural practices, septic tanks, and animal facilities, the nitrate management program should focus attention on promoting management measures to decrease nitrate contributions from these sources. Potential management measures for reducing nitrates contamination include:

- Crop nutrients budgeting;
- Identifying crop types, and amounts and timing of nutrients;
- Identifying hazards to site and adjacent environment;
- Water sampling and analysis to determine nitrate concentrations;
- Soil sampling and analysis to determine available nutrients;
- Plant tissue sampling and analysis;
- Calibrating nutrient equipment;
- Irrigation techniques to prevent leaching of nutrients;
- Controlling discharge from animal facilities;
- Runoff management of agricultural and urban areas; and
- Monitoring and maintaining septic tanks.

More detailed monitoring is necessary to better understand the extent and sources of nitrate contamination in the various basin aquifers. PVWMA could then detail and implement a nitrates management plan. In the interim, a public outreach program could be implemented to provide education relative to controlling nitrate leaching into the groundwater system. A cooperative education and outreach effort with the Counties of Monterey, Santa Cruz, and San Benito and other local agencies could be developed.

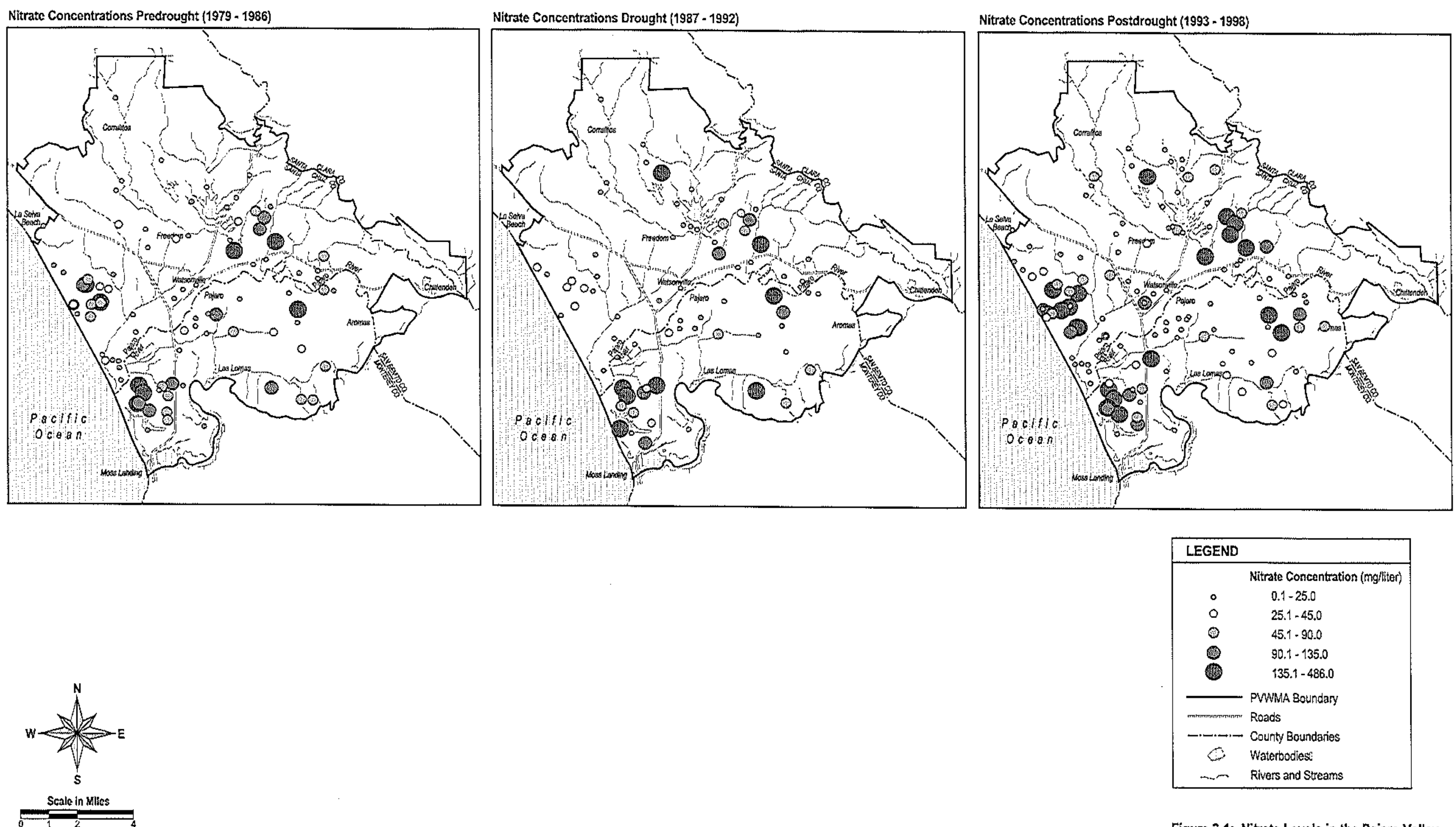


Figure 3-1: Nitrate Levels in the Pajaro Valley

3.4.4 Water Metering Program

Water use data provided by PVWMA's water metering program provide a mechanism for billing, planning, and water management. The data are especially critical for managing the Pajaro Valley groundwater basin and the funding of solutions to eliminate seawater intrusion. PVWMA's metering program includes monitoring and reading meters, maintaining and calibrating meters, and repairing or replacing meters.

In 1993, the PVMWA adopted Ordinance 93-2 requiring the installation of flow meters on all water supply facilities capable of producing over 10 AF of water annually. This included both groundwater and surface water facilities. Production facilities of less than 10 AF are approximated for billing purposes. Water use by non-metered agricultural production facilities is estimated to be about 1% of the total water use in the PVWMA service area.

The Ordinance required mandatory meter installation by the end of 1995 and most meters were installed in 1994. Turbine meters with an expected life of 5 years and propeller meters with a life of 8 years were the typical meters installed. These types of flow meters have a typical accuracy of 5% with regularly scheduled maintenance. However, since the installation of meters approximately 8 years ago, there has been limited maintenance of the meters due primarily to limited Agency resources. As a result, a significant number of broken and malfunctioning meters have not been repaired, resulting in lower than typical accuracy. PVMWA currently estimates that the water metered had an error of approximately 16% in 2001. Therefore, the PVWMA is developing an enhanced metering program to improve the accuracy of the program.

PVWMA is in the process of developing and implementing an enhanced meter program that includes the following tasks:

- Meter Readings for Billing - Biannually in June and December;
- Meter Readings for Maintenance - Biannually in the Spring and Fall;
- Maintenance and Calibration Program – Each meter to be checked, serviced and repaired at least once every two years;
- Ultrasonic Meter Accuracy Tests – Meter testing in conjunction with maintenance and calibration program;
- Turbine Meters Replacement Program – Turbine meters have become obsolete and replacement parts are no longer available. Therefore, turbine meter replacement with propeller meters is an ongoing task.
- Propeller Meter Repairs – Repair of aging propeller meters is critical for monitoring and maintaining accurate data.
- Database Tracking – PVMWA staff is in the process of developing a database to track and manage the metering program. The database shall allow for effective tracking and management of metering activities and resources.

The enhanced metering program will provide confidence in the collected data and will be a valuable tool for future planning and management of the groundwater basin. Data could be used to calibrate the PVIGSM model and validate model results. These data shall allow for evaluation of conservation efforts and accurate collection of augmentation charges for developing supplemental water supplies.

3.4.5 Well Management Program

Well management is critical to ensure maximum groundwater quality in the Pajaro Valley because wells can serve as conduits for transport of contaminated water from one aquifer to another. Therefore, the PVWMA needs to undertake a comprehensive well management program with regard to well decommissioning and well replacement. For additional information on the regulatory processes of well management, see Feeney et al, March 1999.

Well Decommissioning:

Wells are constructed in varying manners, including those with a single screened interval and those with multiple screened intervals. Wells with single screened intervals, if properly constructed with well seals between aquifers, extract groundwater from a single aquifer. Wells with multiple screened intervals can be used to extract water from more than one aquifer. Within the Pajaro Groundwater Protection Zone of the Santa Cruz County portion of the PVWMA (Zone boundaries are published on a map on file with the Environmental Health Office), new well construction is limited to wells being completed in a single aquifer only (Feeney, et al, March 1999).

When not in operation, wells with screened intervals in multiple aquifers can serve as a conduit to allow groundwater to flow from one aquifer to another. This can pose problems if one of the aquifers is intruded with seawater, or is otherwise contaminated. In particular, seawater has a higher specific gravity than fresh water. As seawater intrudes into and contaminates a fresh water aquifer, there is an increase in specific gravity that will cause the "heavier" seawater-intruded-groundwater to flow down a well and into the lower elevation aquifer, resulting in seawater contamination of the lower aquifer. This effect may be magnified by the hydrostatic pressure difference between aquifers.

It is therefore important that a consistent procedure be developed to guide decommissioning of groundwater wells that are abandoned from operation. The California Department of Water Resources has regulations that govern the construction and destruction of wells (DWR, 1974) that are applicable to all of California. The Monterey County Water Resources Agency adopted an ordinance that incorporates the requirements set by DWR, including sealing of the well casing to prevent vertical migration of contaminated water within the well. The PVWMA has a program for notifying the respective county whenever an abandoned well is discovered. PVWMA may consider an ordinance similar to that adopted by MCWRA.

Well Replacement:

Well replacement is a concern to groundwater users throughout the Pajaro Valley. Along the coast, where seawater intrusion is occurring, some wells that are seawater intruded may have to be replaced with wells that are drilled into a non-intruded aquifer. In inland areas, well deepening is used to enhance well yield or escape nitrates or other water quality problems associated with the shallow groundwater zones. These replacement wells may be needed to meet the users' water needs on an interim basis, while the long-term water supply projects are being built.

A current Santa Cruz County regulation allows a well to be replaced only with a well that is constructed to the same depth, unless CEQA documentation prepared by the well owner demonstrates such a replacement will have no detrimental impact on groundwater resources. The purpose of this regulation is concern that replacement of wells in shallow intruded aquifers with wells in deeper, less-intruded aquifers could serve to accelerate seawater intrusion into the deeper aquifer.

Once implemented, the projects identified and evaluated in this draft Revised BMP will obviate the need for this regulation because they will eliminate over-drafting and seawater intrusion of the basin by providing an overall long-term reduction in coastal groundwater pumping.

In the inland areas of the Pajaro Valley the need for this regulation is also questioned, because replacement wells drilled to a deeper aquifer do not directly impact the advance of seawater intrusion, nor overall basin groundwater balance. The groundwater underlying the Pajaro Valley flows into the aquifers from the surrounding aquifers, infiltrates through the river and streambeds, and recharges through the soil structure. In general, the flow of groundwater in the aquifers underlying the Pajaro Valley is from the inland areas toward Monterey Bay, with the exception of the areas along the coast where groundwater levels are below sea level and seawater flows into the aquifer.

5 Basin Management Plan Strategies

The previous draft BMP 2000 contained a recommended Basin Management Plan for balancing the basin and eliminating seawater intrusion. However, public review of that draft document indicated the need to more fully assess the merits of alternative management options, particularly those strategies that incorporate local supply options.

This section presents four alternative Basin Management strategies that incorporate a range of feasible local supply options that were identified and evaluated in Section 4. These alternatives are:

- **BMP 2000 Alternative.** This strategy is similar to the one identified in the draft BMP 2000 document published in May 2000. Modifications to this Alternative between the BMP 2000 document and this Draft Revised BMP were limited to updating individual cost estimates.
- **Local-Only Alternative.** This strategy demonstrates the costs and implications associated with developing *only* local water supplies and storage projects within the Pajaro basin. The Local-Only Alternative was developed based on recommendations from local stakeholders, and information about this alternative is extracted from *Local-Only Water Supply Alternative Evaluation* (RMC, May 2001).
- **Modified Local Alternative.** This strategy builds upon the projects that comprise the Local-Only Alternative and maximizes potentially feasible local projects. It supplements the local projects with the minimum quantity of imported water needed to balance supply with current demand. The concept behind this alternative was developed based on recommendations from local stakeholders.
- **Modified BMP 2000 Alternative.** This strategy presents a potential modification of the BMP 2000 alternative that reduces the size of the import pipeline. The size reduction is brought through in-basin storage with groundwater injection/extraction and elimination of the inland distribution system. Other project components were also modified from the original BMP 2000 alternative to maximize their cost effectiveness.

Table 5-1 compares the four alternatives in terms of which projects they involve and what issues may be associated with their implementation.

A description, cost estimate, map, operational strategies, requirements for meeting anticipated future agricultural and urban increases in water demand, and a discussion of each alternative is provided in the following sections.

Table 5-1: Comparison of Alternatives

Project	BMP 2000	Local-Only	Modified Local	Modified BMP	Issues and Comments
5,000 AF Water Conservation	♦	♦	♦	♦	Requires 5,000 AFY of water conservation.
Harkins Slough Project	♦	♦	♦	♦	Construction of diversion and recharge basin is complete.
Coastal Distribution System	♦	♦	♦	♦	Necessary to eliminate coastal pumping to maximize groundwater yield.
Recycled Water Project (4,000 AFY)	♦			♦	Blending facility required to meet water quality requirements; additional permits required.
Recycled Water Project (6,000 AFY)			♦		Blending facility required to meet water quality requirements; additional permits required; additional treatment for recharge of recycled water.
Recycled Water Project (7,700 AFY)		♦			Blending facility required to meet water quality requirements; additional permits required; additional treatment for recharge of recycled water.
Murphy Crossing Project	♦				Protests from DFG; additional studies requested by NMFS.
Watsonville Slough Project		♦	♦		Water rights permit; restoration of the slough probably required.
College Lake Project			♦		Protests by DFG and NMFS; water rights permit required.
Expanded College Lake Project		♦			Same issues as above two projects; plus water rights permit required for Corralitos Creek. Injection may require reverse osmosis treatment.
60" Import Water Project	♦				Implementation requires resolution of Measures D and K and acquisition of CVP contracts.
54" Import Water Project				♦	Implementation requires resolution of Measures D and K and acquisition of CVP contracts; requires filtration for injection.
42" Import Water Project			♦		Implementation requires resolution of Measures D and K and acquisition of CVP contracts; requires filtration for injection.
Additional 5,000 AFY Water Conservation via Land Fallowing		♦			Requires the equivalent of 2,200 acres of basin-wide land fallowing, or approximately 800 to 1,000 acres of fallowing near the coast.
Bolsa de San Cayetano Project					Significant seismic, environmental and cost issues eliminated this component.
Seawater Desalination					Permitting difficulties for disposal of brine; cost-prohibitive.

Note: See Sections 5.1 – 5.4 for additional information about data contained in Table 5-1.

5.1 BMP 2000 Alternative

The BMP 2000 included a recommended alternative that incorporated imported CVP water to supplement locally developed supplies to eliminate seawater intrusion and balance the basin, without regard to the location of the water source. This strategy identified the following projects as components of the recommended BMP 2000 alternative:

- Coastal Distribution System;
- Conservation: 7-year plan (5,000 AFY);
- Harkins Slough with Harkins Slough Recharge Basin with Supplemental Wells and Connections (1,100 AFY);
- Murphy Crossing with Recharge Basins (1,600 AFY);
- Recycled Water (4,000 AFY); and
- 60-inch Import Water Project with Inland Distribution System and Supplemental Wells (10,300 AFY).

A map of the BMP 2000 facilities is shown in Figure 5-1. The BMP 2000 Alternative was created in order to meet current urban and agricultural demand of 71,500 AFY and eliminate seawater intrusion. The current BMP 2000 Alternative would fully meet existing demand conditions, but would not provide any additional supply necessary to meet future demands.

With existing supplies from the Corralitos Creek Filter Plant and other surface water diversions, the total groundwater demand is reduced to approximately 69,000 AFY. The implementation of the agriculture and urban water conservation program will further reduce the total groundwater demand to 64,000 AFY.

As previously discussed in Section 2.8.2, the basin sustainable yield assuming coastal pumping reductions and an extremely dependable supplemental supply is 48,000 AFY. However, when supplemental supplies are hydrologically dependent, the basin sustainable yield deceases as groundwater pumping is increased to meet demand during drought or below normal years. Due to the hydrologic dependency of the BMP 2000 Alternative water supply projects, the sustainable yield of the groundwater basin following implementation of the BMP 2000 alternative is estimated to be approximately 47,000 AFY.

With development of recycled water, Murphy Crossing, and Harkins Slough local supplies, the estimated average annual delivered CVP water required to balance the basin is 10,300 AF. Assuming an average CVP annual delivery of 60% of contract entitlement, the PVWMA will need to secure water contracts for approximately 17,200 AFY to meet this need. Total supplemental yield of the capital projects associated with this alternative were estimated to be approximately 17,000 AFY, representing a total sustainable yield for all supplies of 64,000 AFY.

Although 17,000 AFY is the total quantity of supplemental supply required to balance the basin, approximately 18,500 AFY of water must be delivered to the CDS in order to develop a hydrostatic barrier resulting in sustainable groundwater pumping of 47,000 AFY. Therefore, on average at least 1,500 AFY would be pumped from supplemental wells east of Highway 1 and delivered to the CDS.

In addition to providing in-lieu recharge and storage of water in the groundwater aquifer, the IDS also provides the benefit of supplying higher quality water to inland farmers that presently irrigate with lower quality water.

The water balance objective for this alternative is summarized in Table 5-2.

Figure 5-1: Map of BMP 2000 Alternative

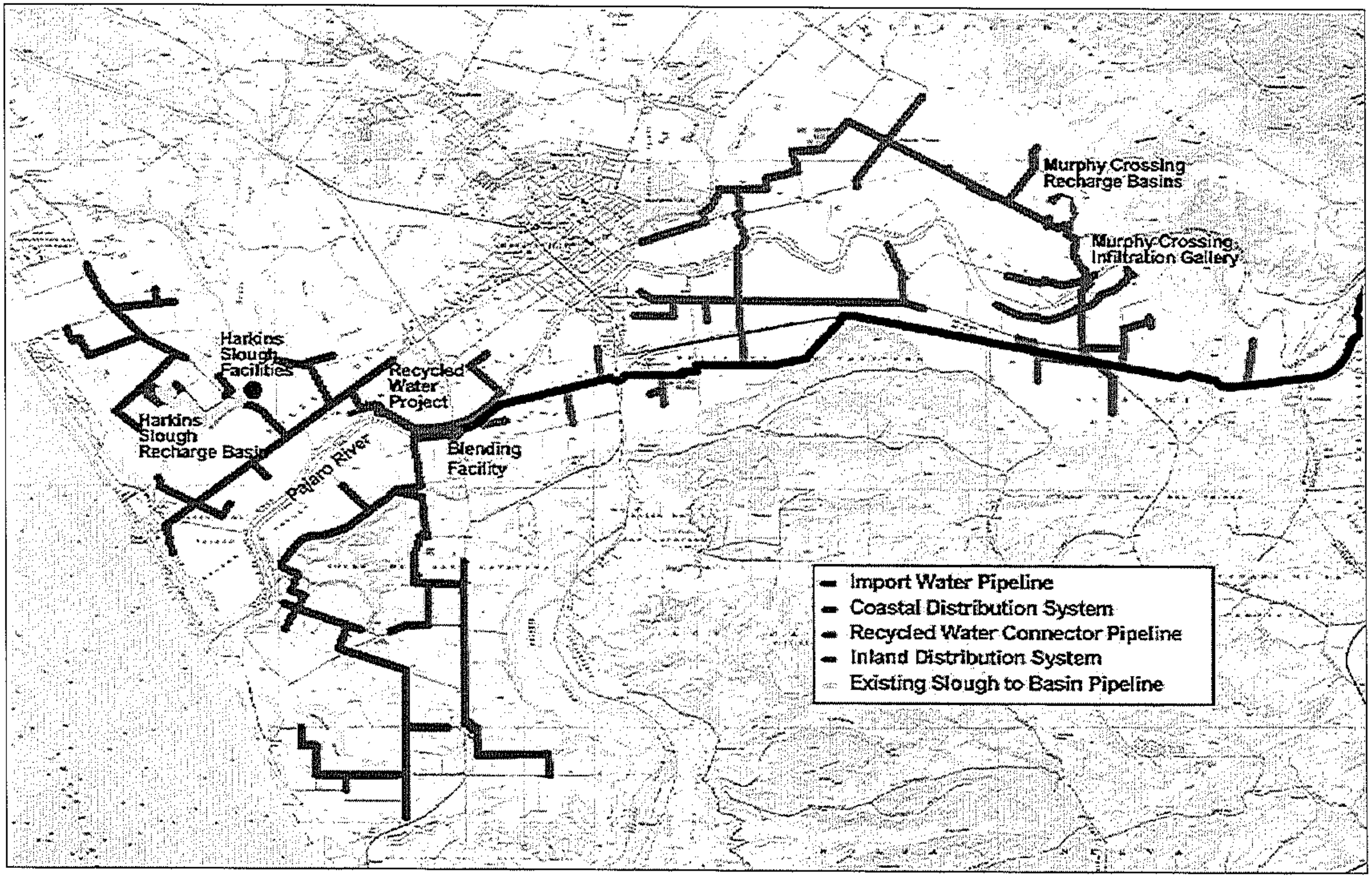


Table 5-2: BMP 2000 Alternative Water Balance Objective

Water Demand Objective	**AFY**
Current Agricultural	59,300
Current Urban	12,200
Total Demand	**71,500**
Corralitos Creek Filter Plant	(1,100)
Other Surface Water Diversions	(1,000)
Remaining Demand[a]	**69,000 (rounded)**
Future Agricultural and Urban Water Conservation	(5,000)
Total Demand Objective	**64,000**
Water Supply Objective	
Existing Basin Sustainable Yield	24,000
Increase in Sustainable Yield due to Coastal Pumping Management	23,000
Murphy Crossing with Murphy Crossing Recharge Basin	1,600
Harkins Slough with Harkins Slough Recharge Basin	1,100
Recycled Water	4,000
Import Water Project	10,300
Total Supply Objective	**64,000**

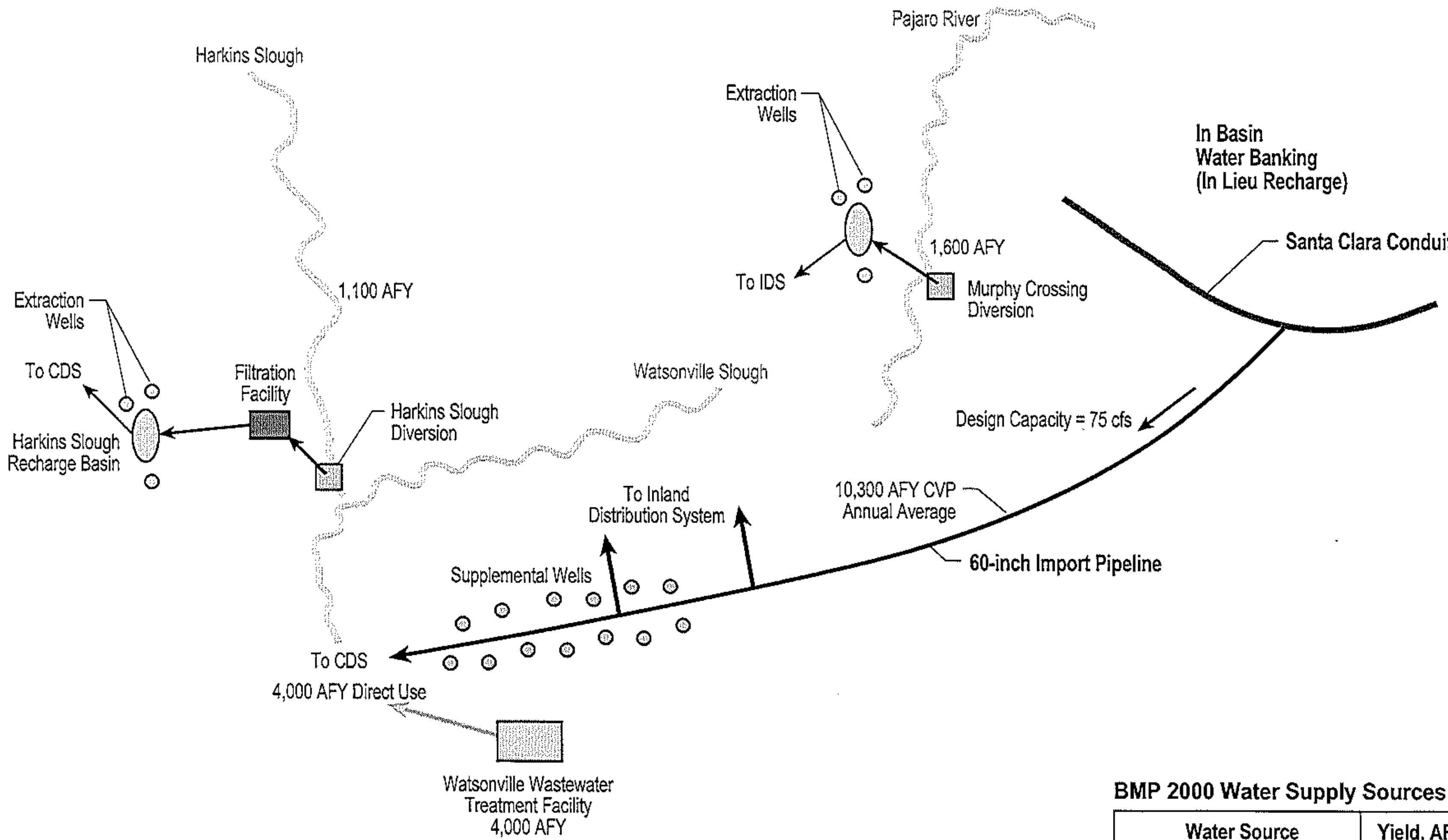
Footnotes:
a. Values rounded to two significant figures or to the nearest thousand to represent the values significant accuracy.

The locations of the supplemental wells have yet to be identified, but are anticipated to be in an area adjacent to the Import Pipeline between Highway 1 and Allison Road. Conservation measures included in the BMP 2000 Recommended Alternative would be at levels identified in the WC 2000. The water quality objective is also consistent with the CCRWQCB Basin Plan water quality criteria identified in Section 2. No out-of-basin storage of water is included in this alternative, although it could be incorporated if determined to be cost-effective.

Operational Strategy:

A flow schematic for the BMP 2000 alternative is shown in Figure 5-2.

CVP water would be the major source water supply, and would be conveyed from the Santa Clara Conduit to the CDS and IDS for direct use. Water from the CVP would be combined with water extracted from the Murphy Crossing recharge basin and direct Pajaro River diversions to supply the IDS. Supplying the IDS with supplemental water supplies results in in-lieu recharge of the basin, and a reduction in groundwater pumping. In the CDS, CVP water would be blended with recycled water at a blending facility located near the intersection of Highway 1 and the Pajaro River, prior to distribution. Water extracted from the Harkins Slough Recharge Basin would be blended within the San Andreas portion of the CDS. CDS deliveries provide a basis for stopping agricultural pumping along the coast to assist in the creation of the coastal hydrostatic barrier.



BMP 2000 Water Supply Sources

Water Source	Yield, AFY
Recycled Water	4,000
Harkins Slough	1,100
Murphy Crossing	1,600
CVP - Import Water	10,300
Total	**17,000**

Figure 5-2. BMP 2000 Schematic

During a normal rainfall year, farmers in the CDS would receive a blend of CVP, Murphy Crossing, and recycled water, with farmers in the Dunes area receiving the Harkins Slough Project water in addition to the blended supply. Supplemental wells would be utilized to meet peak day demands. Farmers in the IDS would receive a blend of Murphy Crossing and CVP water, supplemented by groundwater to meet peak day demands.

During a below-normal rainfall year, inland farmers would only receive water from the import pipeline after the CDS demands had been accounted for. As a result, inland farmers on the IDS would be required to maintain their on-site wells for use as a backup supply. Farmers receiving water from the CDS would be supplied water from supplemental wells during dry years in order to maintain the coastal hydrostatic barrier. The quantity of water conveyed to the CDS by supplemental wells would be the difference between CDS demand and available supplies from CVP, Murphy Crossing extraction, recycled water and Harkins Slough extraction.

During an above-normal year of CVP deliveries, both the CDS and IDS would be operated similar to a normal year. However, it is anticipated that the additional water supplies would be utilized by increased numbers of IDS farmers, resulting in increased in-lieu recharge in the inland portion of the groundwater basin. Less water would be pumped from the supplemental wells in order to maximize use of imported water supplies and maximize water stored in the inland and coastal groundwater basins.

Cost Estimate:

The BMP 2000 alternative relies mainly on imported and recycled water supplies. A significant portion of the cost is associated with construction of the Import Pipeline and associated facilities, and purchase of CVP contracts. The cost of the contract is estimated to be $1,300 per AF of firm contract supply, based on the cost of the Mercy Springs contract assignment, as described in Section 4.12. The cost of 10,300 AF average annual CVP water supplies is estimated to be $13.4 million.

The cost of the CVP contract is included in the cost of the 60-inch Import Water Project with IDS. In addition, the $117.4 million for the 60-inch Import Water Project with IDS includes costs for supplemental wells needed to meet peak demand and to supply additional water during drought years.

The cost estimate contained in Table 5-3 includes the same projects identified in the BMP 2000, but with cost estimates updated to Spring 2001. The updated costs reflect the result of bid estimates received for the Harkins Slough Project and additional information collected between the distribution of the Draft BMP 2000 and this document. Actual implementation costs may vary from the costs shown due to scheduling, design modifications or other actions.

Table 5-3: BMP 2000 Alternative Cost Estimate

Project Element	($ Millions)
Coastal Distribution System	$34.4
Conservation (7-year)	$1.7
Harkins Slough Project with Harkins Slough Recharge Basin	$6.6
Murphy Crossing with Recharge Basins	$6.6
Recycled Water Project (4,000 AFY)	$19.2
60-inch Import Water Project with Inland Distribution System, CVP contract purchase and Supplemental Wells	$117.4
Subtotal	**$185.8**
Financial & Bond Sale Cost @ 1.0%	$1.9
Recycled Water Grant (Title XVI)	$(20.0)
Total Capital Cost	**$167.6**
Annualized Capital Cost at 6% for 30 years	$12.2
Annual O & M Costs	$4.4
Total Annual Cost	**$16.6**
Income from PVWMA Delivery Charges on Customers Receiving Delivered Water @ $92 per AF (18,500 AFY)	$1.7
Adjusted Total Annual Cost	**$14.9**
Combined Sustainable Yield (AFY)	64,000
Cost per AF ($/AF)[a]	**$233**
PVWMA Delivery Charge for Customers Receiving Delivered Water ($/AF)	**$92**
Cost per AF plus PVWMA Delivery Charge for Customers Receiving Delivered Water ($/AF)	**$325**

Footnotes:
a. Cost to growers pumping from the groundwater basin.

Notes:
1. Spring 2001 construction costs.
2. Capital Recovery Factor (A/P) for 6% at 30 years is 0.07265.
3. Cost estimates include a Construction Contingency of 20%, Engineering/Legal/Admin/Permits Contingency of 17.5%, and Environmental and Permitting Contingency of 5%.
4. *Cost per AF shown assumes (total annual costs minus total annual avoided cost of pumping) divided by combined* sustainable yield.

Future conditions (2040 Demand):

In order to meet potential future increases in agricultural and urban water use, an additional 9,000 AFY (3,900 AFY of urban demand, plus 5,100 AFY of agricultural demand) of supplies must be identified and secured for development to occur. Local supply options to meet this demand could include College Lake, Watsonville Slough, and expanded recycled water use. However, the most cost-effective alternative would be an increase in the amount of imported CVP water. This would require purchase of additional CVP supplies and expansion or maximization of the existing coastal or inland distribution systems. It is also expected that this will increase the required number of supplemental wells, particularly if water deliveries from CVP average 60% of the CVP contract entitlement. It is not expected that an increase in CVP deliveries would require additional pumping (CH2M Hill, 1997).

Although expanded conveyance, distribution and supply facilities are required to meet future demands, these facilities have not been quantified in detail. For estimation purposes, it was assumed that the unit cost of these additional facilities would be similar to the unit costs of facilities evaluated in this document. The cost for increased distribution service area was based on the CDS cost estimate, assuming a similar $/AFY unit cost. The number of additional supplemental wells was assumed based on the percent increase in CVP contract entitlement. Preliminary cost estimates for these facilities are summarized in

Table 5-4. It should be noted that expansion of the water delivery capabilities would be incremental in nature, and would staged to respond to increased demands on as as-needed basis.

Table 5-4: Additional Facilities Required to Meet 2040 Agricultural and Urban Demand

Item	Quantity	Loaded Unit Cost	Cost ($ Millions)
CVP Contract	9,000 AFY	$1,300/AFY	$11.7
Increased Distribution[a]	9,000 AFY	$1,860/AFY	$16.7
Increased Supplemental Wells[b]	8 wells	$530,000/well	$4.2
Total Capital Cost			**$32.6**

Footnotes:

a. Unit cost estimate based on construction of a $34.4 million CDS serving 18,500 AFY.

b. The number of additional wells was based on a linear estimate assuming 15 wells to supply approximately half of the peak hour demand for an 18,500 AFY CDS. No additional wells are provided for reliability. Loaded unit cost for supplemental wells includes filtration treatment, pipelines, well, and land purchase of 1 acre. Estimates also include 20% contingency, 17.5% engr/legal/admin/permitting, and 5% environmental and permitting contingency.

Key Points and Implementation Issues:

Presented below is a summary of key points and implementation issues regarding this alternative:

- Utilization of the IDS for in-lieu groundwater banking and delivery of CVP water will improve water quality to many farmers in the inland portion of the basin. Numerous farmers in this area pump groundwater with TDS concentrations above 900 mg/L. Supplementing this source with CVP water would be expected to improve crop yield and soil drainage as well as increase groundwater levels.

- In addition to pumping benefits previously discussed, the 60-inch import pipeline with a maximum flow rate of 75 cfs provides sufficient flexibility in the event additional water supplies are required.

- Rights to water from a Pajaro River diversion at Murphy Crossing have yet to be obtained, and were challenged by DFG.

- Harkins Slough supplemental wells and connections will provide peaking supply for the distribution system until additional supplemental supplies can be developed. Once these supplies are developed, these wells would continue to provide peaking supply for the entire CDS.

5.2 Local-Only Alternative

The objective of the Local-Only Alternative (LOA) is to eliminate seawater intrusion through the implementation of local water supply projects and demand management measures, without importation of water from outside the basin. Demand management measures include high levels of conservation above those identified in WC 2000.

In developing the LOA, it was recognized that the overall quality of water supplied to growers would be less than the identified objectives, since a higher portion of the overall water supply is composed of recycled water. Therefore, the identified water quality objectives were not adopted as an objective of this alternative. Instead, the general aim of the LOA is to provide water quality that avoids a significant level of impact to agricultural production.

The LOA includes the following water supply projects and demand management plan:

- Coastal Distribution System;
- Conservation: 7-year plan (5,000 AFY);
- Additional Conservation (5,000 AFY);
- Expanded College Lake with Pinto Lake, Corralitos Creek, Harkins Slough, and Watsonville Slough Diversions, and Aquifer Storage and Recovery (6,700 AFY);
- Recycled Water Project with Harkins Slough and North Dunes Recharge Basin (7,700 AFY); and
- Land Fallowing (Achieved with annual agriculture land leases of 2,200 acres basin-wide.)

The proposed location of these facilities is shown in Figure 5-3.

The Local-Only Alternative would maximize the use of recycled water by constructing an additional percolation basin as well as use of the Harkins Slough recharge basin for seasonal storage of recycled water. The proposed North Dunes recharge basin and injection/extraction wells would be located approximately 1,500 ft southwest of the intersection of Sunset Beach Road and San Andreas Road. This would allow use of approximately 7,700 AF of annual recycled water for irrigation in the Pajaro Valley. The total yield of the Expanded College Lake Project with supplemental elements was estimated to be 6,700 AFY based on hydrologic analyses completed by the PVWMA, providing a total additional supply of approximately 14,400 AFY.

Additional conservation of 5,000 AFY was then assumed, increasing total agricultural and urban water conservation to 10,000 AFY (9,000 AFY agricultural and 1,000 AFY urban conservation) or approximately 14% of current overall PVWMA demands. The combined conservation is summarized in Table 5-5. Water use factors for various agricultural crops were reduced to account for either increased conservation or reduction in number of crop rotations. Modeling of the alternative was then completed with the PVIGSM to determine sustainable groundwater basin yield.

The Local-Only Alternative was modeled with the PVIGSM utilizing the local water supply projects that produce an average yield of 14,400 AFY, with conservation and no land fallowing. PVIGSM results from this scenario showed significant basin imbalance and seawater intrusion resulting from insufficient water supplies, reduced infiltration of surface water supplies, and the impact of hydrologic conditions on surface water supplies. As a result, demand management techniques above those modeled, such as those identified in Section 3, were required to bring the basin into balance and eliminate seawater intrusion.

A second model run was utilized to determine the required level of land fallowing necessary to meet these objectives. Based on modeling iterations, the LOA would require the equivalent of 2,200 acres of basin-wide agricultural land fallowing in addition to the assumed 14% conservation within the PVWMA service area in order to balance the basin. This land fallowing reduces the overall basin water demand by approximately 3,000 AFY. Modeling input assumptions are summarized in Table 5-5.

Table 5-5: PVIGSM Modeling Input to Achieve Basin Balance for LOA

Item	Assumption
Total Agricultural & Urban Conservation	10,000 or 14% (of Current Water Use)
Agricultural Land Fallowing[a]	2,200 acres

Footnotes:

a. The reduction in water demand due to land fallowing is in addition to other water conservation.

Notes:

1. The PVIGSM model assumes this result to be equivalent to 14,400 AFY from the hydrologic model. PVIGSM intricacies limit the input of the exact value.

As previously discussed in Section 2.8.2, the basin sustainable yield assuming coastal pumping reductions and an extremely dependable supplemental supply is 48,000 AFY. However, when supplemental supplies are hydrologically dependent, the basin sustainable yield deceases as groundwater pumping during drought or below normal years is increased to meet demand. Due to the hydrologic dependency of local surface water supplies, coupled with the low yield of supplemental supplies, the sustainable groundwater yield for the LOA has been estimated to be 42,000 AFY. Including demand management measures and the supplemental supply yield associated with the LOA, the supply and demand in the PVWMA boundary would be balanced at 56,000 AFY.

This sustainable yield estimate is based on the anticipated reliability of the various supplies, creation of the hydrostatic barrier and modeling assumptions. With development of the Recycled Water Project, the Harkins Slough and North Dunes Recharge Basins, and the Expanded College Lake Project, the total yield of the capital projects associated with this alternative was estimated to be approximately 14,400 AFY. This represents a total sustainable yield for all supplies of 56,000 AFY. The water balance objective for this alternative is summarized in Table 5-6.

Figure 5-3: Map of Local-Only Alternative

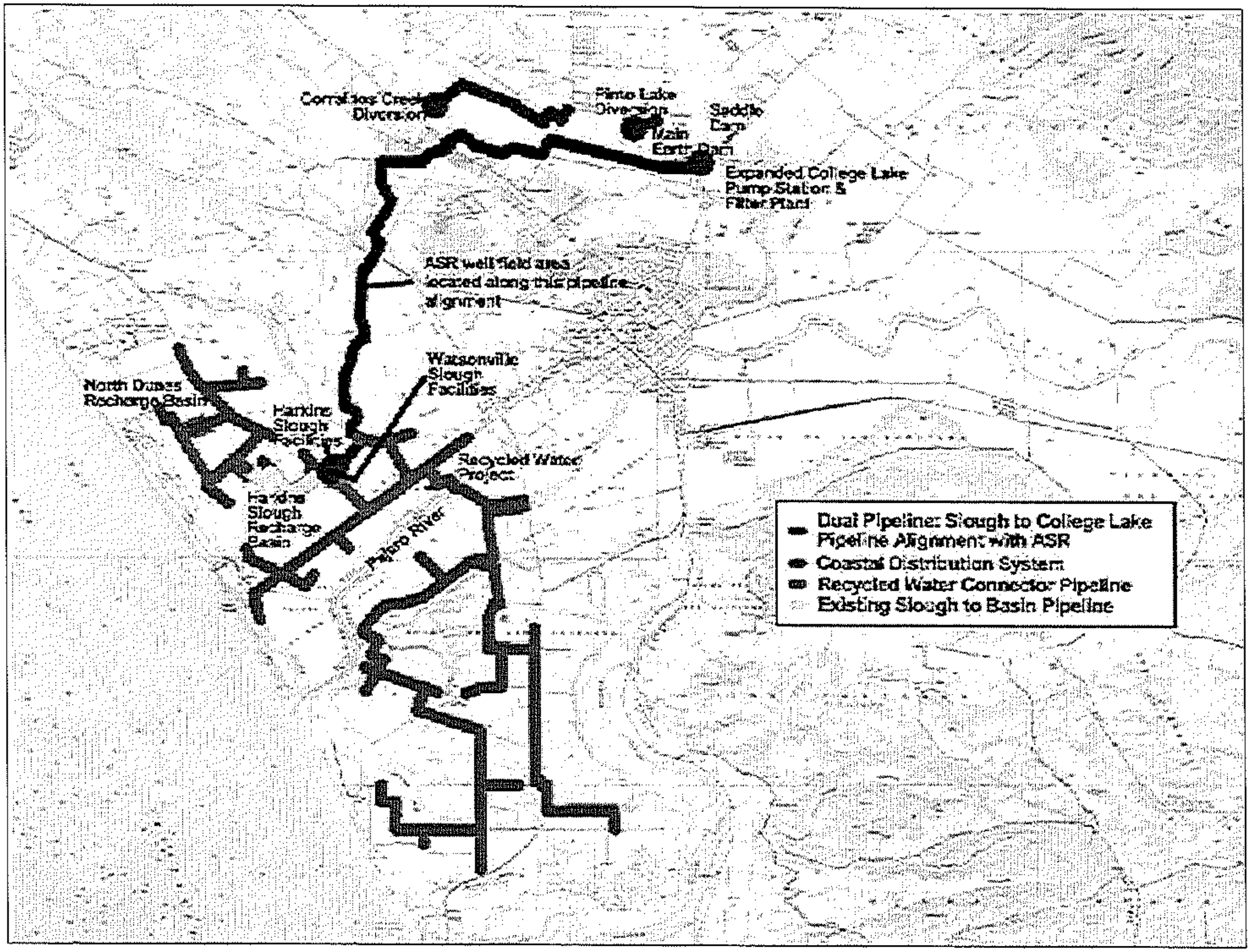


Table 5-6: LOA Water Balance Objective

Water Demand Objective	**AFY**
Current Agricultural	59,300
Current Urban	12,200
Total Demand	**71,500**
Corralitos Creek Filter Plant	1,100
Other Surface Water Diversions	1,000
Remaining Demand[a]	**69,000 (rounded)**
Future Agricultural and Urban Water Conservation (WC 2000)	(5,000)
Additional Water Conservation	(5,000)
Land Leases – Average Water Demand Mitigated	(3,000)
Total Demand Objective	**56,000**
Water Supply Objective	
Existing Basin Sustainable Yield	24,000
Increase in Sustainable Yield due to Coastal Pumping Management, demand management, and land fallowing	18,000
Expanded College Lake with Pinto Lake, Corralitos Creek, Harkins Slough, and Watsonville Slough Diversions, and ASR	6,700
Recycled Water Project with Harkins Slough and North Dunes Recharge Basin	7,700
Total Supply Objective[a]	**56,000 (rounded)**

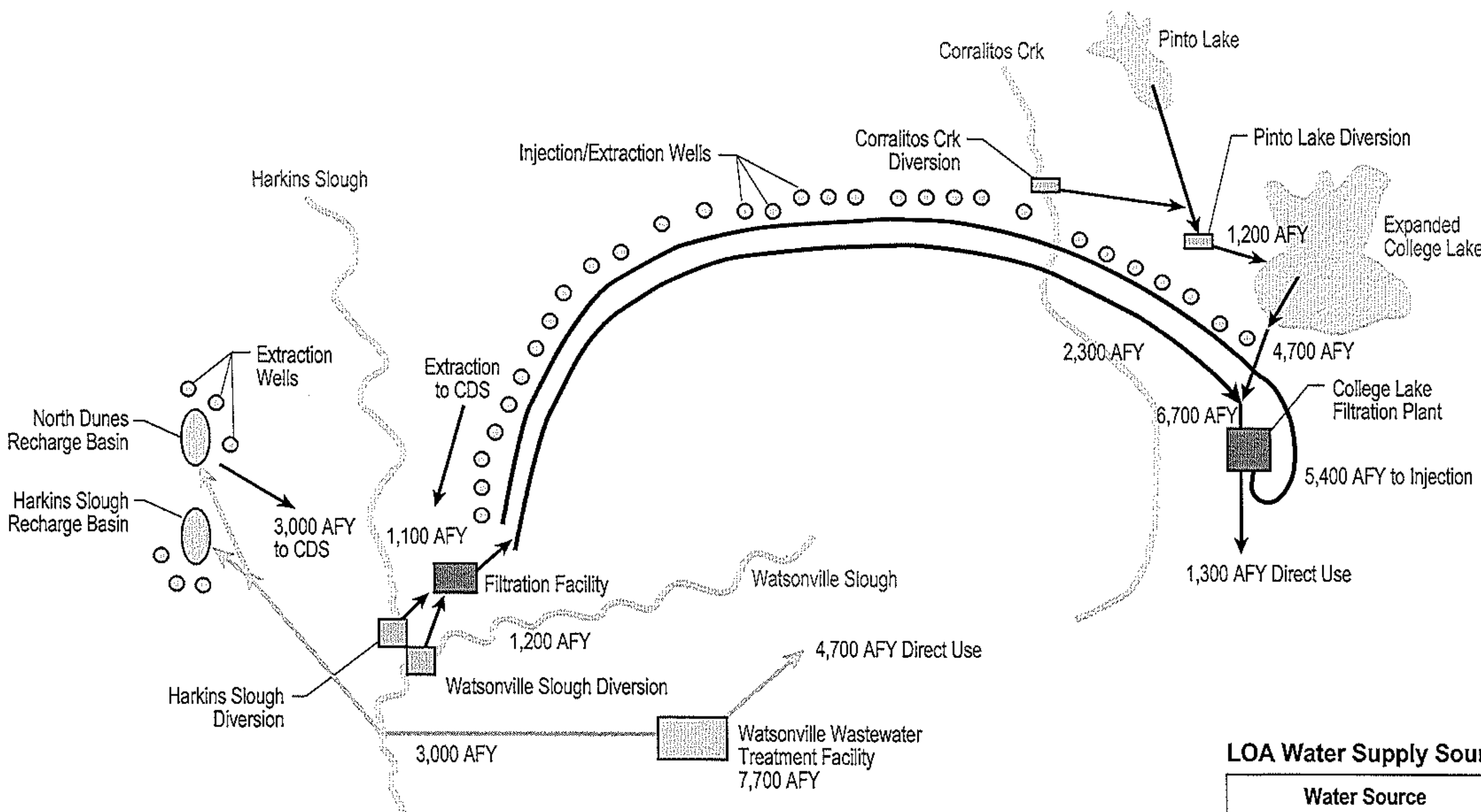
Footnotes:
a. Values rounded to two significant figures or to the nearest thousand to represent the values significant accuracy.

Operational Strategy:

A flow schematic for the LOA is shown in Figure 5-4.

Operationally, the Local-Only Alternative would maximize recycled water use, and at times will deliver up to 100% recycled water, which would result in TDS concentrations of up to 900 mg/L. This scenario is most likely during the beginning and end of the irrigation season. During these periods, water demands are nearly equal to the recycled water flow that is not directed to storage, and recycled water will comprise the entire water supply in many areas. The recycled water facility produces a daily average supply of 7 million gallons per day (RMC, May 2001). On an annual basis, local farmers would directly use approximately 3,000 AF of this water.

During low demand periods, nearly the entire recycled water treatment plant flow would be diverted to the North Dunes and Harkins Slough recharge basins. The Recycled Water Project with Harkins Slough and North Dunes recharge basins are described in Section 4.5.



LOA Water Supply Sources

Water Source	Yield, AFY
Recycled Water	7,700
Harkins Slough	1,100
Watsonville Slough	1,200
Pinto Lake & Corralitos Crk	1,200
College Lake	4,700
Losses due to Mitigation and Facilitiy Limitations	(1,500)
Total	**14,400**

Figure 5-4. Local-Only Alternative Schematic

The Local-Only Alternative would reroute water from the Harkins Slough and Watsonville Slough pump stations to College Lake, where it would be combined with water from College Lake, Corralitos Creek, and the Pinto Lake Diversion for ASR. Storage of water from the Harkins and Watsonville Slough Projects will require a conveyance pipeline from the sloughs to College Lake. The pipeline would serve a dual purpose of conveying water from the sloughs to College Lake for treatment and injection, then later delivery of water from the ASR wells to the CDS during the irrigation season. At College Lake, the water would be treated and then injected into the groundwater basin through wells located along a parallel conveyance pipeline. The Expanded College Lake Project could also provide storage for direct use. During the irrigation season, water would be pumped from the ASR wells and blended with recycled water extracted from the recharge basins plus recycled water directly produced at the WWTF in the plant clearwell. A central pump station would deliver the blended water to the CDS.

The entire CDS would be constructed for the Local-Only Alternative although on average only 14,400 AFY of supply would be available. Constructing the entire CDS would allow for increased agriculture during above normal rainfall years when additional water would be available from local supplies, and would allow the land fallowing to be moved throughout the CDS area.

During above normal and wet weather years, additional available surface water supplies would be stored in College Lake and injected into the groundwater basin. ASR would normally provide only seasonal storage, but during wet years there could be some carryover of injected water to the following year.

During severe dry years, little or no surface water supplies would likely be available. Therefore, the PVWMA would pump banked water from the ASR wells. Without surface water supplies, groundwater and recycled water would be the sole source of available supplies. Therefore, salinity and SAR levels are likely to be extremely high during dry periods.

<u>Cost:</u>

Table 5-7 summarizes the overall cost estimate for the Local-Only Alternative. This alternative has an estimated capital cost of $127.5 million, with an annual O & M cost of $6.6 million. The annual O & M cost includes $3.3 million for land fallowing leases based on unit cost of $1,500 per acre. Land leases were assumed to be the mechanism of land fallowing.

The estimated cost of additional conservation has a present worth of $1.7 million and was determined based on the unit cost of conservation efforts outlined in WC 2000. Although additional conservation may have a higher unit cost than that of the WC 2000, without additional data, a unit cost equal to that of the WC 2000 was used. The cost of this additional conservation is shown in Table 5-7.

Table 5-7: Local-Only Alternative Cost Estimate

Project Element	Cost ($ Millions)
Coastal Distribution System	$34.4
Conservation (7-year)	$1.7
Additional Conservation	$1.7
Expanded College Lake Project with Pinto lake, Corralitos Creek, Harkins Slough and Watsonville Slough Diversion, and ASR	$73.9
Recycled Water Project with Harkins Slough North Dunes Recharge Basin	$34.4
Construction Cost Subtotal	**$146.1**
Financial & Bond Sale Cost @ 1.0%	$1.5
Recycled Water Grant (Title XVI)	$(20.0)
Total Capital Cost	**$127.5**
Annualized Capital Cost at 6% for 30 years	$9.3
Annual Operation & Maintenance Costs	$3.3
Annual Land Leases[a]	$3.3
Total Annualized Cost	**$15.9**
Income from PVWMA Delivery Charges on Customers Receiving Delivered Water @ $92 per AF	$1.3
Adjusted Total Annual Cost	**$14.6**
Combined Sustainable Yield (AFY)	56000
Cost per AF ($/AF)[b]	**$259**
PVWMA Delivery Charge for Customers Receiving Delivered Water ($/AF)	**$92**
Cost per AF plus PVWMA Delivery Charge for Customers Receiving Delivered Water ($/AF)	**$351**

Footnotes:
a. Land fallowing is assumed to be achieved through land leases with an annual cost of $1,500/acre.
b. Cost to growers pumping from the groundwater basin.

Notes:
1. Spring 2001 construction costs.
2. Capital recovery factor (A/P) for 6% at 30 years is 0.07265.
3. Cost estimates include a Construction Contingency of 20%, Engineering/Legal/Admin/Permits Contingency of 17.5%, and Environmental and Permitting Contingency of 5%.
4. Cost for Recycled Water Project based on cost for conventional filtration and chlorination treatment processes. It does not include the expected cost of reverse osmosis treatment prior to percolation, cost for the potable water supply required for blending prior to percolation, or cost to improve water quality to meet the RWQCB basin plan objective.
5. Cost per AF shown assumes (total annual costs minus total annual avoided cost of pumping) divided by combined sustainable yield.

Future Conditions (2040 Demand):

The LOA has limited capability to further increase basin water supplies without construction of either a desalination or import water project. In order to meet anticipated future increases in agricultural and urban water use, an estimated additional 9,000 AFY (5,100 AFY Agricultural and 3,900 AFY Urban) of supplies must be identified and delivered or additional levels of demand management must be implemented to off-set supply increases that are short of the additional 9,000 AFY of demand. Additional demand management or local supplies could be implemented but are limited. Local supply projects may include the Murphy Crossing Project, Bolsa de San Cayetano Project, or a seawater desalination plant. Demand management options include purchasing additional agriculture land leases to reduce demand. However, these options would be costly and are not currently viewed as feasible or realistic.

There are no other obvious projects or management strategies to supply increases in urban water demand through construction of the LOA without developing a desalination plant or a water supply project involving importation of water from outside the Pajaro Basin. All opportunities for local supply development involve costs greatly exceeding those available from a CVP supply.

Key Points and Implementation Issues

Presented below is a summary of the key points and implementation issues regarding this alternative:

- Implementation of the Local-Only Alternative will face a number of significant regulatory and socioeconomic challenges. The proposed Watsonville Slough, Pinto Lake, Corralitos Creek, and Expanded College Lake Projects will require extensive regulatory permitting efforts. No water rights have been secured for any of these projects. In addition, fishery issues and concerns may result in mitigation measures that reduce the potential yield and increase the overall cost.

- The proposed recycled water percolation project and ASR project face additional implementation issues due to a potential degradation of existing groundwater quality and future beneficial uses of the groundwater basin. As previously discussed, water quality from College Lake is a concern and additional treatment may be required to remove nitrates and other chemical constituents before it can be injected into the groundwater aquifers. In addition, it is uncertain if the RWQCB and other regulatory agencies would permit the percolation of tertiary treated recycled water without advanced treatment beyond Title 22 levels. The draft groundwater recharge regulations generally state that reverse osmosis or equivalent treatment is required for percolation or injection of recycled water (DHS, 2001). As the Local-Only Alternative is currently configured, the recycled water to be produced at the WWTF does not meet this standard. Tertiary treatment with microfiltration would likely be required prior to reverse osmosis. The cost of additional treatment facilities to meet potential regulatory compliance concerns is not included in the LOA as it is presently configured.

- If required by DHS, reverse osmosis treatment for ASR of College Lake water would increase the estimated capital cost of the LOA by at least $12.6 million and annual O & M costs by $0.6 million (Feeney, July 2001). The capital cost assumes a 20% construction contingency, 17.5% for engineering/legal/administration/permitting, and 5% for environmental and permitting. The annual O & M cost was calculated assuming 5% of construction cost of the facilities and assuming pumping of 5,400 AFY at 100 ft head and 80% efficiency. (If microfiltration were needed as a pretreatment step for the reverse osmosis treatment, this cost would increase.)

- DHS requirements for reverse osmosis treatment of recycled effluent that is percolated into the groundwater would add an estimated $4.2 million to the capital costs of the alternative and $0.2 million in annual O&M cost. The capital cost assumes a 20% construction contingency, 17.5% for engineering/legal/administration/permitting, and 5% for environmental and permitting. The annual O & M cost was calculated assuming 5% of construction cost of the facilities and assuming pumping of 3,700 AFY at 100 ft head and 80% efficiency. (If microfiltration were needed as a pretreatment step for the reverse osmosis treatment, this cost would increase.)

- The Local-Only Alternative may face opposition as a result of both water quality concerns and the amount of land fallowing required to balance the basin. The land fallowing alternative would have a significant economic effect on the region in lost jobs, income, etc., though the magnitude of this impact has not been identified in this document. It is also unknown if the PVWMA would have the ability to acquire land leases. Historically, any fallowing of farmland has encountered strong opposition.

- Water quality will also be a major issue, as farmers can expect to receive water TDS concentrations as high as 900 mg/l during portions of the year. This is a higher TDS concentration than would be delivered by any of the other alternatives and is above the goal of 500 mg/l. Desalination treatment could be added to reduce salinity, however, this would result in significant increases in capital and O&M cost.

- Harkins Slough supplemental wells and connections would be a temporary base load supply of water to the distribution system until sufficient supplemental supplies can be developed. Once these supplies are developed, these wells can serve as additional supplemental wells for the entire distribution system.

5.3 Modified Local Alternative

This alternative builds upon the components of the Local-Only Alternative, but maximizes the more feasible local projects and supplements them with a minimum quantity of imported water. The concept behind this alternative was developed based on input from local stakeholders.

The Modified Local alternative eliminates land fallowing, replaces the Expanded College Lake Project with supplemental supplies with the smaller College Lake Project, and reduces the quantity of percolated recycled water. In addition, the high levels of conservation were reduced to coincide with conservation estimates in the WC 2000. This alternative uses the following demand management options and water supply projects:

- Coastal Distribution System;
- Conservation: 7-year Plan (5,000 AFY);
- Harkins Slough Project with Harkins Slough Recharge Basin and Supplemental Wells (1,100 AFY);
- Watsonville Slough Project with North Dunes Recharge Basin (1,200 AFY);
- Recycled Water Project with direct use and storage in the Southeast Recharge Basin (6,000 AFY);
- 42-inch Import Water Project with ASR (Injection and Extraction Wells) (6,900 AFY); and
- College Lake with Pinto Lake Diversion (1,800 AFY).

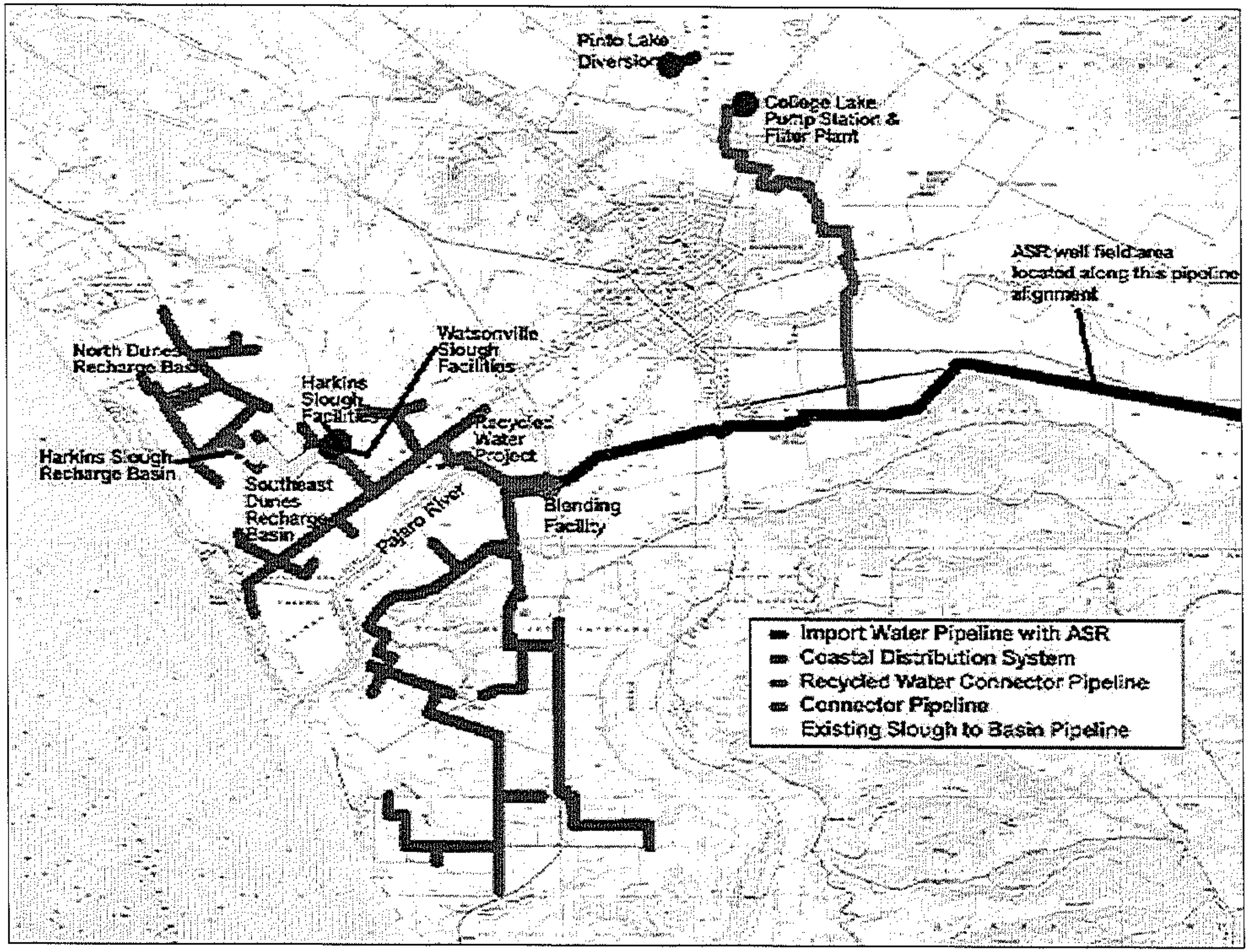
Additional details on each project, including water quality and yield are discussed in Section 4. A figure showing the location of physical facilities is included as Figure 5-5. The objective of this alternative was to eliminate seawater intrusion and balance the current agricultural and urban demand of the basin.

Conservation measures identified as a part of the Modified Local Alternative are the same as other alternatives being considered (except for the LOA), and result in water conservation of 5,000 AFY. This level of conservation reduces current groundwater demand to 64,000 AFY, *assuming no future increases.* The water quality objective of the Modified Local Alternative is intended to be consistent with the water quality objectives identified in Section 2. However, the quantity of recycled water to be used in this alternative will make it difficult to meet the desired salinity and SAR water quality criteria.

As previously discussed in Section 2.8.2, the basin sustainable yield assuming coastal pumping reductions and an extremely dependable supplemental supply is 48,000 AFY. However, as discussed earlier in Section 5, when supplemental supplies are hydrologically dependent the basin sustainable yield decreases as groundwater pumping during drought or below normal years is increased to meet demand.

Due to the hydrologic dependency of local and imported surface water supplies, the sustainable yield of the groundwater basin following implementation of the Modified Local Alternative is estimated to be approximately 47,000 AFY. With construction of the Southeast Dunes Recharge Basin for storing recycled water, the Watsonville Slough with North Dunes Recharge Basin, College Lake with Pinto Lake Diversion, and Harkins Slough, the estimated average annual CVP water required to balance the basin is 6,900 AFY. Assuming an average CVP annual delivery of 60%of contract entitlement, the PVWMA will need to secure water contracts for approximately 11,500 AFY to meet this demand. Total supplemental yields from the capital projects associated with this alternative were estimated to be approximately 17,000 AFY, representing a total sustainable yield for all supplies of 64,000 AFY.

Figure 5-5: Map of Modified Local Alternative



Although 17,000 AFY is the total quantity of supplemental supply required to balance the basin, approximately 18,500 AFY of water must be delivered to the CDS in order to develop a hydrostatic barrier resulting in sustainable groundwater pumping of 47,000 AFY. Therefore, on average at least 1,500 AFY would be pumped from supplemental wells east of Highway 1 and delivered to the CDS.

The water balance objective of the alternative is shown in Table 5-8.

Operational Strategy:

A flow schematic for the Modified Local Alternative is shown in Figure 5-6.

CVP water and recycled water will be the major sources of water supply for the Modified Local Alternative. CVP supplies would be utilized by the CDS both directly and via ASR.

During normal and above-normal rainfall years, recycled water would be conveyed to a blending facility located near the intersection of Highway 1 and the Pajaro River for blending with the combined CVP/College Lake/Pinto Lake water prior to distribution. Water extracted from the Harkins Slough Recharge Basin would be blended within the San Andreas portion of the CDS. CDS deliveries assist in the creation of the coastal hydrostatic barrier. Available CVP water above and beyond the total water demand would be filtered and injected into the groundwater aquifers. The ASR wells would be located along the Import Pipeline alignment, although exact locations of the wells and well treatment facilities have not been determined.

Table 5-8: Modified Local Alternative Water Balance Objective

Water Demand Objective	**AFY**
Current Agricultural	59,300
Current Urban	12,200
Total Demand	**71,500**
Corralitos Creek Filter Plant	1,100
Other Surface Water Diversions	1,000
Remaining Demand[a]	**69,000 (rounded)**
Future Agricultural and Urban Water Conservation	(5,000)
Total Demand Objective	**64,000**
Water Supply Objective	
Existing Basin Sustainable Yield	24,000
Increase in Sustainable Yield (Estimated) due to Coastal Pumping Management	23,000
Harkins Slough	1,100
Watsonville Slough with North Dunes Recharge Basin	1,200
College Lake with Pinto Lake Diversion	1,800
Recycled Water with Southeast Dunes Recharge Basin	6,000
Import Water Project	6,900
Total Supply Objective	**64,000**

Footnotes:
a. Values rounded to two significant figures or to the nearest thousand to represent the values significant accuracy.

In below-normal rainfall years, CVP allotments plus local water supplies will not meet CDS water demands. Therefore, CVP water previously stored in the groundwater basin would be pumped from the ASR wells and delivered to the CDS through the Import Pipeline. During severe dry-weather years, as little as 10% of CVP contract entitlement might be available. This supply would be distributed during the high-demand months to meet peak agricultural demands and minimize the required number of extraction wells. It is assumed that no water from hydrologically dependent local supplies would be available. However, water from the Recycled Water Project would be available. Based on assumptions of coastal demand and assuming ASR wells would provide supply to meet half of the peak hour demand, it is estimated that approximately 17 injection/extraction wells would be needed[1].

This alternative is currently assumed to deliver water to the CDS only. It does not include provisions to serve areas within the inland area. Areas impacted by the injection/extraction wells or the CVP pipeline would not be permitted to connect to the pipeline until such time as additional supplies could be acquired.

Recycled water provides a highly reliable supply for the Pajaro Valley. Operationally, the project would supply 4,000 AF for direct use and percolate approximately 2,000 AFY into the shallow groundwater aquifer via the three Dunes recharge basins. The reason for the intermixing of water is that water would be conveyed from the Harkins Slough, Watsonville Slough and WWTF to the three recharge basins through a common pipeline. This would reduce the percentage of recycled water percolated in any one basin, which brings the proposed project closer to compliance with draft DHS groundwater recharge regulations that require recycled water to be no more than 50 percent of the water injected or percolated into the groundwater basin. Extraction wells located along the perimeter of the recharge basins would extract water during the irrigation season and would provide a peaking supply to augment CVP supplies. Groundwater storage for these supplemental supplies would be seasonal with percolation occurring in the winter months and extraction occurring during the irrigation season.

The College Lake Project would capture runoff from the College Lake Drainage area plus diverted water from the Pinto Lake diversion. Operationally, water from College Lake would be the first supply utilized during the irrigation season allowing for agricultural production once the lake is drained. College Lake water would be treated then delivered to the CDS by a pipeline that connects College Lake to the Import Water Pipeline. Water collected by the College Lake Project would be directly used, following filtration at the College Lake treatment facility.

Cost:

The Modified Local Alternative relies mainly on supply from the Import Project and the recycled water facility. A significant portion of the cost is associated with construction of the import pipeline and associated facilities and purchase of CVP contracts. The cost of the 6,900 AFY average annual CVP water contract is estimated to be $9.0 million. This cost is included in the cost of the 42-inch Import Project with ASR. In addition, the cost for the 42-inch Import Water Project with ASR includes treatment facilities that are expected to be required prior to injection of CVP supplies.

Table 5-9 summarizes the estimated cost of the Modified Local Alternative. Assuming the PVWMA acquires a $20.0 million Title XVI recycled water grant, this alternative has an estimated capital cost of $147.6 million, with an annual O & M cost of $4.7 million.

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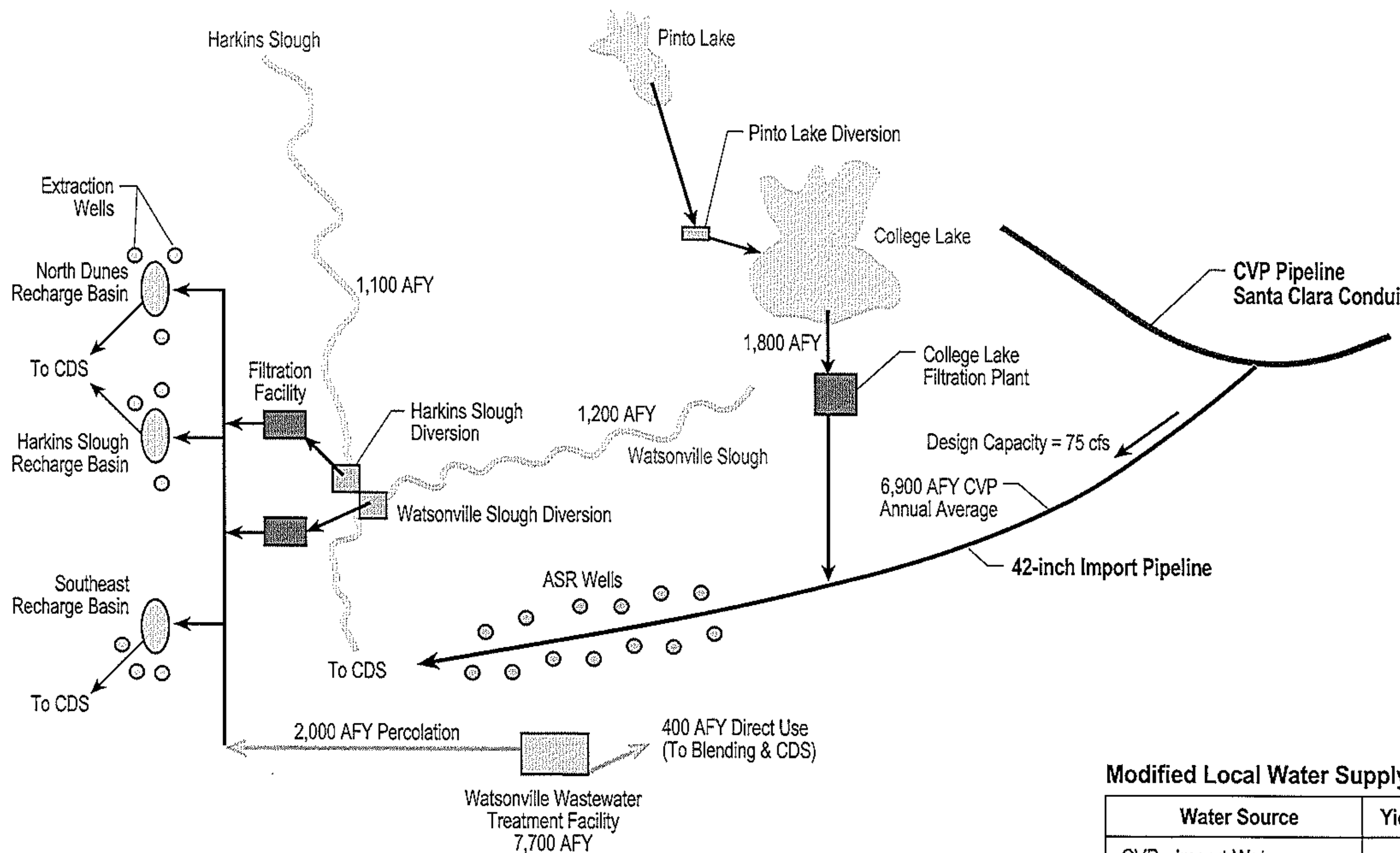
1 Assumed 2 of the 17 wells were standby, for added reliability. It was also assumed that areas would not be impacted by drawdown associated with the pumping due to build up of groundwater levels, therefore allowing existing wells to continue operation.



Modified Local Water Supply Sources

Water Source	Yield, AFY
CVP - Import Water	6,900
Harkins Slough	1,100
Watsonville Slough	1,200
College Lake & Pinto Lake	1,800
Recycled Water Project	6,000
Total	**17,000**

Figure 5-6. Modified Local Alternative Schematic

Future conditions (2040 Demand):

In order to meet anticipated future increases in agricultural and urban water uses, an additional 9,000 AFY (3,900 AFY of urban demand, plus 5,100 AFY of agricultural demand) of supplies must be identified and delivered. The cost-effective local supply options may include Murphy Crossing and expanded recycled water use, though water quality from these two sources would degrade the quality of delivered water. It is expected that the most cost-effective alternative would be via additional supplies of CVP water. This would require purchase of additional CVP contracts, and expansion or maximization of the existing CDS or construction of a portion of the IDS. It would also increase the number of ASR wells required for banking of CVP water.

This increase in CVP deliveries would probably require additional pumping, or construction of a pipeline larger than the proposed 42-inch pipeline, based on modeling conducted at 75 cfs. Construction of a 42-inch pipeline potentially limits CVP deliveries. Costs for pumping and pump stations have not been determined, though previous modeling by CH2M Hill indicates that a large diameter pipeline without pumping may be more cost effective than smaller diameter pipelines that required pumping.

Table 5-9: Modified Local Alternative Cost Estimate

Project Element	**Cost ($ Million)**
Coastal Distribution System	$34.4
Conservation (7-year)	$1.7
Harkins Slough Project with Harkins Slough Recharge Basin	$6.6
Watsonville Slough with North Dunes Recharge Basin	$6.6
Recycled Water Project with Southeast Dunes Recharge Basin	$28.6
42-inch Import Water Project with ASR	$73.9
College Lake with Pinto Lake Diversion	$14.1
Construction Cost Subtotal	**$165.9**
Financial & Bond Sale Cost @ 1.0%	$1.7
Recycled Water Grant (Title XVI)	(20.0)
Total Capital Cost	**$147.6**
Annualized Capital Cost at 6% for 30 years	$10.7
Annual Operation & Maintenance Costs	$4.7
Total Annual Cost	**$15.4**
Income from PVWMA Delivery Charges on Customers Receiving Delivered Water @ $92 per AF	$1.7
Adjusted Total Annual Cost	**$13.7**
Combined Sustainable Yield (AFY)	64,000
Cost per AF ($/AF)	**$215**
PVWMA Delivery Charge for Customers Receiving Delivered Water ($/AF)	**$92**
Cost per AF plus PVWMA Delivery Charge for Customers Receiving Delivered Water ($/AF)	**$307**

Footnotes:

a. Cost to growers pumping from the groundwater basin.

Notes:

1) Spring 2001 construction cost.
2) Capital recovery factor (A/P) for 6% at 30 years is 0.07265.
3) Cost estimates include a Construction Contingency of 20%, Engineering/Legal/Admin/Permits Contingency of 17.5%, and Environmental and Permitting Contingency of 5%.
4) Cost for Recycled Water Project based on cost for conventional filtration and chlorination treatment processes. Cost does not include cost for reverse osmosis treatment prior to percolation, or cost required to ensure compliance of blended water with basin plan objectives.
5) Cost per AF shown assumes (total annual costs minus total annual avoided cost of pumping) divided by combined sustainable yield.

Although expanded conveyance, distribution and supply facilities are required to meet the future demand conditions, these facilities have not been quantified in detail. For estimation purposes, it was assumed that the unit cost of these additional facilities would be similar to the unit costs of facilities evaluated in this document. The cost for increased distribution service area was based on the CDS cost estimate, assuming a similar $/AFY number. The number of additional injection/extraction wells was assumed based on the percentage increase in CVP contract entitlement. Preliminary cost estimates for these facilities are summarized in Table 5-10.

Table 5-10: Additional Facilities Required to Meet 2040 Agricultural and Urban Demand

Item	Quantity	Loaded Unit Cost	Cost
CVP Contract	9,000 AFY	$1,300/AFY	$11.7
Increased Distribution[a]	9,000 AFY	$1,860/AFY	$16.7
Increased Injection/Extraction[b,c]	8 wells	$700,000/well	$5.6
Total Capital Cost			**$34.0**

Footnotes:

a. Unit cost estimate based on construction of a $34.4 million CDS serving 18,500 AFY.

b. The number of additional wells was based on a linear estimate assuming 15 wells to supply approximately half of the peak hour demand for an 18,500 AFY CDS. No additional wells are provided for reliability. Load unit cost for the wells includes filtration treatment, pipelines, wells, and land purchase of 1 acre. Estimates also include 20% contingency, 17.5% engr/legal/admin/permitting, and 5% environmental and permitting contingency.

c. Includes one monitoring well per injection/extraction well and wellhead treatment at each injection/extraction well.

Key Points and Implementation Issues

Presented below is a summary of the key points and implementation issues regarding this alternative:

- A 42-inch Import Pipeline with maximum flow rate of 40 cfs could allow delivery of future increased water supplies. However the amount of needed underground storage would be significant because the limiting flow rate would be insufficient to meet demands during the irrigation season. Therefore, it may be advisable to increase the size of the pipeline to allow for additional conveyance capacity during the irrigation season. An alternate solution would include construction of a pump station, but as previously stated this would probably be a higher cost alternative on a life cycle basis.

- Currently, no water will be delivered to inland areas in the currently defined alternative. However, the Import Pipeline alignment with a larger pipeline would make it very practical for inland growers to receive CVP water.

- Rights to water from the College Lake have yet to be obtained, and were challenged by DFG and NMFS. It is unknown how the resolution of this issue will impact implementation of this alternative.

- Water rights applications for Watsonville Slough and Pinto Lake have yet to be filed with the SWRCB. Securing water rights for the diversions is a significant effort due to expected challenges from environmental agencies.

- Direct use of filtered College Lake water may still lead to *Phytophthora* problems for local strawberry farmers. If this water cannot be directly used, yield will be reduced and alternate water supplies or treatment must be identified.

5.4 Modified BMP 2000 Alternative

This alternative presents a potential modification of the BMP 2000 alternative based on input from local stakeholders. This alternative reduces the diameter of the CVP pipeline by one nominal size through in-basin storage via injection/extraction (ASR). Other non-CVP projects were also modified from the original BMP 2000 alternative to maximize their cost-effectiveness. In addition, the Murphy Crossing and IDS projects were eliminated and 64,000 AFY of water is provided after conservation with no allowance for future needs.

The goal of this alternative is to meet the identified objectives for water quality, address regulatory issues, and develop reliable supplemental supplies at the lowest overall unit cost. The most feasible projects and policies were selected, and an alternative identifying the operational strategy for utilizing water from the various projects was created. In addition to the identified capital projects, conservation was selected for demand management. Land fallowing was not selected as a preferred policy, due to the expected economic impacts to the local economy. This Modified BMP 2000 alternative consists of the following demand management policies and water supply projects:

- Coastal Distribution System;
- Conservation: 7-year Plan (5,000 AFY);
- Harkins Slough Project with Harkins Slough Recharge Basin and Supplemental Wells and Connection (1,100 AFY);
- Recycled Water Project (4,000 AFY) and
- 54-inch Import Water Project with ASR (11,900 AFY).

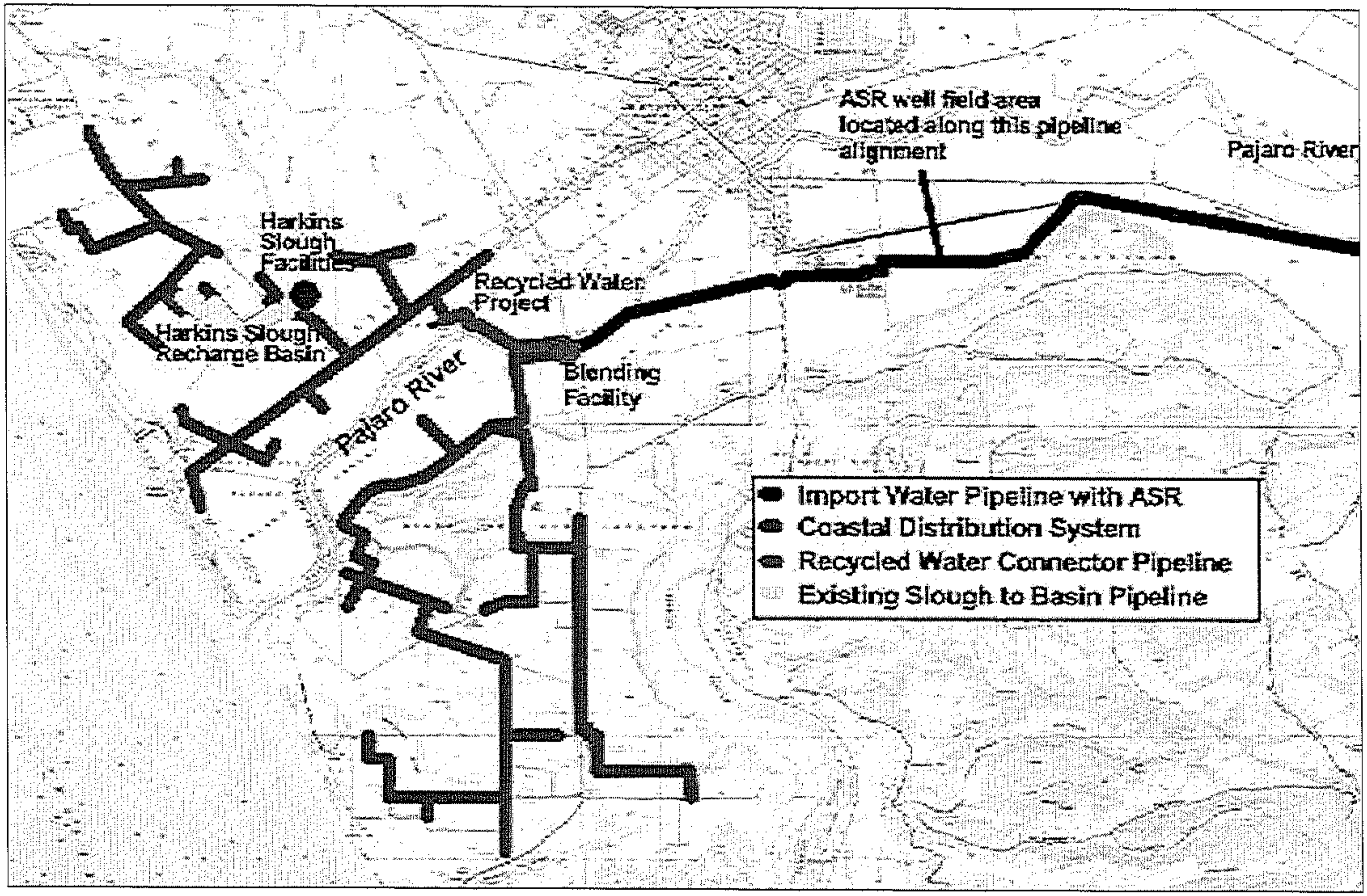
Additional details on each project, including water quality and yield are discussed in Section 4. A figure showing the location of physical facilities is included as Figure 5-7. The objective of this alternative is to eliminate seawater intrusion based on a current water use of 71,500 AFY. With existing supplies from the Corralitos Creek Filter Plant and other surface water diversions, the total groundwater demand is 69,000 AFY.

Conservation measures for the WC 2000 were identified as a part of the Modified BMP 2000 Alternative. The expected water conservation of 5,000 AFY would reduce groundwater demand to 64,000 AFY assuming no future increases.

As previously discussed in Section 2.8.2, the basin sustainable yield assuming coastal pumping reductions and an extremely dependable supplemental supply is 48,000 AFY. However, when supplemental supplies are hydrologically dependent, the basin sustainable yield deceases as groundwater pumping during drought or below normal years is increased to meet demand.

Due to the hydrologic dependency of local surface and imported CVP water supplies, the sustainable yield of the groundwater basin following implementation of the Modified BMP 2000 alternative is estimated to be approximately 47,000 AFY. With construction of the Recycled Water Project plus the existing Harkins Slough local supplies, the estimated average annual CVP water required to balance the basin is 11,900 AFY. Assuming an average CVP annual delivery of 60% of contract entitlement, the PVWMA will need to secure CVP water contracts of approximately 19,800 AFY to meet this need. Total supplemental yield of the capital projects associated with this alternative were estimated to be approximately 17,000 AFY, representing a total average sustainable yield for all supplies of 64,000 AFY.

Figure 5-7: Map of Modified BMP 2000 Alternative



Although 17,000 AFY is the total quantity of supplemental supply required to balance the basin, approximately 18,500 AFY of water must be delivered to the CDS in order to develop a hydrostatic barrier resulting in sustainable groundwater pumping of 47,000 AFY. Therefore, on average at least 1,500 AFY would be pumped from supplemental wells east of Highway 1 and delivered to the coast distribution system.

The water balance objective of the alternative is shown in Table 5-11.

Table 5-11: Modified BMP 2000 Alternative Water Balance Objective

Water Demand Objective	**AFY**
Current Agricultural	59,300
Current Urban	12,200
Total Demand	**71,500**
Corralitos Creek Filter Plant	(1,100)
Other Surface Water Diversions	(1,000)
Remaining Demand[a]	**69,000 (rounded)**
Future Agricultural and Urban Water Conservation	(5,000)
Total Demand Objective	**64,000**
Water Supply Objective	
Existing Basin Sustainable Yield	24,000
Increase in Sustainable Yield (Estimated) due to Coastal Pumping Management	23,000
Harkins Slough	1,100
Recycled Water Project	4,000
Import Water Project with ASR	11,900
Total Supply Objective	**64,000**

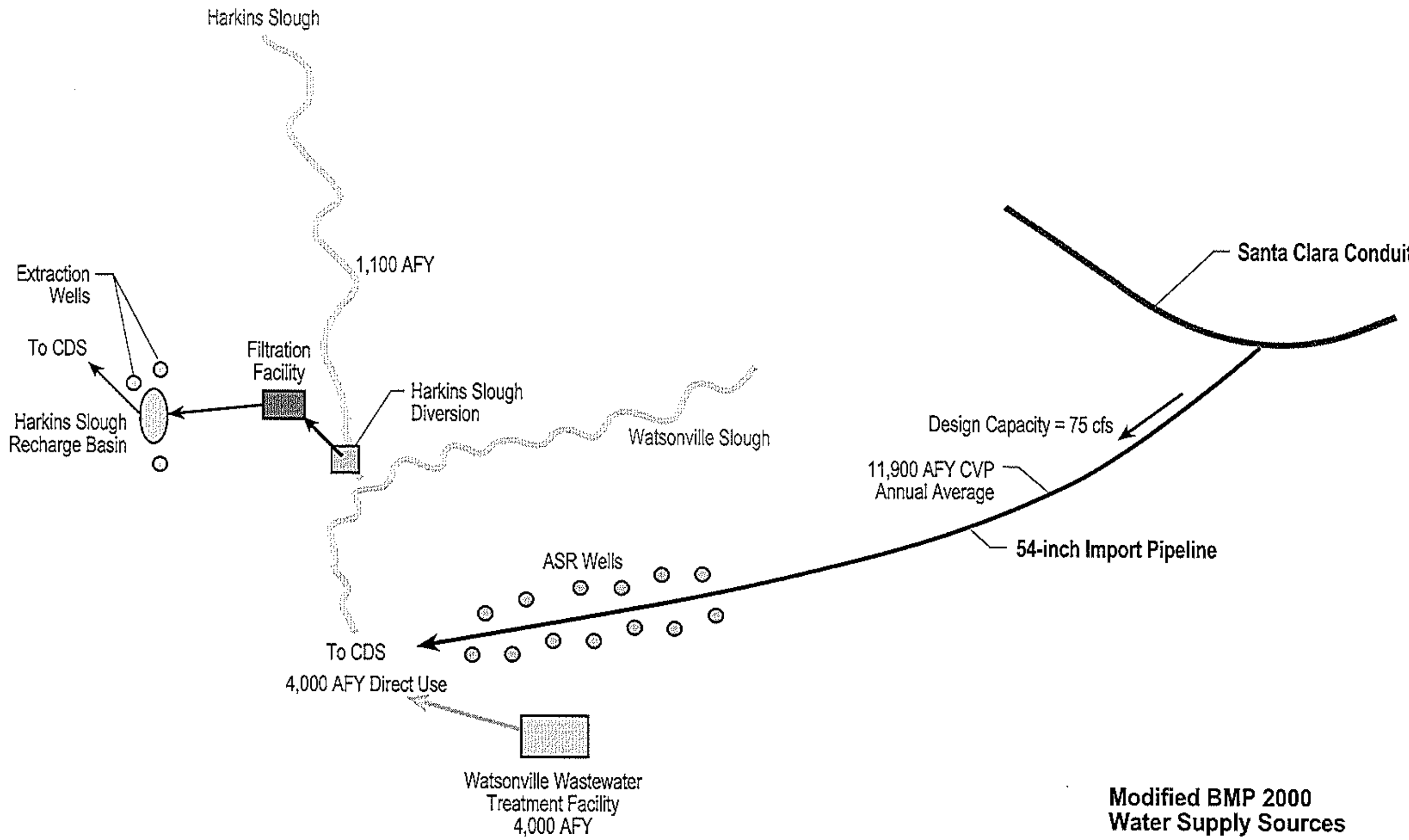
Footnotes:

a. Values rounded to two significant figures or to the nearest thousand to represent the values significant accuracy.

Operational Strategy

Figure 5-8 shows a flow schematic for the Modified BMP 2000 alternative.

CVP water would be the major source of water supply, and would be conveyed from the Santa Clara Conduit to the CDS for direct use after blending with recycled water at a blending facility, located near the intersection of Highway 1 and the Pajaro River, prior to distribution. Similar to the Modified Local alternative, CVP supplies would be utilized by the CDS both directly and via ASR wells. Water extracted from the Harkins Slough recharge basin would be blended within the San Andreas portion of the CDS.



Modified BMP 2000 Water Supply Sources

Water Source	Yield, AFY
Recycled Water	4,000
Harkins Slough	1,100
CVP - Import Water	11,900
Total	**17,000**

Figure 5-8. Modified BMP 2000 Schematic

In average years, CVP deliveries plus water from the Harkins Slough extraction wells and Recycled Water Project would provide the water required to meet peak CDS demands. The ASR wells would be available to balance peak demands.

During above-normal rainfall years, CVP allotments plus supplies extracted from the Harkins Slough recharge basin and the Recycled Water produced at the WWTF are expected to meet or exceed CDS demands. Therefore, CVP water above current demands would be stored in the groundwater basin by injection utilizing wells located along the import pipeline alignment. The exact locations of the ASR wells have yet to be identified. Due to the lack of storage for recycled water and limited long-term storage for Harkins Slough supplies, these supplies would be utilized prior to utilizing the banked CVP water.

In below-normal rainfall years, stored CVP water would be pumped from the ASR wells would be utilized to augment surface water supplies and meet CDS demand. During the most severe dry-weather years, when as little as 10% contract entitlement might be available, all recycled water would still be available, and none would be available from Harkins Slough. Operationally, the 10% CVP entitlement would be distributed over the high demand months to reduce peak demand, therefore reducing the number of extraction wells required to meet the CDS demand. Based on assumptions of peak coastal demand and assuming wells would provide half of the peak supply, it is estimated that approximately 17 wells with a 2,000 gpm extraction rate would need to be constructed. This includes two standby wells for reliability.

The annual yield of recycled water for this alternative is limited to about 4,000 AFY by the recycled water facility daily flow rates and the irrigation demand for recycled water. Due to the absence of seasonal storage, flow not directly used by the farmers would be discharged to the WWTF outfall. Water quality is also a limiting parameter, given the desired TDS objective of 500 mg/L. Recycled water produced at the WWTF would be blended with recovered water from ASR wells and CVP water to create a uniform water supply for the CDS that meets or exceeds the water quality objectives. Some minor storage of recycled water is provided to maximize recycled water during peak hour demands.

CVP supply may not always be able to meet peak demands due to pipeline flow limitations. However, pumping from the ASR wells can make up any shortfall.

Cost:

The Modified BMP 2000 alternative relies mainly on supply of imported and recycled waters. A significant portion of the cost is associated with construction of the import pipeline and associated facilities and purchase of CVP supplies. The cost of the 11,900 AFY average annual CVP water supplies is estimated to be $15.5 million. This cost is included in the cost of the 54-inch Import Project with ASR. In addition, the cost for the 54-inch Import Water Project with ASR includes treatment facilities that are expected to be required prior to injection of CVP supplies.

This alternative has an estimated total capital cost of $138.3 million assuming a $20.0 million Title XVI grant for the Recycled Water Project. The alternative would incur an annual O & M cost of $4.3 million. Table 5-12 summarizes the estimated cost components of the Modified BMP 2000 Alternative.

Future conditions (2040 Demand):

In order to meet anticipated future increases in agricultural and urban water use, an additional 9,000 AFY (3,900 AFY of urban demand, plus 5,100 AFY of agricultural demand) of water must be delivered. The cost-effective local supply options include College Lake, Watsonville Slough, Murphy Crossing, and expanded recycled water use. However, it is expected that the most cost-effective alternative would be additional imported CVP water.

Table 5-12: Modified BMP 2000 Cost Estimate

Project Element	Cost Estimate ($ Millions)
Coastal Distribution System	$34.4
Conservation (7-year)	$1.7
Harkins Slough Project with Harkins Slough Recharge Basin and Supplemental Wells and Connection	$6.6
Recycled Water Project (4,000 AFY)	$19.2
54-inch Import Water Project with ASR	$94.9
Construction Cost Subtotal	**$156.7**
Financial & Bond Sale Cost @ 1.0%	$1.6
Recycled Water Grant (Title XVI)	($20.0)
Total Capital Cost	**$138.3**
Annualized Capital Cost at 6% for 30 years	$10.0
Annual Operation & Maintenance Costs	$4.3
Total Annual Cost	**$14.3**
Income from PVWMA Delivery Charges on Customers Receiving Delivered Water @ $92 per AF	$1.7
Adjusted Total Annual Cost	**$12.6**
Combined Sustainable Yield (AFY)	64,000
Cost per AF ($/AF)[a]	**$198**
PVWMA Delivery Charge for Customers Receiving Delivered Water ($/AF)	**$92**
Cost per AF plus PVWMA Delivery Charge for Customers Receiving Delivered Water ($/AF)	**$290**

Footnotes:
a. Cost to growers pumping from the groundwater basin.

Notes:
1. Spring 2001 construction cost.
2. Capital recovery factor (A/P) for 6% at 30 years is 0.07265.
3. Cost estimates include a Construction Contingency of 20%, Engineering/Legal/Admin/Permits Contingency of 17.5%, and Environmental and Permitting Contingency of 5%.
4. Cost per AF shown assumes (total annual costs minus total annual avoided cost of pumping) divided by combined sustainable yield.

This would require purchase of additional CVP supplies, and expansion or maximization of the existing coastal system or development of an inland distribution system. It would also increase the number of ASR wells required for banking of CVP water. It is not expected that this increase in CVP deliveries will require additional pumping, based on modeling conducted at 75 cfs (CH2M Hill, 1997).

Although expanded conveyance, distribution and supply facilities are required to meet future demands, these facilities have not been quantified in detail. For estimation purposes, it was assumed that the unit cost of these additional facilities would be similar to the unit costs for such facilities as discussed in previous alternatives, and will be separately analyzed if and when needed. Preliminary cost estimates for these facilities are summarized in Table 5-13.

Table 5-13: Additional Facilities Required to Meet 2040 Agricultural and Urban Demand

Item	Quantity	Loaded Unit Cost	Cost Estimate ($ Millions)
CVP Contract	9,000 AFY	$1,300/AFY	$11.7
Increased Distribution[a]	9,000 AFY	$1,860/AFY	$16.7
Increased Injection/Extraction[b,c]	8 wells	$700,000/well	$5.6
Total Capital Cost			**$ 34.0**

Footnotes:

a. *Unit cost estimate based on construction of a $34.4 million CDS serving 18,500 AFY.*

b. The number of additional wells was based on a linear estimate assuming 15 wells to supply approximately half of the peak hour demand for an 18,500 AFY CDS. No additional wells are provided for reliability. Load unit cost for the wells includes filtration treatment, pipelines, wells, and land purchase of 1 acre. Estimates also include 20% contingency, 17.5% engr/legal/admin/permitting, and 5% environmental and permitting contingency.

c. Includes one monitoring well per injection/extraction well and well head treatment at each injection/extraction well.

Key Points and Implementation Issues

Presented below is a summary of the key points and implementation issues regarding this alternative:

- Under the Modified BMP 2000 Alternative, no water will be delivered to inland areas in the currently defined alternative. However, the Import Pipeline alignment would make it very practical for inland growers to receive CVP water, dependent upon securing an additional source of supply.

- The 54-inch pipeline with a maximum flow rate of 75 cfs provides flexibility to meet future demands through procurement of additional CVP water supplies and construction of expanded distribution systems. However, additional pumping may be required for portions of the CDS. Construction of a 60-inch pipeline might be substituted for the 54-inch pipeline at a lower life-cycle cost.

- Harkins Slough supplemental wells and connections will provide peaking supply for the distribution system until additional supplemental supplies can be developed. Once these supplies are developed, these wells would continue to provide peaking supply for the entire CDS.

5.5 Non-Economic Comparison of Alternative Strategies

Each of the four alternative strategies discussed above meet the primary objective of eliminating seawater intrusion and balancing the basin. To further differentiate between the alternatives, additional project criteria were added to reveal the relative merits of the various strategies. These include:

- Can Meet Existing and Future Water Needs;
- Limited Dependence on Out-of-Basin Water Supplies;
- Minimizes Regulatory Hurdles;
- Meets Water Quality Goals; and
- Economic Impact.

Each of the alternatives was ranked based on their ability to meet these criteria. The ranking system was based on a plus (+) or minus (-) scale with plus/minus (+/-) representing a neutral ranking. A plus score meant that the alternative met that criteria, while a minus score identified a failure to meet that criteria.

A detailed analysis of the environmental impacts and associated mitigation measures for each alternative is included in the Revised BMP Environmental Impact Report that is being prepared by PVWMA. This EIR will be available for public review and comment in October 2001.

A discussion of each criterion is provided below, followed by a summary of the criteria comparison.

5.5.1 Can Meet Existing and Future Water Needs

Water usage in the Pajaro Valley is expected to increase in future years, based on population growth and agricultural crop changes. While future conditions were addressed in previous sections for all four alternatives to the year 2040, it is expected that growth will continue subsequent to that year. The greater the ability of the selected alternative to provide the infrastructure and water needed to meet these future demands, the higher the score for the alternative.

The Local-Only Alternative would not be able to accommodate future growth without significantly greater capital investment in either an imported supply or in desalination, and so it receives the lowest score. The Modified Local Alternative has some room for expansion, but only through construction of a pump station or some other method of expansion of the capacity of the Import Pipeline. The other two options have larger import pipelines to accommodate the conveyance of more water without the construction of new facilities.

Another aspect of meeting existing and future water needs is reliability of supply. The Local-Only Alternative includes a Recycled Water Project that will provide over 50% of the supplemental water supplies. This supply would be extremely reliable. Surface water projects would provide the remaining supply for the Local-Only Alternative and would be highly dependent on hydrologic conditions.

The BMP 2000, Modified Local, and Modified BMP 2000 alternatives include smaller Recycled Water Projects that provide a reliable supply to the PVMWA service area. The three alternatives also include surface water projects that would likely produce limited yield during drought years and an import water project that would be subject to restrictions during drought years. However, this limitation is offset to some degree by the fact that an import pipeline and connection to the CVP would allow the PVWMA to purchase CVP water on the open market during drought years. Out-of-basin banking is another means of increasing the reliability of imported supplies. The Local-Only Alternative is incapable of obtaining water from outside the basin or providing an opportunity to partner with another water agency in an out-of-basin arrangement.

5.5.2 Limited Dependence on Out-of-Basin Water Supplies

Water supplied from out-of-basin sources such as the CVP are not directly controlled by the PVWMA, and are largely dependent upon hydrologic and other factors outside its sphere of influence. This reduces the ability of the PVWMA to control this supply. A high score in this criterion represents higher dependence on in-basin supplies (limited dependence on out-of-basin supplies).

The Local-Only Alternative relies exclusively on development of local water supplies, and the Modified Local Alternative relies heavily on development of local supplies. The BMP 2000 Alternative and Modified BMP 2000 Alternative rely heavily on out of basin supplies to meet future water demand.

5.5.3 Minimizes Regulatory Hurdles

Each of the alternatives was developed with the aim of complying with expected local, state and federal regulations. However, the degree of mitigation associated with compliance with these regulations, and the difficulty associated with obtaining permits or agreements, varies greatly.

The Local-Only Alternative has the most significant implementation issues to address, including injection and extraction of surface water, percolation of recycled water, and securing water rights permits required for local surface water diversions. The Local-Only Alternative encounters numerous policy and regulatory issues with land fallowing. The BMP 2000, Modified BMP 2000, and Modified Local alternatives would all require NEPA evaluation for importing CVP water and connection to the CVP system. The BMP 2000 Alternative would also require securing water rights for the Murphy Crossing Project. Implementation issues associated with the Modified Local Alternative include percolation of recycled water and securing water rights permits for College Lake, Pinto Lake, and Watsonville Slough. The Modified BMP Alternative has the least number of unique implementation issues and would therefore be the easiest to implement.

5.5.4 Meets Water Quality Goals

Each of the alternatives has a different average expected water quality, which is largely based on the percentage of flow originating from CVP and recycled water supply sources. Alternatives maximizing recycled water use with minimal CVP or other dilution water are expected to have the lowest overall water quality, while alternatives with less recycled water use and greater CVP or other dilution water use will have the best water quality.

Because the Local-Only Alternative maximizes the use of recycled water, the water quality is lowest of the four strategies. The Modified Local Alternative relies slightly less on recycled water. The BMP and Modified BMP 2000 alternatives both rely heavily on CVP water, which is generally of good quality.

5.5.5 Economic Impact

The economic impact of the alternative strategy is the impact on the local economy resulting from the strategy. Alternative strategies that maximize the ability to farm agricultural lands scored the highest, while those strategies that require fallowing of significant amounts of farmland scored the lowest. Construction, operation and maintenance costs were also considered as a part of this criterion, and are discussed further in Section 5.6.

The Local-Only Alternative relies on land fallowing and additional conservation practices beyond the WC 2000 recommendations. The land fallowing alternative would have a significant economic effect on the region in lost jobs, income, etc., though the magnitude of this impact has not been identified in this document. These adverse impacts give it a low economic score. The other three alternatives allow agricultural lands to stay in production. All projects have relatively similar total capital costs.

5.5.6 Summary of Criteria Comparison

Based on the aforementioned criteria and a (+), (+/-), (-) scale with (+) being the best score and (-) being the worst score, the four alternatives were scored for each criterion. The results are shown in Table 5-14.

Table 5-14: Alternative Ranking Based on Identified Criteria

Criteria	BMP 2000 Alternative	Local-Only Alternative	Modified Local Alternative	Modified BMP 2000 Alternative
Can Meet Existing and Future Water Needs	+	-	+/-	+
Limited Dependence on Out-of-Basin Water Supplies	-	+	+/-	-
Minimizes Regulatory Hurdles	+/-	-	+/-	+
Meets Water Quality Goals	+	-	+/-	+
Economic Impact	+	-	+	+

The Local-Only Alternative clearly ranks lowest when compared to the other three strategies due to the following findings:

- It requires reduced agricultural irrigation equivalent to the fallowing of 2,200 acres basin-wide. The associated reduction in agricultural production would be costly to implement and would cause significant economic impacts to the local economy, particularly since this level of fallowing is in addition to 9,000 AFY of agricultural water conservation.

- Regulatory approval for recharging the groundwater with tertiary treated recycled water is problematic. The RWQCB and the DHS could require reverse osmosis treatment of recycled water prior to groundwater recharge, which would significantly increase the cost of the strategy beyond that shown herein.

- The water quality of this alternative will not meet the requirements of the agricultural users with regard to TDS. At times this alternative would deliver 100 percent recycled water to the users with TDS concentrations of 900 mg/L or higher.

The BMP 2000 and Modified BMP 2000 alternatives rate similarly in most aspects. However, the BMP 2000 Alternative includes Murphy Crossing, which has a DFG Water Rights protest against it. The BMP 2000 Alternative could be implemented without the Murphy Crossing Project if approval of water rights for Murphy Crossing becomes too great a hurdle. The Modified BMP 2000 Alternative includes ASR, which appears to comply with known regulatory statutes.

The three alternatives using imported water all have the flexibility to meet future water demands through importation of more water. However, the Modified Local Alternative is limited in this aspect, and would require construction of a pump station or other method of increasing the capacity of the import pipeline.

Under future conditions, ASR could become a seasonal operation instead of a long-term banking option to meet water supply and demand while operating the design constraints for the import pipeline. For the Modified BMP 2000 and BMP 2000 alternatives, the diameter of the import pipeline varies, this only impacts downstream pumping requirements, not overall water supplies as the maximum capacity for both pipelines is 75 cfs. These three alternatives all have the potential flexibility to deliver flows meeting fluctuating future demands.

5.6 Cost Comparison of Alternatives

A summary of the components and cost estimates for each of the four alternatives is contained in Table 5-15.

The costs identified in Table 5-15 are the most recent cost estimates, and should be considered planning level estimates. The costs can be expected to fluctuate based on numerous factors, including market conditions and implementation schedules. Markups for construction contingency, engineering, legal, administration, permits, and environmental contingency correspond to those assumed in Section 4.

Cost Ranking of Alternatives:

As shown in this Table 5-15, the Local-Only Alternative has the lowest total capital cost, while the Modified BMP 2000 Alternative has the second lowest capital cost. A key to the cost of all alternatives is the potential for a $20 million Title XVI grant to offset the cost of water recycling from the WWTF.

Cost of Delivered Water (Cost per AF plus PVWMA Delivery Charge):

Table 5-15 also shows the cost of delivered water (Cost plus PVWMA Delivery Charge) that would be required if this fee were to pay for all costs of any given alternative. (The term 'cost per AF' is used to distinguish it from the Augmentation Charge presently levied by the PVWMA on extraction of groundwater, and used for the purpose of paying the cost of purchasing, capturing, storing and distributing supplemental water.) The cost per AF is assumed to be recovered from total water sales (pumped groundwater and delivered water), and the cost of delivered water is assumed to be recovered only from those receiving delivered water. In the case of pumped groundwater, the cost per AF is the same as the augmentation charge. As shown, the cost per AF for all customers in the PVWMA service area would be the same assuming a flat rate structure. However, customers receiving delivered water would be expected to pay an additional $92/AF, the average avoided cost of pumping realized by these customers (RMC, May 2001). That is, by receiving delivered water these customers avoid the costs of developing, maintaining, and operating their wells. In that sense, delivered water has a 'benefit' of $92/AF greater than groundwater that has to be pumped by an individual farmer.

On this basis, the cost per AF range from $198 per acre-foot to $259 per acre-foot. For those users receiving delivered water, the cost recovery plus delivery fee per AF would range from $290 to $351 per acre-foot.

Cost Risks Associated with Local-Only and Modified Local-Only Alternatives:

The Local-Only Alternative has significant cost risks not presented in Table 5-15. The largest cost risk associated with the Local-Only Alternative is that regulatory authorities may require reverse osmosis treatment for surface water from College Lake prior to injection. Based on College Lake water quality data, nitrate concentrations have periodically exceeded drinking water standards (Feeney, July 2001).

In addition, aluminum, arsenic, manganese, and iron have also periodically exceeded drinking water standards, although the elevated concentrations could be related to sampling or analytical program errors. If required, reverse osmosis treatment could increase the estimated capital cost of the Local-Only Alternative by $12.6 million and annual O & M cost by $0.6 million (Feeney, July 2001).

Table 5-15: Summary of Alternative Cost Estimates

Project Element	Cost Estimate ($ Millions)			
	BMP 2000	**Local-Only Alternative**	**Modified Local**	**Modified BMP 2000**
Coastal Distribution System	$34.4	$34.4	$34.4	$34.4
Conservation (7-year)	$1.7	$1.7	$1.7	$1.7
Conservation (additional)		$1.7		
Harkins Slough Project (Existing) with Supplemental Wells and Connections	$6.6		$6.6	$6.6
Murphy Crossing with Recharge Basins	$6.6			
Watsonville Slough with North Dunes Recharge Basin			$6.6	
College Lake Project with Pinto Lake Diversion			$14.1	
Expanded College Lake, with Pinto Lake, Corralitos Creek, Watsonville and Harkins Sloughs, and ASR		$73.9		
42-inch Import Water Project with ASR			$73.9	
54-inch Import Water Project with ASR				$94.9
60-inch Import Water Project with IDS and Supplemental Wells	$117.4			
Recycled Water Project (4,000 AFY)	$19.2			$19.2
Recycled Water Project with Southeast Dunes Recharge Basin (6,000 AFY)			$28.6	
Recycled Water Project with North Dunes and Harkins Slough Recharge Basins (7,700 AFY)		$34.4		
Subtotal	**$185.8**	**$146.1**	**$165.9**	**$156.7**
Financial & Bond Sale Cost @ 1.0%	$1.9	$1.5	$1.7	$1.6
Recycled Water Grant (Title XVI)	($20.0)	($20.0)	($20.0)	($20.0)
Total Capital Cost	**$167.6**	**$127.5**	**$147.6**	**$138.3**
Annualized Capital Cost at 6% for 30 years	$12.2	$9.3	$10.7	$10.0
Annual O & M Costs	$4.4	$6.6	$4.7	$4.3
Total Annual Cost	**$16.6**	**$15.9**	**$15.4**	**$14.3**
Income from PVWMA Delivery Charges Water @ $92 per AF	$1.7	$1.3	$1.7	$1.7
Adjusted Total Annual Cost	**$14.9**	**$14.6**	**$13.7**	**$12.6**
Combined Sustainable Yield (AFY)	64,000	56,000	64,000	64,000
Total Water Delivered (AFY)	18,500	14,400	18,500	18,500
Cost per AF ($/AF)[a]	**$233**	**$259**	**$215**	**$198**
PVWMA Delivery Charge Delivered Water ($/AF)	$92	$92	$92	$92
Cost per AF plus PVWMA Delivery Charge of $92/AF ($/AF)	**$325**	**$351**	**$307**	**$290**

Footnote:

a. Cost to growers pumping from the groundwater basin.

Another cost risk is that regulatory authorities may require reverse osmosis for percolation of recycled water. *As discussed previously, the CCRWQCB and DHS have required this level of treatment on most* other projects that have recharged groundwater with recycled water. Based on the estimate of the level of facilities that may have to be added to the College Lake facilities, this requirement could add an estimated $4.2 million to the capital costs of the alternative and $0.2 million in annual O&M costs.

A third cost risk relates to the presence of *Phytophthora* in College Lake. The Expanded College Lake project includes the injection and extraction of College Lake water. Percolation has been identified as an effective means of *Phytophthora* removal, and so the cost estimate for the Expanded College Lake project includes sand filtration as a similar means for removal. However, it is undetermined whether the sand filtration or the injection/extraction process will be sufficient to eliminate *Phytophthora*. In the case that these removal mechanisms are unsuccessful, an alternative treatment process may have to be developed. Costs for this process development are unknown.

Like the LOA, the Modified Local Alternative has the same cost risk associated with percolation of recycled water in the Dunes Recharge Basins. Regulators may require reverse osmosis treatment of reclaimed water prior to percolation in to the shallow aquifer. However, the Modified Local Alternative would percolate a smaller quantity of recycled water. The Modified Local Alternative also faces the same cost risk associated with *Phytophthora* removal from College Lake waters.

5.7 Cost Comparison with Future Water Use

The four alternatives developed in Section 5.1 to 5.4 address various levels of water use for the Pajaro Valley, while balancing the basin and eliminating seawater intrusion. Cost to meet future demands were briefly addressed in each of the alternative sections. This section summarizes those discussions and provides a cost comparison if future (year 2040) water use is the objective of the alternatives.

The BMP 2000 alternative could meet growth in water demand through purchase of additional CVP supply. To meet future demands, this alternative would need to develop 9,000 AFY of additional supplies.

The Local-Only Alternative relies solely on local water sources and is only able to meet water demands by reducing the demand significantly through land leases and conservation measures, or through development of an additional source of supply such as desalination or water importation. Without such additions, this alternative is unable to meet any future growth in water demand.

The Modified Local Alternative and Modified BMP Alternative could meet growth in water demand through the purchase of additional CVP water supplies and conveying the water via the import pipeline. Additional supplemental wells, ASR facilities, and distribution facilities would be required.

The costs shown in Table 5-15 reflect the costs to current water users for the various projects needed to meet current water demands. The infrastructure provided by these projects would also serve to meet the growth in water demand projected for PVWMA's service area. Future users will pay for their fair share of these project costs by means of impact fees and/or capacity charges. These fees and charges would lower the costs to existing users and from those shown in Table 5-15.

5.8 Summary Comparison of Alternatives

A summary of findings for the alternatives is presented in Table 5-16. As shown in this table, the Modified BMP Alternative would result in the lowest cost per AF and has the flexibility to meet current and future water demands. It is able to deliver these attributes while avoiding significant regulatory hurdles. It also avoids the need for land fallowing (or its equivalent) and the associated economic impacts.

The BMP 2000 Alternative is similar to the Modified BMP Alternative, but results in higher costs primarily because of the inland distribution system and the additional water to supply the IDS. It does not appear to deliver higher levels of benefit to offset these higher costs.

The Local-Only Alternative results in the highest cost per AF. This alternative balances water supply and demand at a point significantly lower than today's water use levels. As a result, this alternative would require severe demand reduction measures. Although the economic impacts of such demand reductions were not quantified, they would be significant. This alternative does not have the flexibility to meet future demands, without construction of a desalination facility or an import pipeline, and has poor water quality.

The Modified Local Alternative has slightly higher costs than the Modified BMP Alternative and would incur greater regulatory hurdles. This alternative relies on development of surface diversions from water bodies that are habitat for endangered species. PVWMA would have to secure water rights for these diversions, which could prove difficult to obtain. The alternative also requires groundwater recharge with recycled water. DHS could require costly treatment levels beyond those assumed herein. Therefore, this alternative carries cost risks that are higher than those associated with the Modified BMP.

The Modified BMP Alternative is similar to the BMP 2000 Alternative, except it utilizes injection and extraction of CVP water through ASR in place of the IDS. Use of ASR for CVP water does not appear to be a significant regulatory hurdle. This alternative provides an alternate high quality supply that could be available to growers in the Murphy Crossing area that are affected by pour groundwater quality.

Table 5-16: Summary Comparison of the Basin Management Strategies

Comparison Criteria	BMP 2000	Local-Only	Modified Local	Modified BMP
Total Yield (AFY)	64,000	56,000	64,000	64,000
Capital Costs ($ Million)[a]	$162	$128	$148	$138
Adjusted Total Annualized Costs ($ Million)[b]	$14.5	$14.6	$13.7	$12.6
Cost per AF[c] ($/AF)	$226	$259	$215	$198
Cost per AF + PVWMA Delivery Charge to Those Receiving Delivered Water ($/AF)[d]	$318	$351	$307	$290
Can Meet Future Water Demands?	√		√	√
Limited dependence on out-of-basin supplies?		√	√	
Minimizes significant regulatory/implementation hurdles?	√			√
Meets Water Quality Goals?	√		√[e]	√
Requires Land Fallowing or Other Measures with Significant Economic Impact?		√		

Footnotes:

a. Includes pro rata share of costs to balance basin at today's conditions and costs of additional water supplies
b. Annualized costs included annualized capital cost, operation & maintenance costs
c. Fee is applied to all water users based on first quarter, 2001 construction costs
d. Includes delivery charge of $92/AF for those customers receiving delivered water
e. Water quality goals are met only during certain times of the year

6 Revised Basin Management Plan Recommendation

The objective of this section is to identify a Recommended Alternative that meets the water supply goals of the PVWMA and the local community. In addition, this section summarizes the process used in selecting the Recommended Alternative, provides a cost estimate for the alternative, and identifies potentially viable future projects. Implementation and funding of the Recommended Alternative are discussed in Sections 7 and 8 of this document.

The Recommended Alternative is the Modified BMP 2000 Alternative with minor enhancements. The PVWMA Board of Directors identified the Modified BMP 2000 Alternative, with enhancements, as the preferred alternative after taking into account the public and stakeholder input, engineering and cost evaluations, environmental impacts, and direction from PVWMA staff. The Recommended Alternative provides a phased approach for meeting the major objectives and goals of the Pajaro Valley by eliminating seawater intrusion and balancing the basin in the most environmentally superior manner with the least amount of capital investment.

This section includes the following discussions:

- Draft BMP and Selection Process for Recommended Alternative;
- Recommended Alternative;
- Water Balance;
- Operational Strategy;
- Cost Estimate;
- Potential Future Projects; and
- Summary of Key Points.

6.1 Draft BMP and Selection Process for Recommended Alternative

The Draft Revised Basin Management Plan was completed and released for public and stakeholder review in August 2001. From August through November 2001, two public workshops were held to present projects and alternatives to the public and stakeholders. PVMWA also held two public BMP hearings, which consisted of presentations and question and comment sessions. Questions, concerns, and comments received during this period were addressed and noted for consideration in the development of the Final Revised Basin Management Plan. The Revised BMP Draft EIR was also released for public review in September 2001.

In addition to these public meetings, the projects and alternatives presented in the Draft Revised BMP were presented and discussed at public PVWMA Board of Directors meetings held from September through early December 2001. PVWMA also attended and participated in various public stakeholder meetings to present and answer questions on the Revised BMP and Revised BMP Draft EIR. The Draft EIR was utilized as a vehicle to solicit input from the various local, state and federal regulatory agencies.

Stakeholder and regulatory comments and additional evaluations played a key role in the selection process. Some of the most significant issues, comments, and developments include the following:

- Comments received from the DHS indicated that percolation of recycled water included in the Local-Only Alternative and Modified Local Alternative would not be a feasible project without reverse osmosis treatment. The treatment is required because of the potential impact to groundwater resources whose beneficial uses include drinking water supply. Due to the expected cost of reverse osmosis treatment, percolation of recycled water was eliminated as a potential project.

- Following the release of the Draft Revised BMP, an evaluation of injection and extraction of CVP water was completed. The evaluation concluded that membrane treatment such as ultra-filtration or micro-filtration would be required prior to injection of CVP water into the groundwater basin. This was required to meet both the Surface Water Treatment Rule and to prevent plugging of the injection and extraction wells. As a result of these evaluations, the cost for the ASR wells and associated treatment, connection pipelines, and monitoring wells increased to $29.3 million including contingencies. The estimated annual O&M costs for the project is $0.9 million. Due to the increased cost, injection and extraction of CVP water is not recommended at this time. However, ASR remains a potential future option for in-basin banking.

The Recommended Alternative will be implemented using a phased approach to take into account project funding constraints, rate increases, and implementation tasks. This phased approached for implementation of the recommended capital improvement projects is discussed further in Section 7.

In addition to the specific project components included in the Recommended Alternative, it has been recognized that several local water supply projects might become viable in the future. If they become viable, they can be implemented to provide in-basin banking and meet future increases in water demand. These additional local water supply projects (described in Section 4) include the Watsonville Slough, College Lake, and Murphy Crossing Projects. They presently have issues of concern that preclude them from immediate implementation. However, they are all potentially viable future projects that could add to the diverse mix of water supplies available to the PVWMA, and are included as part of the Recommended Alternative.

In-basin banking facilities may also be constructed in the future to increase operating flexibility and provide greater local control of water supplies. Implementation of complete in-basin banking facilities was not included in the next phases of the recommended alternative due to cost considerations. However, they may be included in future phases of the project as funding becomes available, and if it is considered at that time more cost effective than continued use of out of basin banking.

6.2 Recommended Alternative

The goal of the Recommended Alternative is to meet the identified objectives for eliminating seawater intrusion, balancing the basin, addressing regulatory concerns, and developing reliable supplemental water supplies. Included with the Recommended Alternative under Potential Future Phases are three local surface water supply projects and two local water-banking projects. The potentially feasible local surface water supply projects include Watsonville Slough, College Lake and Murphy Crossing Projects (described in Section 4). The potential future local water-banking projects include in-lieu recharge in an Inland Distribution System or an Aquifer Storage and Recovery System. The inclusion of these projects into the Recommended Alternative is a result of public and stakeholder comments and funding considerations. This section reiterates some of the key project elements and discussion that were previously described in Section 5.4 Modified BMP 2000 Alternative. In addition, the recommended enhancements and modifications to the alternative are also discussed.

A phased implementation approach is necessary for the Recommended Alternative due to funding constraints and other factors. The phasing of the Recommended Alternatives is shown below. A map of the Recommended Alternative is shown in Figure 6-1.

Phase 1

- Conservation: 7-year plan (5,000 AFY);
- Harkins Slough portion of the Coastal Distribution System;
- Harkins Slough with Harkins Slough Recharge Basin, Supplemental Wells, and Connections (1,100 AFY);
- CVP Contract Assignment from Mercy Springs Water District for the Import Water Project;
- Watershed Management Programs.
    - Water Metering Program; and
    - Water Resources Monitoring Program.

Phase 2

- Remaining portions of the Coastal Distributions System;
- Import Water Project with Out-of-Basin Banking (13,400 AFY);
    - Acquisition of additional CVP Water Supplies;
    - Five supplemental wells;
    - Potential sale of water to users along the pipeline alignment.
- Recycled Water Project (4,000 AFY); and
- Watershed Management Programs.
    - Nitrate Management Program;
    - Wells Management Program; and
    - Recharge Protection Plan.

Enhancements were made to the Modified BMP 2000 Alternative to meet funding objectives and identified goals. The most significant change to the Modified BMP 2000 Alternative described in Section 5.4 is the strategy for water banking. Due to the estimated cost of ASR facilities and the funding constraints outlined in Section 8, out-of-basin banking was selected as an initial water banking option for the import water project. As funding becomes available for potential future phases, the interim out-of-basin banking option will be replaced by a local ASR and/or IDS banking option. With out-of-basin banking, the PVMWA would bank surplus water available during higher water delivery years with another CVP contractor. In return, PVWMA would receive water from the CVP contractor during lower water delivery years. For additional information on out-of-basin banking see Section 4.10.4.

In addition, five supplemental wells sited along the import pipeline alignment would be constructed for reliability and to provide peaking supply. The supplemental wells will also be used in conjunction with out-of-basin banking to provide water for the PVWMA during dry-years. As potential future phases are implemented, these supplemental wells could be used as ASR facilities after injection capabilities are added.

As part of this arrangement it is recommended that importation of CVP water increase by 1,500 AFY to 13,400 AFY (as compared with the Modified BMP Alternative) to allow a reliable delivery of 18,500AFY to the coastal area. This increase in CVP water would provide the flexibility of delivering 18,500 AFY directly to the coastal areas, or selling up to 3,000 AFY to interested users along the pipeline alignment. Any water sold to these users would be replaced with an equal amount of groundwater pumped from inland areas along the pipeline alignment. In this way, 18,500 AFY could still be delivered to the coastal areas.

Enhancements of existing and development of new Watershed Management Programs are also added as part of the Recommended Alternative. Existing Watershed Management Programs include the Water Metering Program and Water Resources Monitoring Program. The development of new Watershed Management Programs will include a Nitrate Management Program, Wells Management Program, and a Recharge Area Protection Program. In response to the recognized problem of nitrate contamination within the Basin, PVWMA has worked together with other public agencies on outreach tasks. However, no formal development of a Nitrate Management Plan has been completed.

Phase 1 of the Recommended Alternative has already been implemented by the PVWMA to near completion. The implementation included the initiation of the Water Conservation Plan, enhancements to the Water Metering Program, assessment of the Water Resources Monitoring Program, assignment of one CVP contract for import supply, construction of the Harkins Slough Project, and construction of a portion of the Coastal Distribution System in the vicinity of Harkins Slough and Beach Road. In addition, the PVWMA is preparing final documents for construction of the three supplemental wells at Harkins Slough scheduled for completion during the spring and summer of 2002.

Construction of Phase 1 capital projects began in 2000 and will be completed in 2002. The CVP contract assignment from Mercy Springs Water District was completed in November 1998. Conservation efforts began in 2000 and are schedule to continue through at least 2007. Enhancements to the Water Metering Program were also developed in 2000 and complete implementation of the recommended improvements is underway. The Water Resources Monitoring Program is currently undergoing assessment and is also scheduled for completion by the end of 2002.

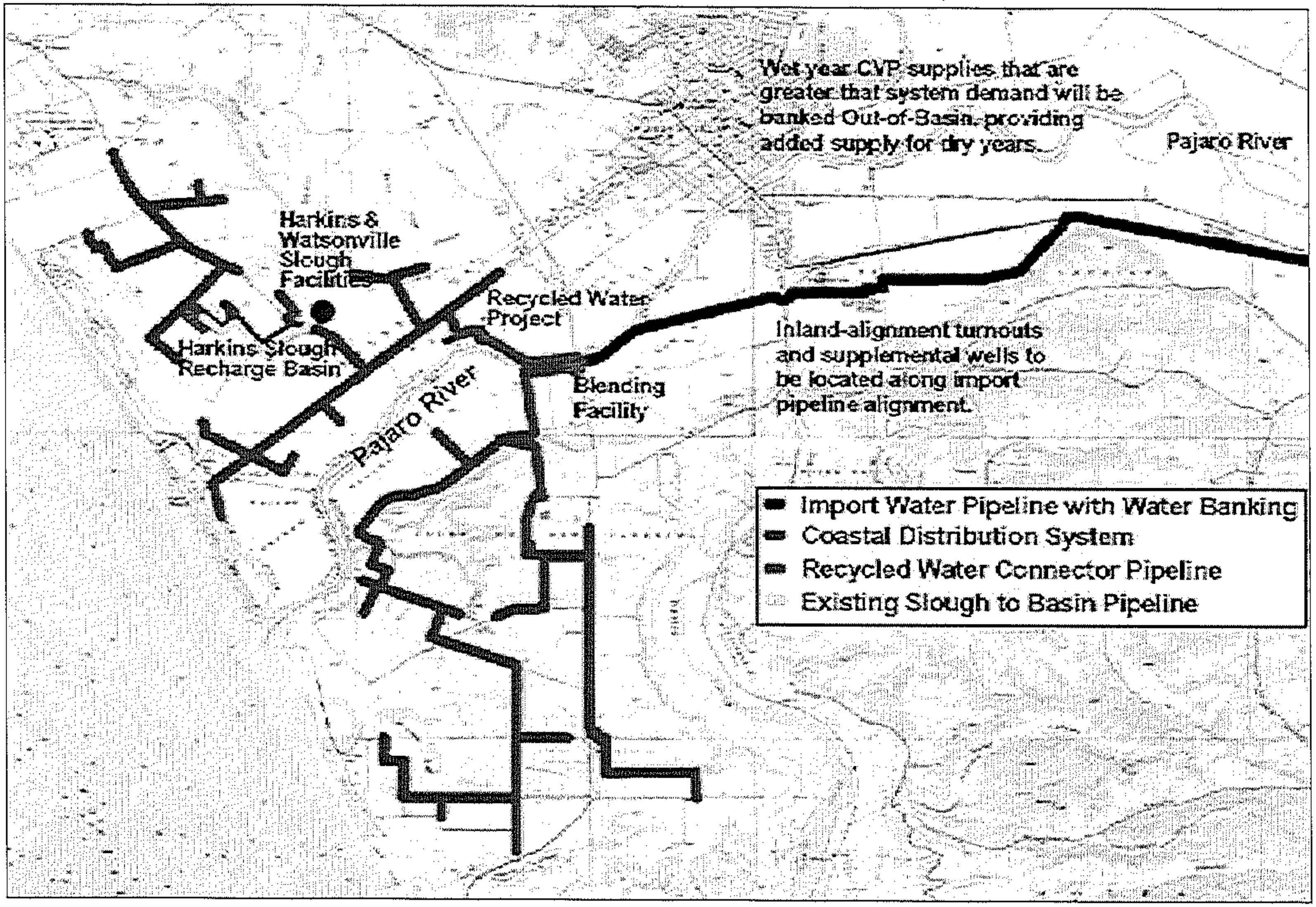
Construction of Phase 2 capital projects is scheduled to begin in 2004 with completion in 2007. Watershed management programs are continuing efforts and once enhanced, developed, or implemented, the programs would be maintained.

Phases 1 and 2 of the Recommended Alternative are scheduled for completion in 2007 and will address the overdraft and seawater intrusion associated with current groundwater demand on an annual average basis. However, the recommended facilities would meet approximately 90 percent of the CDS peak day demand assuming an 18 hour irrigation day. Extending the irrigation day to 20 hours would allow the estimated peak day demand to be met. Hence, providing estimated peak day flows within an 18 hour irrigation day, as well as meeting future increases in water use, will require additional funding beyond the proposed rate structure in Section 8. The projects listed under the Potential Future Phases are envisioned to be the most viable future projects, which could be constructed to provide in-basin banking, and/or to meet future increases in water use.

Potential Future Phases

- Aquifer Storage and Recovery (ASR) of CVP Water;
- Inland Distribution System (IDS);
- Watsonville Slough Project and North Dunes Recharge Basin;
- Murphy Crossing Project with Murphy Crossing Recharge Basins; and
- College Lake Project in coordination with Corp of Engineers flood protection project.

Figure 6-1: Recommended Alternative (Phase 1 and 2)



6.3 Water Balance

As previously discussed in Chapter 3.3, pumping of 18,500 AFY must be eliminated in coastal areas to stop seawater intrusion. Under the Modified BMP 2000 Alternative it was assumed that new water projects would supply 17,000 AFY and 1,500 AFY of inland groundwater would be pumped to the coast.

In the course of developing the Recommended Alternative, PVWMA decided to develop 18,500 AFY of new water supply rather than 17,000 AFY. Consequently, CVP purchase was increased from 11,900 AFY to 13,400 AFY for the Recommended Alternative. Although this amount of water is more than is needed to simply balance demand and supply, it provides increased operational flexibility. As described above, this approach allows delivery of up to 18,500 AFY directly to the coast, or selling up to 3,000 AFY to interested users on the pipeline alignment. Any water sold to these users would be replaced with an equal amount of groundwater pumped from inland areas along the pipeline alignment. In this way, 18,500 AFY could still be delivered to the coastal areas.

A summary of the new water supplies developed in the Recommended Alternative is presented in Table 6-1.

Table 6-1: New Water Supplies Developed by Recommended Alternative

Water Supply to Coastal Area [b]	AFY[a]
Harkins Slough with Harkins Slough Recharge Basin	1,100
Recycled Water Project	4,000
Imported CVP Water	13,400
Total	**18,500**

Footnote:
a. Values rounded to two significant figures or to the nearest thousand to represent the values significant accuracy.
b. Water required to be delivered at the coast to eliminate seawater intrusion.

The estimated implementation schedule indicates completion of Phase 2 of the Recommended Alternative by 2007. Thus, by 2007 sufficient water will be available in the coastal area to stop seawater intrusion.

As previously discussed, the peak day water delivery to the CDS will meet approximately 90 percent of the peak day demand, assuming an 18 hour irrigation day. Extending the irrigation day to 20 hours would allow the estimated peak day demand to be met. If extension of the irrigation day to 20 hours proved unacceptable to growers, additional storage, such as ASR wells, within the Pajaro Basin will be needed. These facilities would be added during future phases of the program. If additional storage is developed within the Pajaro Valley, out-of-basin banking could be phased out. Hence, out-of-basin banking may be only a temporary solution within the budgeted rate structure presented in Section 8.

Future increases in water use are expected in the PVWMA service area. Therefore, the PVWMA should continue to evaluate water use and local water supply options for maintaining basin balance. Feasible local water supply options include the development of the Watsonville Slough, College Lake, or Murphy Crossing Projects.

6.4 Operational Strategy

A flow schematic for the Recommended Alternative is shown in Figure 6-2.

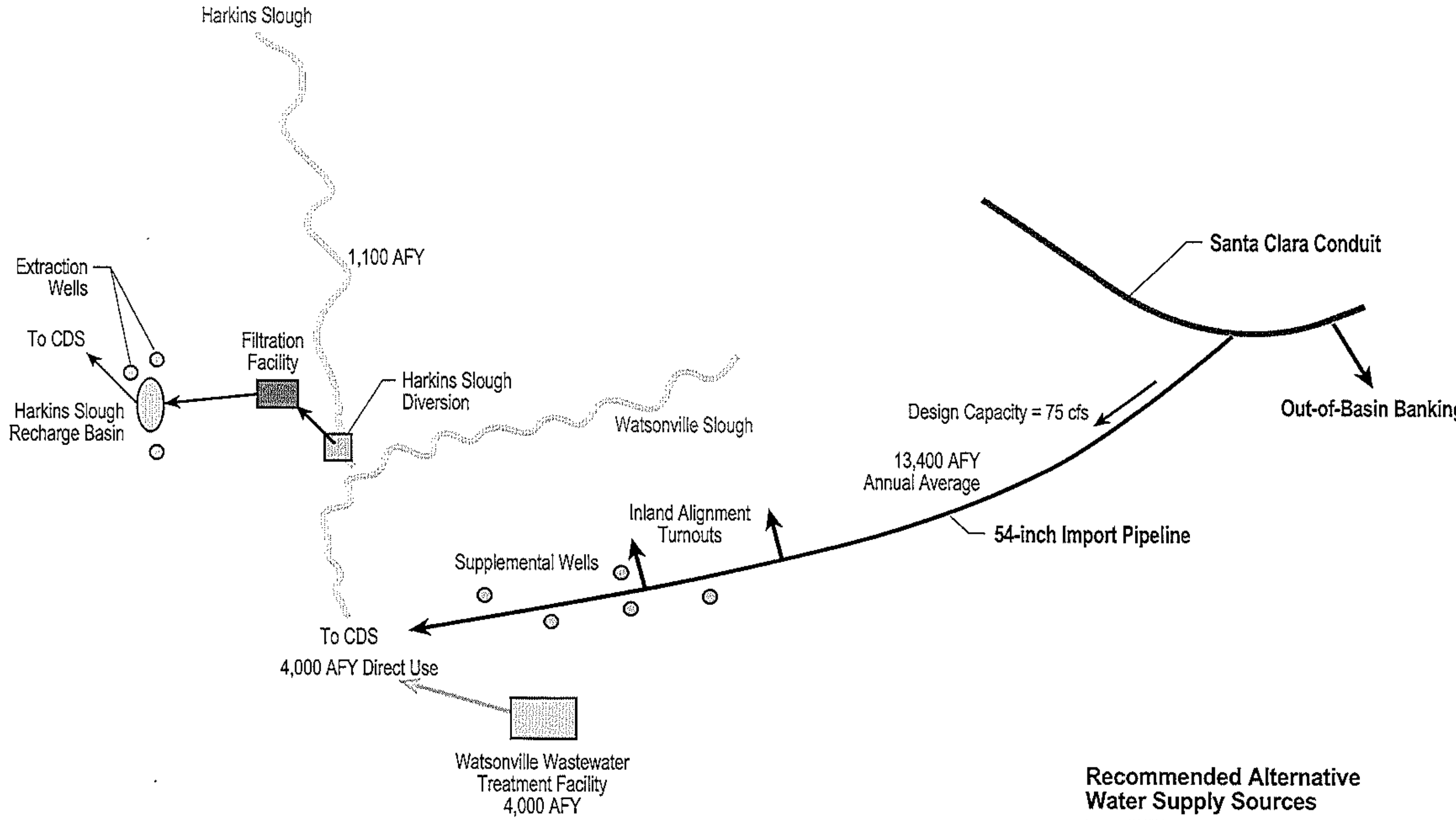
The operational strategy of the Recommended Alternative relies upon recycled and Harkins Slough water in combination with CVP water and groundwater as the major sources of supply. Recycled Water requires a source of blending water to reduce the TDS of the delivered water to 500 mg/l or less. The CVP water supply (some groundwater from inland wells would also be mixed with the CVP supply) will serve as the primary source of blend water to reduce the TDS levels of the recycled water. During years of low supply availability of CVP water, banked in-basin groundwater and out-of-basin banked supplies can be used as additional sources of dilution for the recycled water. Water provided to users on the CDS would be blended with recycled water at a blending facility, proposed to be located near the intersection of Highway 1 and the Pajaro River. Water extracted from Harkins Slough recharge basin would be delivered within the San Andreas portion of the CDS.

In average rainfall years, CVP deliveries plus water from the Harkins Slough recovery wells, inland supplemental wells, and the Recycled Water Project would provide the water required to meet CDS demand. The Harkins Slough recovery wells and inland-alignment supplemental wells would be used to meet peak delivery requirements.

During above-normal rainfall years, CVP deliveries, plus supplies extracted from the Harkins Slough recharge basin and the Recycled Water produced at the WWTF, are expected to exceed CDS. Therefore, CVP water deliveries above current demands would be banked with a CVP contractor through an out-of-basin banking agreement. Water users at the inland-alignment turnouts would also have access to direct CVP supplies during this period.

In below-normal rainfall years, PVMWA would minimal amounts from the CVP system. However, PVWMA would receive additional CVP deliveries through out-of-basin banking agreements. The PVWMA would also withdraw water from the supplemental wells to provide additional supply to the system. The additional CVP and supplemental well supplies would augment surface water and recycled water supply and help meet CDS demand. During these dry years, inland growers would be requested to utilize their existing wells during peak demand conditions. During the most severe dry-weather years, all recycled water would still be available, but it is not anticipated that any supply would be available from Harkins Slough.

The annual yield of the Recycled Water Project is limited to about 4,000 AFY by the recycled water facility daily flow rates, blending requirements, and the irrigation demand for recycled water. Due to the absence of seasonal storage, flow not required for irrigation would be treated to the existing levels and discharged to the WWTF outfall. Water quality is also a limiting parameter. Given the desired TDS



Recommended Alternative Water Supply Sources

Water Source	Yield, AFY
Recycled Water	4,000
Harkins Slough	1,100
CVP - Import Water	13,400
Total	**18,500**

Figure 6-2: Flow Schematic for the Recommended Alternative (Phase 1 & 2)

objective of 500 mg/L, recycled water produced at the WWTF would need to be blended with CVP water (some groundwater from inland wells would also be mixed with CVP supply) to create a uniform water supply for the CDS that meets or exceeds the water quality objectives. Due to the variation of flows into the WWTF, some minor storage of recycled water via equalization basins and a clearwell will be provided at the treatment plant for the purpose of maximizing recycled water use and minimizing the treatment plant design capacity.

6.5 Estimated Costs

The estimated capital cost of the Recommended Alternative is $130.6 million, in Spring 2001 dollars. The annual O&M cost is estimated to be $4.4 million. The cost estimate includes annual administration cost and annual average water banking costs for out-of-basin banking. As discussed in Section 4.10.4, in addition to administration and banking cost, an out-of-basin banking agreement also typically entails the contractor acting as the water bank to retain approximately 10% of the total banked water supply to account for seepage, evaporation, and unaccounted losses. The costs of potential future projects such as ASR, IDS, College Lake, Watsonville Slough, and the Murphy Crossing Projects are not included in the cost estimate. The estimated costs of these project elements are discussed in Section 4. In addition, it should be noted that the estimated cost is likely to increase due to inflation and other cost escalations, which will occur between Spring 2001 and actual project construction.

Table 6-2: Recommended Alternative Cost Estimate (Phase 1 and 2)

Project Element	Cost Estimate ($ Millions)
Coastal Distribution System	$34.4
Conservation and Watershed Management Programs	$1.7
Harkins Slough Project with Harkins Slough Recharge Basin and Supplemental Wells and Connection[a]	$6.6
Recycled Water Project (4,000 AFY)	$19.2
54-inch Import Water Project with Out-of-Basin Banking	$87.3
Construction Cost Subtotal	**$149.1**[b]
Financial & Bond Sale Cost @ 1.0%	$1.5
Recycled Water Grant (Title XVI)	($20.0)
Total Capital Cost	**$130.6**
Annualized Capital Cost at 6% for 30 years	$9.5
Annual Operations & Maintenance Costs	$4.4
Total Annual Cost	**$13.9**

Footnotes:

a. Includes $460,000 CalFed Grant, which reduces cost to $6.6 million. This project is complete except for three supplemental wells and associated piping.
b. Subtotal reflects sum of individual project elements before rounding.

Notes:

1. Spring 2001 construction cost.
2. Capital recovery factor (A/P) for 6% at 30 years is 0.07265.
3. Cost estimates include a Construction Contingency of 20%, Engineering/Legal/Admin/Permits Contingency of 17.5%, and Environmental and Permitting Contingency of 5%.

The amount shown for Conservation and Watershed Management Programs is the recommended increase in budget for these items. The $1.7 million shown is the present worth equivalent of $290,000 per year, which is the recommended increase. Currently these programs consume approximately $340,000 per year. Therefore, in combination with the recommended increase, the total recommended expenditures for these programs would be approximately $640,000 per year. The tentative allocation of this budget is shown in Table 6-3.

Table 6-3: Resource Allocation for Conservation and Watershed Management Programs

Watershed Management Programs	Current Resource Allocation	Recommended Increase in Allocation	Recommended Future Resource Allocation
Water Conservation Plan	$100,000	$100,000	$200,000
Water Metering Program	200,000	100,000	300,000
Water Resources Monitoring Program	40,000	60,000	100,000
Nitrate Management Program	0	15,000	15,000
Wells Management Program	0	7,500	7,500
Recharge Protection Program	0	7,500	7,500
Total Resources Allocation	**$340,000**	**$290,000**	**$630,000**

6.6 Potential Future Phases

As previously discussed, completion of Phases 1 and 2 of the Recommended Alternative will address approximately 90 percent of the CDS peak demand, assuming an 18 hour irrigation day. Extension of the irrigation day to 20 hours would allow the estimated peak day demand to be met. However, if the extension is unacceptable to growers, additional storage such as ASR wells, within the Pajaro Basin will be needed.

Addressing peak demand periods as well as future increases by 2040 in water use will require the construction of an in-basin banking system and additional water supply projects. An in-basin banking system is not being implemented at this time due to funding restrictions. In consideration of near-term cost-saving, out-of-basin banking provides a storage alternative for meeting the water demand in the Pajaro Valley the majority of the time with the least amount of initial capital investment. Furthermore, it is more prudent to reserve long-term storage decisions on ASR and IDS for in-basin banking until more information and studies can be completed and evaluated. The capital projects in Phase 1 and 2 will be designed with flexibility such that future projects can be incorporated into the system to meet the remaining current and future needs.

As more funding becomes available in the future, the potential future in-basin storage and local water supply projects discussed below could be constructed to meet the remaining current and future needs. These listed projects are envisioned to be the most viable future projects for construction to provide in-basin banking and/or increase local water supplies. Hence, the design of the recommended projects included in the next phase of implementation and described in Section 6.2 should include provisions for future integration of the following projects.

Potential Future Phases – Envisioned Viable Projects

- Aquifer, Storage and Recovery (ASR);
- Inland Distribution System (IDS);
- College Lake Project;
- Watsonville Slough Project; and
- Murphy Crossing Project.

As previously discussed, addressing the entire overdraft and seawater intrusion impacts during peak demand periods as well as future increases in water use by 2040 will require the construction of additional capital projects such as in-basin banking facilities. An in-basin banking system would provide long-term reliability and allow more flexibility for the PVWMA. Construction of ASR facilities, an IDS, or a combination of the two, would provide in-basin banking for imported water. The banked water would then be pumped during below normal water delivery years when CVP supplies are reduced. These two banking projects were not included as part of the next phase of the Recommended Alternative due to funding constraints. However, design of the recommended projects should include provisions for future integration and connection of the ASR facilities and an IDS.

The College Lake Project was not considered a practical project at this time due to a potential ACOE flood protection project at College Lake and impacts to steelhead fisheries. Until the ACOE has completed flood protections studies, a water supply project at this location is not realistic. However, the College Lake Project may be feasible in the future. The ACOE is currently completing outreach efforts and collecting public and stakeholder inputs as a part of the initial phases of its planning study. To date, no schedule is available for the completion of ACOE flood projection evaluation.

Similar to the College Lake Project, the Watsonville Slough Project is not viable at this time. Environmental enhancement and restoration options are currently under evaluation and the Watsonville Sloughs Resource Conservation and Enhancement Plan is being developed. The viability of the Watsonville Slough Project is contingent on experience with the Harkins Slough Project and recommendations of the Resource Conservation and Enhancement Plan.

The Murphy Crossing Project faces several environmental issues and engineering challenges at this time. NMFS and DFG have requested that additional investigations be undertaken to evaluate the sediment characteristics of the proposed infiltration gallery. Therefore, pursuit of this project is currently not warranted. In addition, the most practical delivery of water supplied by the Murphy Crossing Project would be an IDS adjacent to the project. However, the project is still feasible and could be selected for implementation in the future.

6.7 Summary of Key Points

Presented below is a summary of key points of this section.

- The Recommended Alternative was selected through a rigorous process consisting of public outreach, and engagement of regulatory, jurisdictional agencies, and other stakeholders.

- The Recommended Alternative for eliminating seawater intrusion and balancing the basin is the Modified BMP 2000 Alternative with minor enhancements. The Recommended Alternative is to be implemented under a phased approach.

- Due to funding constraints, out-of-basin banking will be utilized as the near-term water banking strategy for the Recommended Alternative.

- The Recommended Alternative would provide new water supplies of 18,500 AFY. In conjunction with conservation of 5,000 AFY, seawater intrusion would be eliminated and basin balance would be achieved by 2007. Future increases in water use are expected, but the inherent flexibility of the Recommended Alternative would allow these demands to be met at a future time.

- Enhancements of existing, and development of new, Watershed Management Programs are also added as part of the Recommended Alternative,

- The estimated capital cost of the recommended alternative is $130.6 million with an annual O&M of $4.4 million.

The next steps for PVMWA are to begin the implementation process for each of the recommended projects. An implementation plan for the recommended alternative is described in Section 7. In addition, Section 8 describes the water rate structure that would be used to fund the projects.

7 Implementation Plan for Recommended Alternative

Implementation of the Recommended Alternative will necessitate numerous activities, ranging from engineering design, environmental documentation and permitting, financing, and construction. Environmental documentation for the Recommended Alternative includes two components: CEQA (California Environmental Quality Act) and NEPA (National Environmental Policy Act). CEQA compliance is scheduled for completion in February 2002. NEPA compliance is scheduled for completion in early 2003, and is being completed in a joint effort with the US Bureau of Reclamation. NEPA compliance is required for connection of the import pipeline to the CVP system and delivery of CVP water. NEPA compliance is also required for receipt of federal funding for the Recycled Water Project under Title XVI.

The purpose of this section is to identify project schedules and highlight significant tasks required for implementation of the Recommended Alternative. The identified tasks are focused on those required between the completion of this planning document (the Revised BMP) and completion of construction.

As previously discussed in Section 6, the Recommended Alternative is to be constructed in multiple phases. Construction of projects under Phase 1 has already begun and will be completed in 2002. Implementation of Phase 1 and 2 of the Recommended Alternative are described in detail below. A preliminary implementation plan for the Potential Future Phases is also included in Section 7.3.

Potential projects listed under future phases include options for in-basin water banking utilizing ASR, construction of an Inland Distribution System, and development of additional local water supplies. As funding becomes available in the future, the PVMWA should implement an in-basin banking option to address current peak demand periods, future increases in water use by 2040, and increase long-term reliability, flexibility, and local control of the CVP supplies. Construction of additional local water supply projects would be contingent on the need for additional water supply, results of environmental and flood control studies currently underway, and funding.

The projects included under each phase are shown below.

Phase 1 (Scheduled Completion in 2002)

- Conservation: 7-year plan (currently underway with 5,000 AFY to be achieved in seven years);
- Harkins Slough with Harkins Slough Recharge Basin and Supplemental Wells and Connections (1,100 AFY);
- Harkins Slough Portion of the Coastal Distribution System (CDS);
- CVP Contract Assignment from Mercy Springs Water District for the Import Water Project.
- Watershed Management Programs; and
    - Water Metering Program; and
    - Water Resources Monitoring Program.

Phase 2 (To be constructed in 2003 to 2007)

- Remaining Portion of the Coastal Distribution System;
- 54-inch Import Water Project with Out-of-Basin Storage (13,400 AFY);
    - Acquisition of additional CVP Water Supplies; and
    - Inland-alignment turnouts and five supplemental wells.
- Recycled Water Project (4,000 AFY); and
- Watershed Management Programs.
    - Nitrate Management Program;

- o Wells Management Program; and
- o Recharge Area Protection Program.

Potential Future Phases

- Aquifer Storage and Recovery (ASR) of CVP Water;
- Inland Distribution System;
- Watsonville Slough Project and North Dunes Recharge Basin;
- Murphy Crossing Project with Murphy Crossing Recharge Basins; and
- College Lake Project in coordination with Corp flood protection project.

Project schedules and critical tasks for Phases 1 and 2, and the associated projects are described in the following sections. No schedules were developed for potential future phases as the PVWMA has not set a timeline to move forward with those future projects at this time.

7.1 Phase 1

Implementation of Phase 1 of the Recommended Alternative is nearly complete. PVMWA has begun a conservation program to achieve levels of conservation identified in the Water Conservation 2000 (WC 2000) plan. The Enhanced Groundwater Monitoring and Enhanced Metering Programs will involve evaluation of the existing programs and building upon these evaluations to create a more effective monitoring and metering program for the PVWMA. Construction of the Harkins Slough project and Harkins Slough portion of the CDS was completed in fall of 2001. The final element of Phase 1 is construction/retrofitting and connection of the three supplemental wells that will initially provide a supplemental supply to the Harkins Slough portion of the CDS. Details of the implementation plan for the ongoing projects are discussed in the following sections.

7.1.1 Conservation Program Implementation

In February of 2000, the WC 2000 was completed by the consultant and accepted by the Board of Directors. Since acceptance of the WC 2000, the PVWMA has implemented many programs identified in the WC 2000 plan to promote agricultural water conservation. Conservation efforts have included mobile laboratory evaluations, installation of an additional CIMIS weather station, demonstration projects, outreach efforts, and farm conservation plan reporting. Mobile laboratory evaluations receive high participation from growers and were funded in cooperation with the San Luis & Delta Mendota Water Authority. Future funding of the mobile laboratory evaluations will be done in part through grants from CALFED. Funding allocation decisions have limited the PVWMA from full implementation of the outlined programs. As a result, the financial assistance program for grower irrigation system improvements has not been implemented.

Implementation of the WC 2000 Program has been focused on elements that would make the biggest impact first. Hence, the urban outreach aspect of the WC 2000 has been largely left to the City of Watsonville, which has a Water Conservation Program originally established in 1992. The City of Watsonville's program includes elements such as low-flush toilet rebate, industrial loans for water efficient facility modifications, free low-flow shower heads, school water education programs, the retrofitting of schools with low-flow plumbing fixtures, and other similar activities.

Ongoing conservation efforts identified in the WC 2000 are scheduled to continue until at least 2007. Full implementation of all the elements identified in the WC 2000 will require additional funding and resources. Depending on the level of conservation that has been achieved and the opportunities for additional conservation, the program could be extended.

7.1.2 Harkins Slough Project with Harkins Slough Recharge Basin and Supplemental Wells and Connections Implementation

The Harkins Slough Project was the first water supply project to be implemented and constructed by the PVWMA. Construction of the diversion facilities and recharge basin were completed in 2001. Construction and retrofitting of the supplemental wells and connections is the final element of the project and is scheduled for completion in 2002. Approximately 150 AF of Harkins Slough water was diverted, treated, and percolated to storage in spring 2001 and full operations are scheduled for late winter or spring of 2002.

The Harkins Slough Project consists of pumping and treatment facilities located at the confluence of Harkins and Watsonville Sloughs, a transmission pipeline from the treatment facility to the recharge basin located off Dairy Road, and extraction wells with a connecting pipeline to the Coastal Distribution System.

7.1.3 Harkins Slough Coastal Distribution System Implementation

In conjunction with the Harkins Slough Project, a portion of the Coastal Distribution System was constructed to deliver water from the Harkins Slough Project and begin elimination of coastal pumping. Design of the project was completed in 2000 and construction was completed in the fall of 2001.

Additional portions of the CDS are to be constructed in conjunction with the Harkins Slough supplemental wells. These facilities are scheduled for completion in early 2002. In all, approximately 35,000 feet, or approximately 25%, of the CDS will be constructed under Phase 1.

7.1.4 Watershed Management Programs

As previously discussed in Section 3, PVMWA Staff is in the process of enhancing the Water Metering and Water Resources Monitoring Programs. Enhancements to the Water Metering Program, including development of a billing and meter tracking database, meter replacement, and regular maintenance, have been developed in 2000. The revamped metering program will improve revenue generation, allow evaluation of conservation efforts, and provide an increased understanding of water use in the basin.

The Water Resources Monitoring Program is currently undergoing evaluation so that the framework for enhancing this program could be developed. An enhanced Water Resources Monitoring Program will allow for better data collection necessary for accurate monitoring of contaminant migration, the seawater intrusion boundary, and surface water diversion. Surface water diversions monitoring will help the PVWMA study the effect of natural recharge and natural dilution of potential constituent concentrations of concern in the basin. In addition, the collected data would allow for evaluation of the effectiveness of water supply projects in eliminating seawater intrusion. The two programs will also provide PVMWA with data for protecting and managing water supplies while accurately evaluating and addressing future water needs for its service area.

7.1.4.1 Water Metering Program

In recognition of the importance of an accurate metering program, PVWMA has undertaken an evaluation of its existing metering program in 2000 and has identified a series of improvements. Recommendations arising from this evaluation process include development of a comprehensive meter program database for tracking of billing and maintenance repair schedule, replacement of obsolete meter technology, and increased frequency of routine maintenance visits between scheduled meter readings. The goal is to implement all of the recommendations by the end of 2002.

7.1.4.2 Water Resources Monitoring Program

A comprehensive monitoring program will allow PVWMA to collect necessary data for evaluation of groundwater and surface water management issues. In addition to monitoring the progress of the Recommended Alternative in stopping seawater intrusion, an expanded groundwater monitoring program is also needed to provide a better understanding of the extent and changes in nitrate contamination. In the past, the groundwater quality monitoring program has been focused on agricultural related parameters. Hence, the PVWMA is in the process of reassessing and developing enhancements to its current groundwater monitoring program. These could include more analyses, such as water dating and isotope analyses, and expansion of the monitoring network for continued updates of the PVIGSM and modeling of contaminant transports. The new monitoring program could also include a database with Access 2000 and GIS compatibility.

Surface water monitoring is essential in understanding natural recharge in the basin and natural dilution of potential constituent concentrations of concern. In addition to water quality and flow monitoring, reporting, and management, enhancements to the surface water monitoring program should include stepped-up efforts to track, meter, and monitor surface water diversions. These tasks are keys to protecting and managing water supplies in the basin.

While the framework for the Water Resources Monitoring Program is being developed by PVWMA, implementation of the enhanced program will require additional budget and resources to perform laboratory analyses and update of the existing database and model. Although PVWMA currently has funds for groundwater monitoring, PVWMA is exploring future funding opportunities to offset the additional cost required for enhancing the Water Resources Monitoring Program.

7.1.5 CVP Contract Assignment from Mercy Springs Water District for the Import Water Project

As previously mentioned in Section 4.10, the PWMA entered into an agreement for the assignment of 6,260 AFY of contracted CVP water from the Mercy Springs Water District in November 1998. At 60 percent long-term average reliability, the contracted amount equals to 3,750 AFY, or 28 percent of the 13,400 AFY needed by the Import Water Project. The facilities for the Import Water Project are scheduled for completion in Phase 2.

7.2 Phase 2

Phase 2 of the Recommended Alternative would be implemented over the next five years and would provide facilities necessary to meet the existing basin overdraft and associated seawater intrusion problem during peak demand conditions assuming a 20 hour irrigation day. The capital projects in Phase 2 include the remaining portion of the CDS, the 54-inch Import Water Project with Out-of-Basin Storage, the Recycled Water Project, and some additional supplemental wells.

In addition to the capital projects, Phase 2 will also include development of the Nitrate Management Program, the Wells Management Program, and the Recharge Area Protection Program. The Nitrate Management Program would guide the PVWMA in taking the first step toward formally recognizing and addressing the potential nitrate contamination problem within the PVWMA service area. The Wells Management Program will help protect the groundwater quality in the Pajaro Valley by ensuring that wells are not a mechanism for transport of constituents from one aquifer to another. The Recharge Area Protection Program would help in enhancing groundwater stability by implementation of public outreach program designed to inform area residents and decision makers of the importance of protecting groundwater recharge areas.

Before construction of any capital projects in Phase 2 could begin, the PVWMA must secure additional CVP water supplies for the Import Water Project. The CDS and the Import Water Projects are dependent upon each other while the Recycled Water Project is dependent upon the Import Water Project for a reliable source of blending water to meet water quality objectives for irrigation. Hence, the start up scheduling for all three projects is set to coincide with each other in spring of 2007. Implementation details for the three projects are presented in the following sections.

7.2.1 Coastal Distribution System Implementation

In order to eliminate coastal pumping and stop seawater intrusion, supplemental water supplies replacing the existing groundwater supply must be delivered via a CDS to the coastal agricultural areas. The proposed CDS will deliver agricultural water supply originating from Harkins Slough, recycled water from the City of Watsonville Wastewater Treatment Facility blended with import water from the CVP and supplemental groundwater wells. The CDS will be designed to accommodate additional water from potential future local projects at College Lake, Watsonville Slough, and the Pajaro River at Murphy Crossing.

The required tasks for implementation of the CDS are broken into three major categories: environmental documentation and permitting, project design, and construction. The environmental documentation process for the project was completed under the Local Water Supply Project EIR in 1999. As previously mentioned in Section 7.1.3, a portion of the CDS has been constructed in conjunction with the Harkins Slough Project. In spring of 2001, the PVWMA approved and authorized a conceptual study for the remaining portion of the CDS. The design and permitting of the total CDS is expected to be completed by mid 2003.

As part of the design process, the PVMWA will need to secure the required land parcels/easements and environmental, development, and encroachment permits. Since construction of the CDS will not result in a significant permanent loss of land use, the required land acquisition process will not be lengthy and is scheduled for completion by the end of 2002. The environmental, development, and encroachment permits necessary for construction of the remaining portion of the CDS are scheduled for completion in 2003.

The advertisement, award, and construction of the remaining portion of the CDS is currently scheduled to start at the end of 2004 and is contingent upon approval from the PVWMA Board of Directors and available funding. Since a CDS is needed for the delivery of water to the coastal area and a CVP pipeline is needed as a source of water supply for the CDS, these two co-dependent projects are scheduled for completion at the same time. Construction of the CDS is expected to begin in fall 2004 and is scheduled for completion in spring of 2007. The proposed implementation schedule for the project is shown in Figure 7-1.

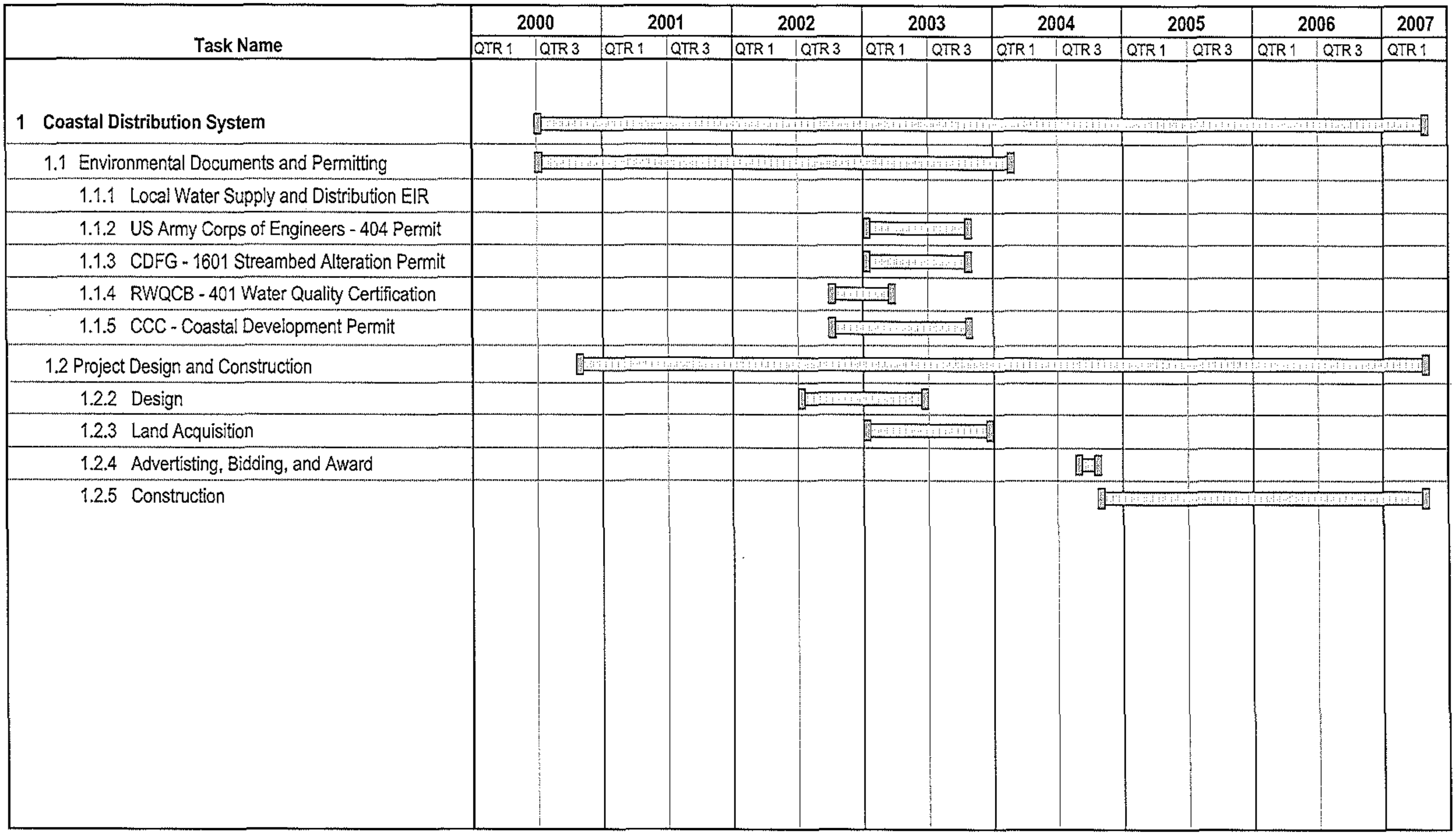


Figure 7-1: Coastal Distribution System Implementation Schedule

7.2.2 54-inch Import Water Project with Out-of-Basin Storage Implementation

The Import Water Project is a major component of the Recommended Alternative and will bring 13,400 AFY of high quality water into the Pajaro Valley to meet water demand and enable the quality of water from the Recycled Water Project to be suitable for irrigation use after blending. Construction of the import water pipeline is contingent on completion of several significant tasks including securing additional CVP water supplies, and environmental review under NEPA.

A CVP contract assignment from Mercy Springs Water District in Phase 1 has secured 28 percent of the CVP supplies needed for the Import Water Project. However, in order to have enough supplies for the Import Water Project, the PVWMA must secure an additional 72 percent of the 13,400 AFY CVP water supplies needed through assignments of existing contracts from other CVP Contractors. Assignment of a CVP contract will involve negotiations with other CVP contractors and coordination of the agreements with the USBR. In addition, CEQA/NEPA requirements must be fulfilled for each assignment. Completion of the necessary tasks to secure additional CVP water supplies is estimated to be a 20-month process. The purchase of additional CVP supplies via assignment appears to be a viable option as PVWMA is currently in the process of exploring assignment opportunities with various CVP Contractors.

After additional CVP water supplies are secured, an out-of-basin banking agreement with one or several CVP contractors/agencies to store surplus CVP water during above average water delivery years will be needed. Out-of-basin banking will increase the reliability of the CVP supply and minimize the need for additional storage facilities and associated costs in the Pajaro Valley.

As previously discussed, the Import Water Project requires CEQA and NEPA compliance as part of the environmental review process in addition to individual CEQA/NEPA evaluations for each water assignment/agreement. The Revised BMP EIR will fulfill the CEQA requirements for the Import Water Project and is scheduled for completion in February 2002. NEPA requirements for the Import Water Project will be fulfilled through an EIS scheduled for completion in early 2003. CEQA/NEPA for any additional CVP contract assignment will be completed as soon as a specific assignment is proposed.

Design of the import pipeline is expected to begin in early 2003, following completion of the EIS and securing of an additional water supply agreement. Various local and jurisdictional agency permits are required prior to construction of the project, and the permitting process would be completed in conjunction with design. The jurisdictional agencies and their required permits/review process are listed in the schedule shown in Figure 7-2 under the Environmental Documents and Permitting section. Construction-related permits such as encroachment permits are considered to be part of the design process and hence are not listed under the Environmental Documents and Permitting section.

Necessary land acquisition and easements for the project will also be negotiated during the design stage, including the agreements to construct and five supplemental/peaking wells along the pipeline alignment. The proposed implementation schedule is shown in Figure 7-2.

Construction of the Import Water Project is scheduled to begin in the summer of 2004. Accounting for the mobilization and start-up/testing period, and the anticipated rate of pipeline construction approximately 180 feet of pipe per day, the Import Water Project will be completed by the spring of 2007.

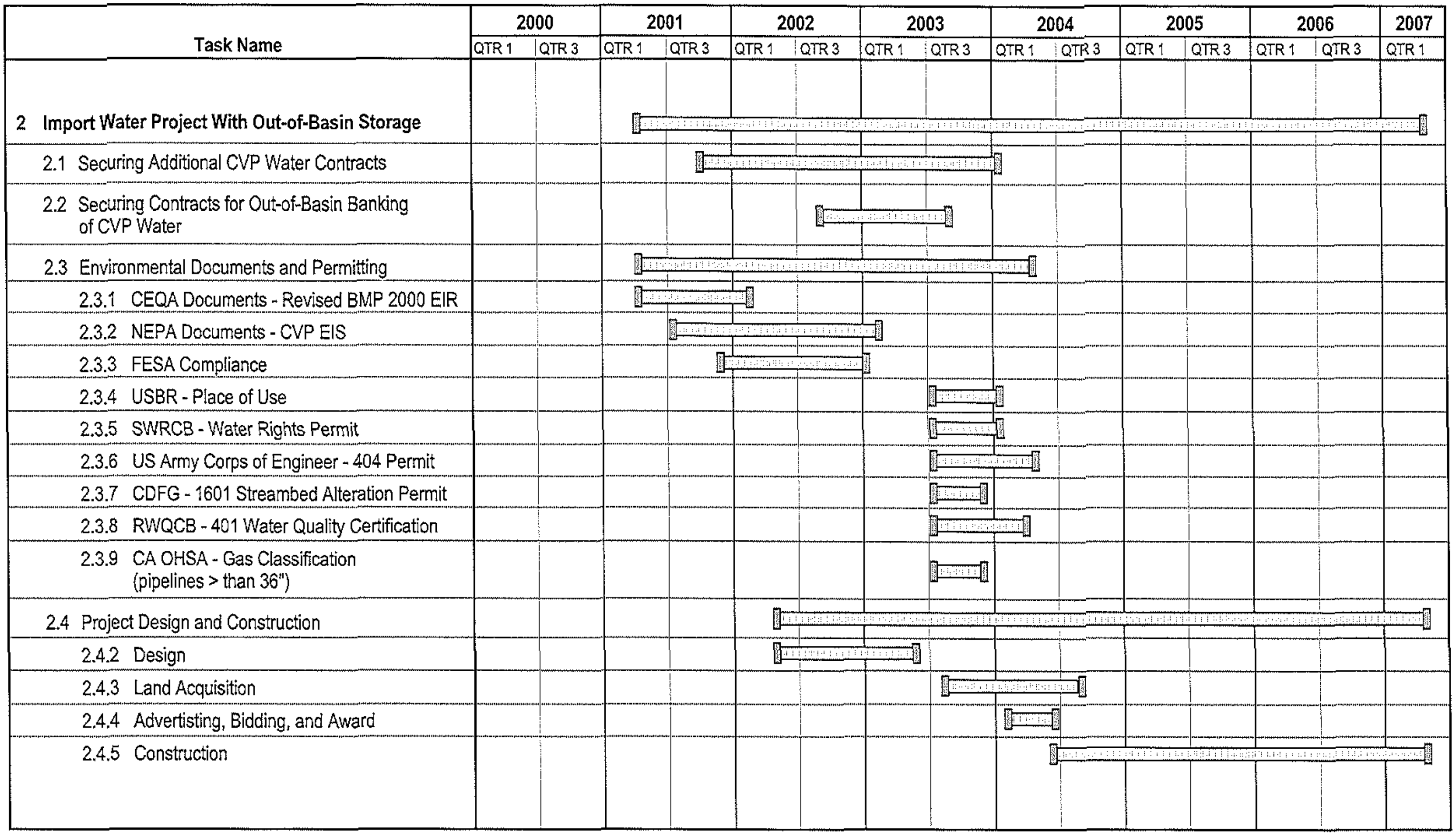


Figure 7-2: Import Water Project Implementation Schedule

7.2.3 Recycled Water Project Implementation

Construction of the Recycled Water Project is contingent on completion of several key tasks including approval of Title XVI funding from the USBR, appropriation of funding by Congress, securing import water for blending, execution of a cooperative agreement between the City of Watsonville (City) and PVWMA, and NEPA compliance. These tasks need to be completed prior to construction of the project.

Implementation of the Recycled Water Project is contingent upon approval for grant funding from the USBR and appropriation of such funds by Congress. In order to receive Title XVI funding, NEPA compliance for the project must first be completed. The NEPA evaluation is being conducted in cooperation with the USBR, and is scheduled for completion in early 2003.

In addition to USBR approval for Title XVI funding, an appropriation of funds from Congress is necessary prior to the release of money for construction of the project. The appropriations process is expected to span a 20-month period and would begin following a record of decision from the USBR.

The Recycled Water Project would also require a blending water supply in order to meet the irrigation water quality objective. Without a blending supply the Recycled Water Project would not be viable due to water quality issues. CVP water from the Import Water Project is the only adequate blending supply for recycled water on a sustained basis. Therefore, sufficient CVP supplies must be secured before the Recycled Water Project is built.

Another necessary task for this project is the development of a cost sharing and delivery agreement between the City of Watsonville and PVWMA. The agreement is necessary, as the City of Watsonville and PVWMA are the major stakeholders in the project. The City owns and operates the WWTF while the PVWMA has jurisdiction over management of water resources within its area.

The design of the Recycled Water Project is scheduled to start at the end of 2003, after the environmental documents and federal appropriation for Title XVI funding. The City and PVWMA are currently completing a feasibility study to evaluate treatment options and processes for the production of recycled water. A Recycled Water Feasibility Study report is scheduled for completion in early 2002. Construction permitting for the project would be completed during the design process. Construction of the Recycled Water Project could begin in the summer of 2005, with a completion target for spring of 2007, in accordance with the CDS and Import Water Project schedule. The proposed implementation schedule is shown in Figure 7-3.

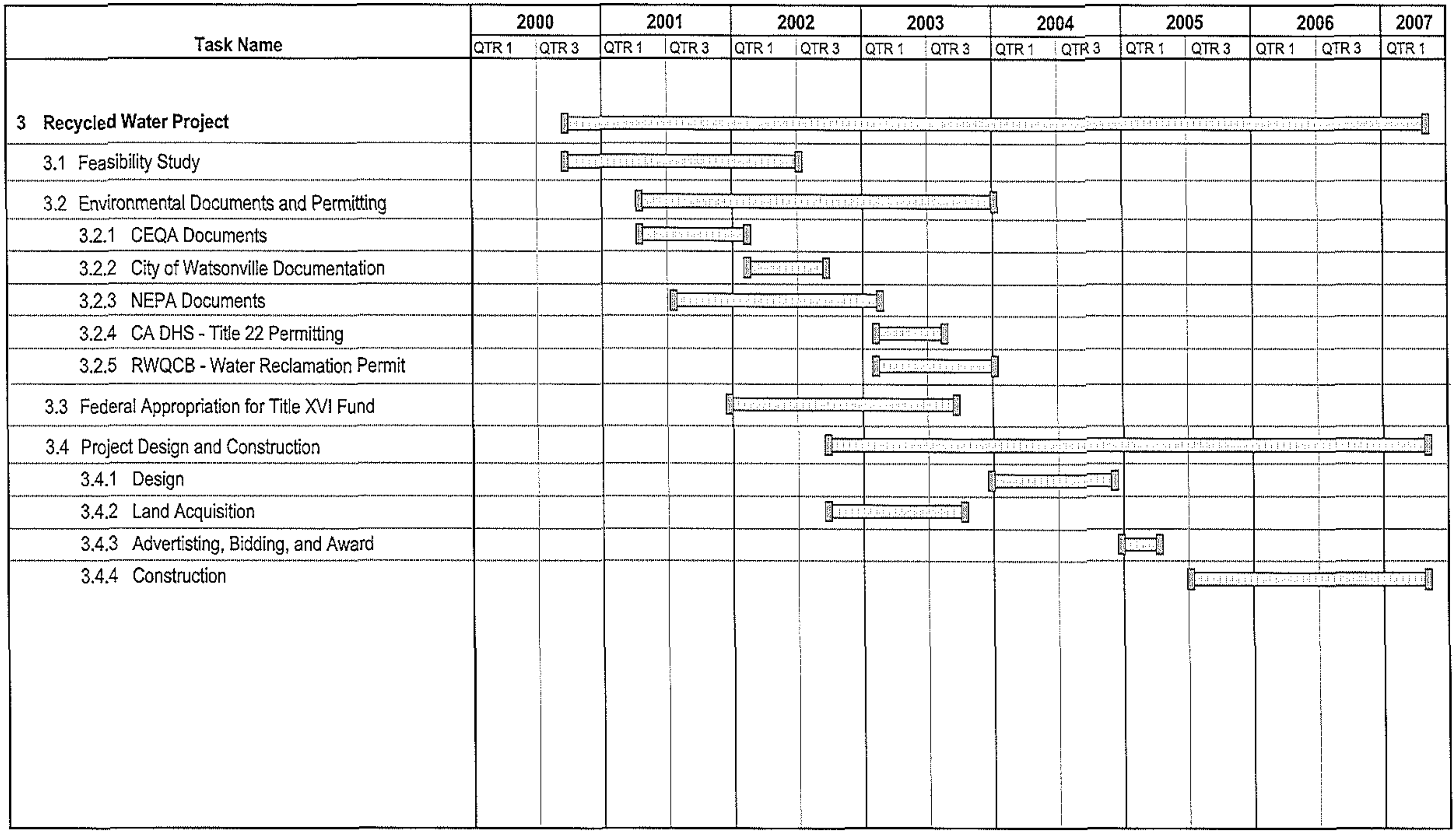


Figure 7-3: Recycled Water Project Implementation Schedule

7.2.4 Watershed Management Programs

The Nitrate Management Program, Wells Management Program, and Recharge Area Protection Program will be developed in Phase 2. As part of the Nitrate Management Program, the PVWMA is proposing to address nitrate contamination within the PVWMA service area by developing and implementing a Nitrate Management Plan. The Nitrate Management Plan would provide guidance for managing and reducing the levels of contribution to nitrate contamination in the Pajaro Valley and serve to increase public awareness and understanding of the situation. The Wells Management Program involves formalizing and adopting a guideline for well decommissioning and well replacement. The Recharge Area Protection Program will include cooperation with other public agencies and public outreach to inform area residents and decision makers of the importance of protecting groundwater recharge areas.

Funding and staffing resources are necessary in order to develop and implement these programs. Currently, no specific implementation schedule has been developed due to resource limitations. However, it is expected that funding and staffing would become available during Phase 2 and that implementation of each program could ensue.

7.2.4.1 Nitrate Management Program

The PVWMA is working with the Monterey County Water Resources Agency (MCWRA) to address agricultural and urban nitrate issues. Together, the two agencies have coordinated and sponsored public outreach events to educate the community on nitrates management and developed pocket guides for management of agricultural nitrates. However, increased efforts are necessary implemented to protect water resources within the Valley. Hence, the PVWMA should develop a Nitrate Management Plan that would identify management measures for reducing nitrate contamination. The plan would outline programs aimed at voluntary implementation of management measures as voluntary action is typically an effective means for reducing nitrate contamination. The goals of the plan would be similar to the Salinas Valley Water Project Nitrate Management Program (Montgomery Watson & RMC, 1998) and would include programs to:

1. Improve irrigation and fertilization practices to reduce the net nitrate/nitrogen load to the groundwater system via grower outreach and education program;
2. More accurate definition of the extent and fate of nitrate contamination in the Pajaro Valley groundwater basin; and
3. Define programs to protect domestic water supplies from nitrate contamination.

The program should include cooperative efforts with Monterey, Santa Cruz, and San Benito Counties to increase public awareness and outreach programs to educate the community on nitrate pollution in the Pajaro Valley. Implementation of the Nitrate Management Programs will require resources and personnel to develop the plan and manage the programs identified in the plan. The programs identified in the plan could be implemented using a phased approach consistent with available resources and funding. The phased approach would also give PVWMA a chance to evaluate and improve the programs applied before the implementation of subsequent phases. The Plan would also give a cost estimate for program implementation and identify potential grant and funding opportunities for nitrate management from regulatory agencies.

7.2.4.2 Wells Management Program

The development of the Wells Management Program will involve active monitoring of well decommissioning to ensure that the wells will not provide conduits for contaminants. The PVWMA currently has a program for notifying the respective county whenever an abandoned well is discovered. To go a step beyond monitoring, the PVWMA should also formalize and adopt guidelines for decommissioning of groundwater wells that are abandoned from operation. The guidelines could be based on existing regulations set by the California Department of Water Resources and an existing ordinance adopted by the Monterey County Water Resources Agency.

7.2.4.3 Recharge Area Protection Program

Protection of recharge areas within the PVWMA service area is critical in preserving water quality and supply within the basin. Recharge areas within the basin are primarily located in the eastern portion of the PVMWA service area. Contamination of, or development on, recharge areas would adversely affect the groundwater supplies of the entire basin. Therefore, it is critical that recharge areas are protected from both development and pollution.

A Recharge Area Protection Program is needed to preserve future groundwater supplies and quality. As previously discussed in Section 3.4.2, the local Counties are aware of key recharge areas and help in monitoring the water quality in these areas. However, a more formal program to spread awareness is recommended. The proposed program could consist of an outreach program designed to inform area residents and decision makers of the importance of protecting groundwater recharge areas. In addition, data from the Water Resources Monitoring Program could be used in developing a model for the key recharge areas and help in monitoring of the water quality in these areas.

7.3 Potential Future Phases

Potential future phases are contingent on the availability of funding, operational strategy, and on future water needs within the Pajaro Valley. Potential future phases include two local water-banking projects and three local water supply projects. As previously mentioned, elimination of overdraft and seawater intrusion impacts during peak demand periods as well as future increases in water use by 2040 will require the construction of an in-basin banking system and/or additional water supply projects. The projects identified were the most feasible and practical at this time. Implementation schedules for these potential future projects are not presently defined. Key implementation tasks for each project are summarized in the following sections.

7.3.1 Aquifer Storage and Recovery of CVP Water (ASR)

Once construction of the import water pipeline is completed and as more funding becomes available, a water banking strategy to store water locally in years when above-average supplies are available should be developed to accommodate peak demand periods, future increases in water use by 2040, and increased long-term reliability, flexibility, and local control of the CVP supplies. Banking of water locally would likely be achieved through ASR, in-lieu recharge, or a combination of both. A local water banking strategy should be developed while considering overall operations requirements during low and high water delivery years. Besides banking, ASR wells could be used to meet peak water demands and provide reliability to the system.

Previous analysis and evaluation of ASR for CVP water with regards to water quality and regulatory requirements indicate treatment is necessary prior to injection of CVP water into the groundwater system. Feasibility level studies have resulted in the recommendation of ultrafiltration (UF) as the preferred treatment process alternative. Ultrafiltration would treat CVP water prior to injection into the groundwater aquifers to meet and comply with the Department of Health Services (DHS) and Central Coast Regional Water Quality Control Board (CCRWQCB) requirements. Upon extraction, water from the wells could be delivered directly to the CDS without additional treatment. A byproduct of UF treatment is reject water, which could be either discharged back into the import supply pipeline or discharged to the WWTF.

Prior to moving forward with full-scale implementation of the ASR project, PVWMA should conduct a more detailed evaluation of existing groundwater quality in the proposed ASR well area and perform a pilot study of the recommended treatment process to gather more information. The pilot study would help PVWMA address water chemistry issues associated with blending of CVP water with groundwater. Furthermore, PVWMA would need to work with property owners to site additional wells at locations that would minimize agricultural and environmental impacts.

7.3.2 Inland Distribution System (IDS)

Construction of an IDS would allow for delivery of water from local or import supplies to inland growers and would reduce groundwater pumping leading to an in-lieu water bank. An IDS provides the ability to deliver water to lands not adjacent to the import pipeline, a benefit not afforded by any other project component.

One potential delivery system was identified in Section 4.10.1. However, the alignment and service area of the system is dependent on the specific needs of the owners and growers in the inland area. As future water needs and water resources are identified, the IDS can be designed to meet the goals and objectives of these inland owners and growers. By providing the inland growers with a water supply in lieu of groundwater pumping, the PVWMA would create an in-basin bank. This in-basin bank could be used to meet future water needs of the Pajaro Valley.

7.3.3 Watsonville Slough Project with North Dunes Recharge Basin

Implementation of the Watsonville Slough Project is dependent upon the recommendations of the Watsonville Sloughs Resource Conservation and Enhancement Plan currently being completed. The plan is evaluating environmental enhancements and restoration options. Recommendations included in the Resource Conservation and Enhancement Plan could affect the cost effectiveness, availability of water, and the feasibility of a water supply project at Watsonville Slough. If recommendations from the plan are favorable, implementation of the project could commence.

The most significant tasks for this project are securing water rights from the SWRCB and ensuring that slough water can be successfully percolated and recovered. The water rights process would require coordination with environmental stakeholders such as NMFS, ACOE, CCC, RWQCB, and USFWS. These stakeholders would likely require significant environmental mitigation measures to protect endangered species and enhance the Slough prior to water rights approval.

7.3.4 College Lake Project Implementation

The College Lake Project is not a viable project at this time due to flood protection evaluations being completed by the ACOE. Construction of the College Lake Project is contingent on completion of the flood protection studies and the recommended flood protection measures. If the evaluations by the ACOE recommend the use of College Lake for flood protection, then a multiuse project could be cost effective. The ACOE is currently completing outreach efforts and collecting public and stakeholder inputs for a planning investigation. To date, no schedule is available for the completion of the ACOE flood projection evaluation.

In addition, the development of College Lake as either a flood control or water supply project will face significant environmental issues, particularly as the project would impact steelhead fisheries. These issues would need to be addressed, including securing a water rights permit, prior to project implementation. In 1995, PVMWA applied for a water rights permit for the College Lake Project. However protests by several jurisdictional agencies and unresolved issues have resulted in delay of the permit being issued. Securing of the water rights permit would involve resolution of design and operations issues identified by the protesting agencies.

7.3.5 Murphy Crossing Project Implementation

The Murphy Crossing Project is still facing several environmental issues and engineering challenges at this time even though the EIR documentation for this project has been certified. Additional investigations requested by the NMFS and DFG would need to be completed before the project could be implemented.

In addition to the environmental and engineering issues, the most practical delivery of water supplied by the Murphy Crossing Project would be adjacent to the project via an IDS. Alternatively, once an import pipeline is constructed, water from Murphy Crossing could be conveyed through that pipeline to the CDS.

7.4 Summary of Key Points

Presented below is a summary of key points of this section.

- The Recommended Alternative will be implemented in multiple phases.
- Implementation of Phase 1 began in 2000 and includes Water Conservation and the Harkins Slough Project with supplemental wells along with a portion of the Coastal Distribution System.
- Phase 2 consists of the remaining portion of the Coastal Distribution system, the Import Water Project plus inland-alignment turnouts and five supplemental wells, the Recycled Water Project, and additional Watershed Management Programs.
- Since the CDS and Recycled Water Project are dependent upon the Import Water Project the construction completion date of all three projects is scheduled to coincide in the spring of 2007.
- Watershed Management Programs are integral parts of the Recommended Alternative and consist of the Water Metering Program, the Water Resources Monitoring Program, the Nitrate Management Program, the Wells Management Program, and the Recharge Area Protection Program.

- The enhanced Water Metering Program is being implemented; the framework for the Water Resources Monitoring Program is currently being developed; the development of the Nitrate Management Program, the Wells Management Program, and the Recharge Area Protection Program will be developed in Phase 2.

- Potential Future Phases consist of potential local water-banking projects and potential local water supply projects. An in-basin banking strategy may be needed to address current peak demand needs and future increases in water use. It should increase the long-term reliability and flexibility of the system, and provide more secure local control of the CVP supplies. The implementation of Potential Future Phases are contingent upon availability of funding and on future water needs within the Pajaro Basin.

8 Proposed Rate Plan for Recommended Alternative

The Recommended Alternative requires an annual source of revenues of approximately $13.9 million to support debt payments and annual operations and maintenance costs, including CVP water purchases and energy costs. PVWMA conducted a series of public workshops to evaluate alternative rate approaches and to identify water users' issues of concern. This approach allowed the PVWMA Board of Directors to formulate a recommended rate plan that addressed these concerns.

8.1 Existing Rates and Restrictions

PVWMA has in place two sources of revenue. The first is a Management Fee that is levied on a parcel basis. The Management Fee results in annual revenues to PVWMA of approximately $400,000. The Management Fee is presently utilized for overall agency management and funding

The second source of revenue presently utilized by PVWMA is an Augmentation Charge. The Augmentation Charge is based on water use, and is administered primarily through well metering. The Augmentation Charge is limited by the agency's enabling legislation to 15 percent of the highest rate charged by the City of Watsonville. Based on the City of Watsonville water rate for customers outside the City limits, the maximum Augmentation Charge allowed by the enabling legislation is presently $162/AF.

The Augmentation Charge is further currently, limited to $50/AF by the passage of Measure D in 1998. A popular vote is scheduled for March 2002 to reinstate the legislative authority of PVWMA and remove this limitation. If the election in March is successful, PVWMA would be allowed to raise the Augmentation Charge to the limit allowed by the enabling legislation, presently $162/AF. The limit could increase in future years if the City of Watsonville raises rates.

8.2 Alternative Rate Structures

Several types of rate structures were considered by PVWMA, including:

- Flat Water Rate Structure;
- Tiered Water Rate Structure;
- Land Assessment Structure; and
- Water Rate and Land Assessment Combination Structure.

Flat Water Rate Structure:

A Flat Water Rate Structure would set all water sales at the same price per acre-foot of use. This rate structure is the simplest of all rate structures to understand and administer. A single water rate would apply to all users whether they used one acre-foot per acre or five acre-feet per acre. In this way a flat water rate avoids the administrative task of tracking the number of acres a user is irrigating with a given well/meter.

If the PVWMA used a Flat Water Rate Structure, nearly all of its income would come from water sales. In years when water sales are less than the assumed long-term average of 64,000 AF, PVWMA revenue would be insufficient to cover the annual costs. To bridge this revenue shortfall, the PVWMA would need to set up a reserve fund. Bond sellers would probably require such a reserve fund with any of the alternative strategies presented herein. They could require that rates be increased by as much as 20 percent for the first five years to build up a reserve fund equal to one year's annualized costs.

Tiered Water Rate Structure:

A Tiered Water Rate Structure would charge progressively higher water rates as the demand of a user increases. For example, the first acre-foot per acre of demand would be at one price, the second acre-foot per acre would be at a higher price and the third acre-foot per acre of demand at a still higher price. If the rate tiers were set up to be 'cascading', the user of three acre-feet per acre would have one third of its water use billed at the lowest rate, one third of its use billed at the middle rate, and one third billed at the highest rate. The water bill for this user would be an average of the three rates.

A tiered structure can also be 'non-cascading'. In this case a user of three acre-feet per acre would see its entire water bill calculated at the highest tier rate.

For the PVWMA service area, tiered water rates would be developed on the basis of intensity of use (the amount of water used per acre of land irrigated). This basis is needed to account for the wide range in agricultural property sizes per water meter in the Pajaro Valley. Without this mechanism within a tiered structure, large property owners would be billed at the highest tier even if they grew crops with low water demands.

Use of tiered water rates alone would result in water sales being the sole source of income for the PVWMA. As with a flat rate, a reserve fund would likely be necessary to meet the requirements of bond sellers.

Tiered water rates are difficult to understand and administer because the rate tiers would be based on the amount of water used per acre of land irrigated. This would require the PVWMA to track acreage under irrigation meter-by-meter.

Land Assessment Rate Structure:

A Land Assessment Rate Structure could be used to raise all or part of the PVWMA annual costs. As the name implies, this source of PVWMA revenue would be an assessment on property. The assessment would be collected on the tax rolls, along with landowner's annual tax assessment payments. Because a land assessment is collected with the annual tax payment, the PVWMA has a greater assurance of receiving payment. Therefore, land assessments often ease the requirements of potential bond sellers. Depending upon how much of the costs are recovered by land assessments, the need to set up a reserve fund could be waived, or greatly reduced.

Proposition 218 requires that land assessments be based on the benefit that a given parcel derives from the project to be funded. To conform to this requirement, a property-by-property assessment must be made and the property owner notified. The assessed property owners must vote upon the assessment. Their votes are weighted based upon the assessment. That is, a property that is assessed $1000 would have twice the votes of a property that is assessed $500. A majority protest of the weighted votes would disapprove the assessment for all properties assessed.

Because land assessments have to be in direct proportion to the benefits derived by a given property, some rationale for assigning benefit must be established.

Water Rate and Land Assessment Combinations:

Water rates can be used in combination with land assessments to recover PVWMA costs. This approach would allow a portion of PVWMA costs to be recovered through a land assessment and the remainder through water use fees. Such an approach could be used to implement a policy that property receives a benefit due to implementation of a given project that is equal to a portion of a given project's costs, and that the remainder of the project benefits accrue to water users in proportion to the cost of service, and should be paid through water use fees.

As with the previous rate discussions, a wide range of combinations could be implemented.

8.3 Alternative Rate Evaluations

PVWMA evaluated alternative rate structures through a multi-phased public process. The first phase of the process included outreach to a number of affected and interested public groups and workshops with the Board of Directors. This initial phase served to identify the range of potential alternatives and constraints associated with each alternative. PVWMA solicited and received input from a number of community interest groups representing a range of agricultural and urban interests. Flat and tiered rates and land-based assessments were discussed, along with combinations of rates and assessments. This phase of the evaluation identified the wide range of perspectives of preferred rate structures, particularly the differences of opinion regarding tiered versus flat rates and the desire for some level of land-based assessments.

The second phase of the process focused on agricultural water rates since agricultural water users will be paying for their proportionate share, or approximately 80 to 85 percent of the project costs. This phase of the water rate evaluation process was used to solicit input from the agricultural community on specific alternative rate structures. An Ad Hoc Agricultural Rate Committee was established by the Board of Directors to facilitate input and discussion of alternative rate structures. The Ad Hoc Committee met three times to discuss alternative rate structures. The majority opinion of the Ad Hoc Committee was a recommendation that the PVWMA adopt a differentiated rate structure that charged a higher rate to the recipients of delivered project water. The recommendation was that the recipients of delivered water would pay approximately 15 to 25 percent more for water than a grower that pumps ground water.

In addition, a minority opinion of the Ad Hoc Committee identified the potential for a low tier (perhaps free) water rate that would be applied to individuals that pumped less than the proportionate sustainable yield of the basin. This proportionate level of sustainable yield was estimated to be the sustainable yield of the basin (24,000 AFY) divided by the total acreage within the PVWMA (79,600 acres), or approximately 0.3 AFY/acre.

The final phase of the rate evaluation process was undertaken by the Board of Directors through a series of public workshops that focused on specific alternative rate structures. Beginning in December 2001 and concluding in January 2002, the Board of Directors conducted three water rate workshops.

The Board workshops included discussion and evaluation of land-based assessments, flat rates, and differentiated flat rates. The Board considered the impacts of the alternative rate structures on both agricultural and municipal water users. The Board selected a differentiated flat rate structure as the basis for recovering costs associated with the Recommended Alternative.

8.4 Recommended Rate Plan

The Recommended Rate Plan is a differentiated flat rate that will result in one rate (Augmentation Charge) for individuals who pump groundwater, and a second, higher flat rate for individuals who receive delivered project water.

California law requires that these charges be based on the cost of service being provided. For the Recommended Alternative, the recommended basis for establishing the cost of service for delivered project water and for augmented groundwater is:

1. Recipients of delivered project water will pay the incremental cost of providing delivered project water to their properties as established by the incremental cost of constructing, operating and maintaining the Distribution System,

2. All water users, including recipients of delivered project water, pay a proportionate share of all remaining costs associated with the Recommended Alternative.

Based on the estimated costs of the Recommended Alternative, as presented in Section 6, the proposed rate structure would be:

Augmentation Charge	\$158/AF
Delivered Water Charge	\$316/AF

The Augmentation Charge would be increased on an incremental basis, assuming a successful election in March 2002. On this basis, the Augmentation Charge would be increased gradually from its current level of \$50/AF to \$158/AF[1].

Upon completion of the project and delivery of project water, the Delivered Water Charge would be applied to those water users receiving delivered water. That is, those water users who stop pumping and receive delivered water would move to the higher rate when they receive delivered water.

It should be noted that those water users who continue to pump groundwater will incur costs of approximately \$92/AF to cover the cost of owning and operating their own wells and pumps. This cost, which is directly borne by the water user, must be considered when calculating the total cost of water for these users. Thus, their total cost of water would be approximately \$250/AF (\$92 + \$158 Augmentation Charge). It is this cost that is directly comparable to the Delivered Water Charge of \$316/AF that will be levied on users of delivered water.

Finally, as discussed in Section 6, the Recommended Alternative would meet peak demand of the CDS if the irrigation day were extended from 18 hours to 20 hours. If this is unacceptable to growers, additional in-basin banking projects could be constructed to meet peak demand conditions relative to today's level of water use. Future projects will have to be funded by all PVWMA water users.

Increases in water supply to meet future water demand above today's level of use must be addressed through future water supply projects, which should be paid for by future water users. In addition, future water users will be asked to 'buy into' the infrastructure that was constructed to meet today's demands. Therefore, PVWMA should adopt a rate structure that includes payment of an Impact Fee, which would be paid by property owners if they convert or develop lands resulting in increased water demand. The exact nature and amount of the Impact Fee needs to be determined.

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[1] These rates are expressed in current dollars and would increase in the future with the overall rate of inflation.

Appendix C – City of Watsonville Water Supply and Distribution Emergency Response Plan

City Of Watsonville

Water Supply and Distribution System Emergency Response Plan

Written

June 17, 2004

Prepared by:
Keith Kimes
Revised by: Steven Hernandez
Water Operations Supervisor

City of Watsonville
Water Utility

Date of last minor update
July 27, 2009

Appendix D – Draft Resolution Declaring a Water Supply Emergency and Establishing Water Use Reductions

A DRAFT RESOLUTION

DECLARING A WATER SUPPLY EMERGENCY

AND ESTABLISHING WATER USE REDUCTIONS

Section 1:
Statement of Purpose and Declaration of Water Supply Emergency

The City of Watsonville enacts this resolution to restrict water waste and unnecessary use of water by reason of a present emergency caused by a water supply shortage. The prohibitions upon water waste and use of non-essential water are authorized by Ordinance 884-92(CM) enacted February 11, 1992. This Resolution establishes five (5) response levels to the water supply emergency to ensure consumptive use of potable water does not exceed anticipated water supplies available to the City.

Section 2:
Mechanisms to Trigger Phase Changes to Increase Water Use Restrictions

Enactment of the Resolution (Phase 1) shall cause no change to the present implementation of Water Waste Restrictions and the Water Use Reduction Program. Phases 2 through 5 are established to achieve subsequent reductions in potable water consumption due to a difference between actual or predicted supply and the theoretic Maximum Day consumption of 17% - 20%, 21% - 22%, 23% - 26%, and 27% - 32%, respectively. Phase changes shall be implemented by Resolution of the City Council following a duly noticed public hearing, and shall be based upon the trigger mechanisms and criteria set forth in this Section.

A. Water Availability Criteria

Water availability criteria refer to a combination of actual or predicted water supply and theoretic maximum day demand and takes into account current and expected inflows, and current and expected demands. Water availability criteria are divided into five levels:

Level One (1): Little to no risk that water supplies will exceed the theoretic maximum day from committed demands. In this case the existing programs continue to achieve the goal of sixteen percent (16%) reduction

Level Two (2): There is some risk that water supplies may not meet existing and committed demands during the theoretic maximum day of usage by between 17 and 20%. Average day use is of no concern and storage should be adequate to meet all needs.

Level Three (3): Water supplies are somewhat below existing and committed demands when taken on a worst-case scenario by between 21 and 22%. Some concern should be stressed for making commitments to new large water users. Maximum day demands should be reduced.

Level Four (4): Water supplies are predicted to be well below existing and committed demands for theoretic maximum day and worst case supplies by between 23 and 26%. Commitments for new water connections should not be made.

Level Five (5): Water supplies are below existing and committed demands for theoretic maximum day by between 27 and 32% or greater. New connections should not be allowed unless a Building Permit has been issued and connection fees paid.

B. Additional Criteria

Additional factors bear upon the need to reduce water consumption during a water supply emergency. These include water system delivery capacity limitation, equipment failure, governmental regulatory requirements and general drought related concerns. Each factor may provide independent cause to accelerate a change from one Level to another during any water supply emergency.

C. Criteria to Determine Level Changes

The City Council may cause a change from one level to another by adoption of a Resolution, but shall convene a public hearing to receive public comment on the level change prior to effecting any change in level.

Level 1. Mandatory Water Waste Restriction shall be continued upon adoption of this Resolution. Measures to promote conservation may also be imposed by Resolution of the City Council as part of Level 1.

Level 2. Mandatory Restrictions Upon Non-Essential Water Use shall be imposed by Resolution of the City Council implementing Level 2, provided the Council finds and determines that City water supplies are between 17 and 20% insufficient by reason of the present demand and committed demand.

Level 3. Mandatory Water use Restrictions shall be imposed by Resolution the City Council to implement Level 3, provided the Council finds and determines that City water supplies are between 21 and 22% insufficient by reason of the present and committed demands.

Level 4. Mandatory Water Policies shall be imposed by Resolution of the City Council to implement Level 4, provided the Council finds and determines that City water supplies are between 23 and 26% insufficient by reason of the present and committed demands.

Level 5. Mandatory Maximum Water Policies shall be imposed by Resolution of the City Council to implement Level 5, provided the Council finds and determines that City water supplies are between 27 and 32%, or greater, insufficient by reason of the present and committed demands.

Section 3:
Definitions

A. Water Waste

"Water Waste" is deemed to be the indiscriminate, unreasonable, or excessive running or dissipation of potable water. Activities considered a water waste are defined in Ordinance 884-92(CM).

B. Non-Essential Water Use

"Non-essential water use" is the indiscriminate, or excessive dissipation of potable water which is unproductive, or does not reasonably sustain economic benefits or life forms.

C. Water Supply

Water Supply is defined as seventy percent of the reasonably predictable capacity of a water source which would occur during that year's day of Maximum demand (usually during the summer) expressed as million gallons per day.

D. Theoretic Maximum Day (TMD)

The Theoretic Maximum Day is a demand based on three factors:
1. Previous year's Average Day Demand
2. A 1.9 multiplier factor
3. The Average Daily Demand from future committed customers.
TMD equals (1.) + (3.) all times (2.) expressed in million gallons per day.

E. Future Committed Customers

A future committed customer is one who has received a letter of water availability from the Water Division but has not paid fees or received a Building Permit.

F. Committed Customer

A Committed Customer is one who has received a letter of water availability from the Water Division and paid connection charges. They may or may not have a Building Permit.

Section 4:

Level 1. Mandatory Restriction Upon Water Waste

Continue the prohibition of the Waste of Water as by Ordinance 884-92(CM). The goal of Level One is to reduce residential consumption to 68 gallons per day per person.

Section 5:

Level 2. Non-Essential Water Use

The City shall further impose and enforce the following conservation measures upon adoption of this Resolution, as an integral part of Level 1 restrictions upon water waste.

Visitors Serving Commercial and General Commercial - (Mandatory)

1. Messages shall explain the local policy regarding water conservation, and this message may be conveyed by placard, decal, menu message, or any appropriate medium to promote water conservation.
2. Messages shall be placed in each public restroom, hotel or motel room (placard or decal) providing information concerning the need to conserve water.
3. Restaurants and convention facilities shall serve water only upon request. Information respecting this limitations shall be appropriately disseminated.
4. The goal of Level 2 shall be to reduce residential consumption to a daily standard of 65 gallons per day per person.

Government and Schools (Mandatory)

1. Message shall be placed in each restroom (placard or decal) providing information concerning the need to conserve water.
2. Government entities shall cease consumptive water use in training exercises.
3. Food service shall serve water only upon request.
4. Water consumption information shall be provided to each occupant of governmental residential quarters.

The City shall implement the following program to increase public awareness, promote conservation, and limit water waste.

1. Public information program
2. Public presentations
3. Conservation awards
4. Assistance to large water users (Staff upon request will aid water users and devise plans to reduce water use).

Nursery/Gardening Trade (Mandatory)

Nurseries and gardeners shall adhere to the following requirements:

1. Promotion of messages concerning the need to conserve water to clients and customers.
2. Promotion of drought tolerant plants as appropriate for new planting purposes.
3. Expanded use of irrigation practices and hardware which conserve potable water and avoid water waste.
4. Restrictions upon unreasonable and excessive use of potable water for non-irrigation uses where subpotable or non-water alternatives are available.
5. Practice efficient outdoor irrigation. The Utilities Director shall promulgate an exception to outdoor gardening trades provided all irrigation practices effect the reductions in potable water consumption required by Level 2.

Swimming Pool and Spa Trade (Mandatory)

1. Promotion of messages concerning the need to conserve water to clients and customers.
2. Expanded use of maintenance practices which conserve potable water and avoid water waste.

Section 6:

Level 3. Mandatory Restrictions Upon Non-Essential Water Uses

The City shall further impose and enforce the following conservation measures and mandatory restrictions upon water waste and non-essential water use upon adoption of a Resolution of the City Council which implements Level 3 Water Use Restriction, and which finds the trigger criteria have been met to justify the level change.

A. All water use restrictions imposed by Level 2 shall be an integral part of Level 3.

B. Non-Essential Water Use Prohibition

1. Operation of fountains, ponds, lakes, or other ornamental uses of potable water.
2. Use of potable water for dust control or earth compaction.
3. Operation of any water using air conditioner or cooler that allows water to run to waste.

C. Level 3 Conservation Restrictions

1. All Level 2 conservation restrictions shall be an integral part of Level 3.

2. The City shall further impose the following conservation measures upon implementation of Level 3 Restrictions. The goal of Level 3 shall be to reduce system-wide water consumption by a factor of 22%. This is equivalent to a daily standard of 63 gallons per person per day for residential consumption.

Hardware and Plumbing Trade (Mandatory)

1. Promotion of ultra low flow and other conservation hardware within retail outlets or by advertisement.
2. Promotion of messages concerning the need to conserve water within retail outlets or by advertisements.
3. Provision to customers of an estimate in gallons of water dissipated by necessary plumbing repairs such as line flushing, leaks or holding tank repairs. This estimate shall be written on the service tag or the payment receipt.

City (Mandatory)

1. In-school education emphasizing water supply emergency restrictions.
2. Daily Leak detection program to find and repair leaks.
3. Letters of water availability will not be issued to proposed large water users.

Construction Trade (Mandatory)

1. No use of potable water for dust control or earth compaction.

Nursery/Gardening Trade (Mandatory)

1. Promotion of messages discouraging installing of new lawns or other high water use plant types.
2. Promote expanded use of non-potable water for irrigation uses.
3. Practice efficient outdoor irrigation. The Utilities Director shall promulgate an exception to outdoor gardening trade provided all irrigation practices effect the reductions in water consumption required by Level 3.

Section 7:
Level 4. Mandatory Water Policies

The City shall further impose and enforce the following water use restrictions and water rationing upon adoption of a Resolution of the City Council which implements Level 4 water use restrictions and which finds the trigger criteria have been met to justify the Level change.

A. All water use restriction imposed by Level 3 shall be an integral part of Level 4.

B. In addition, the following shall be imposed in order to reduce consumption by a total factor of

26%. This is equivalent to a daily standard of 59 gallons per person per day for residential consumption.

1. Non-essential water use prohibition

a. No potable water is to be used for replacing evaporation loss in swimming pools or spas.

b. Vehicle washing is prohibited with potable water.

c. No sidewalk or driveway may be cleaned with potable water.

d. Landscape watering is limited to every fourth day on a rotation basis based on odd or even numbered addresses and only between the hours of 8pm and 7am. This also applies to drip systems and agricultural enterprises.

e. All leaks must be repaired or be otherwise stopped within one hour of notification or of first learning of the leak by the person in charge.

f. No letter of water availability will be issued and the Building Department will be advised that the Water Division will cease collecting connection charges.

Section 8:
Level 5. Mandatory Maximum Water Rationing

The City shall further impose and enforce the following water use restrictions and water rationing upon adoption of a Resolution of the City Council which implements Level 5 water use restrictions and which finds the trigger criteria set forth have been met to justify a level change.

A. All water use restrictions imposed by Level 4 shall be an integral part of Level 5.

B. In addition, the following shall be imposed in order to reduce consumption by a total factor of 32% or greater. This is equivalent to a daily standard of 55 gallons per person per day or less for residential consumption.

1. Non-essential water use prohibition

a. Landscape watering shall maintain the same schedule as for Level 4 restriction but subject to the maximum allocation as specified below.

b. No water is to be used for outdoor cleaning even for Public Health purposes.

c. New water connections will not be allowed unless a Building Permit has been issued and connection fees have already been paid.

2. Water Rationing.

a. Each residential water service account will be provided a mailed affidavit, on which will be requested the number of persons in the premise for residential or multi-residential accounts. Upon return of the affidavit the water allocation shall be set at 55 gallons per day per person for 62 days per billing cycle. Unreturned affidavits will be grounds to allocate to the water account a water allocation based on two persons in the residence or two persons in each unit for a multi-residential account.

b. All other accounts shall be allocated sixty eight (68%) percent or less of their consumption during the comparable period in the previous year.

Section 9:
Administrative Implementation

A. Implementation

The City Manager shall be charged with the implementation of this Resolution, and of any restrictions or requirements imposed by the Levels set forth by the Resolution. The City Manager shall document the number of full time residents for each residential water use, but shall presume each residence has only two (2) occupants for those residences which fail to respond to any reasonable inquiry. The City Manager shall also document the type of commercial use for each user, but shall be authorized to presume the type of use based upon general or previous data in the event the user fails to respond to the reasonable inquiry. The City Manager shall monitor and report to the Council all factors which affect level change criteria.

Water Rationing Surcharge

Water use in excess of the maximum ration allowed by Level 5 shall cause the imposition of a use fee/surcharge upon the customer. The fee shall be calculated at $10 per 100 cubic feet of use, and shall apply to all water use in excess of the maximum ration during the billing period.

Section 10:
Consequences of Non-Compliance for Any Level

1. Notice of Violation

Should any individual or entity fail or refuse to comply with the mandatory provision of any level of this Resolution, the City Manager shall provide that person or entity written Notice of the Violation and an opportunity to correct the non-compliance. This notice shall be in writing, and shall:

a. be posted conspicuously at the site of noncompliance;
b. state time, date, place of the violation or noncompliance;
c. state a general description of the violation or noncompliance;
d. state whether a previous notice of violation had been served on the individual or entity, and whether or not this is the notice of a second offense;
e. state the means to correct the violation or noncompliance;
f. state a date by which correction is required;
g. a copy of the written notice shall further be mailed to the address (if any) of the site of the violation.

2. Notice of Continued Violation and Citation to Appear

Should any individual or entity fail or refuse to correct the violation or non-compliance within the time specified in the written notice given in accord with part 1 and, the City Manager shall provide that person or entity written notice of the continued violation and citation to appear before the City Manager as hearing officer.

a. The notice of continued violation and citation to appear shall be posted, and mailed, and contain the information required by Part 1 above. The Notice shall further provide the date and location of the enforcement hearing.

b. The notice of continued violation and citation to appear shall further be published twice in a paper of general circulation with the City.

3. Enforcement Hearing

The City Manager shall convene an enforcement hearing at the time and place designated within the Notice of Continued Violation and citation provided by Part 2 above. The proceeding shall be dismissed where the notice was for a first offense, and where proof of correction is provided. In the absence of proof of correction, or where the notice alleges a second or subsequent offense and prior enforcement resulted in the imposition of a penalty, the enforcement hearing shall substantially follow the process set forth herein.

a. Pre-hearing issues. Disputes respecting whether an issue is ready for hearing, or whether sufficient information has been provided to set a hearing shall be determined by the hearing officer. The hearing officer shall also rule on any other preliminary question, including but not limited to discovery and pre-hearing motions. A motion to disqualify the hearing officer must be written, must allege actual bias rather than the mere appearance of bias, and must be received by the City no later than five (5) calendar days before the hearing date. No presumption of bias shall arise by reason of the City Manager's role as Staff Supervisor, or by reasons of prior involvement in any Council or staff decision. A ruling on the disqualification of the hearing officer shall be made by the Mayor of the City. An untimely or oral motion to disqualify the designated hearing officer shall have no force or effect. Where the Mayor determines actual bias to exist, he/she shall immediately designate a substitute hearing officer.

b. Continuances. The City shall have a policy of discouraging continuances of calendared hearings. Continuances shall be allowed only in the discretion of the hearing officer, and shall be allowed only upon a showing of good cause which is in the best interests of the City.

c. Hearing Record. An oral recording shall be made of each hearing. Each hearing shall be open, fair and impartial. The hearing officer may require witnesses other than parties to be excluded except when providing testimony. Each hearing shall proceed in substantially the following manner.

d. Hearing Process. Each hearing shall be conducted in quasi-judicial manner, but may proceed in an information fashion without the burden of procedural technicalities.

1. The hearing officer calls the matter for hearing and ask parties (and counsel) to identify themselves.

2. Pleadings, e.g., notice of violation, citation to appear, complaint notices of defense, and notices of hearings are made part of the record.

Section 11:
Rationing Variance

The water use restrictions mandated by Levels 3 and above of this Resolution may be modified in writing by the City Manager or his designee upon written request, without formal application or hearing, when the modification is consistent with the City rationing and water conservation goals, and where a strict application of Level 3 or above requirements would cause health or safety problems, cause extreme hardship or be inappropriate by reasons of extreme or unusual circumstance.

Section 12:
Sunset of Water Use Restrictions

The provision of the Resolution declaring a water supply emergency and imposing present water use restrictions in any level shall have no force and effect on or after December 31, 20___ , except however, that the date of this sunset provision may be extended from time to time by Resolution of the City Council which finds that the present water supply emergency has not ended.

Appendix E – Water Conservation Programs and Public Education Materials

Do your part, be WaterSmart!

In the Pajaro Valley we use more than twice as much water as is naturally available each year. This imbalance is about 6.5 billion gallons per year. This has caused saltwater from the Pacific Ocean to mix with groundwater, contaminating wells near the coast.

Irrigation run-off from landscapes carries motor oil, trash, pesticides and fertilizers down the street into storm drains and directly into our rivers, wetlands and ocean. Polluted irrigation run-off affects the health of our watersheds.

Be part of the solution to conserve water and protect water quality for future generations in the Pajaro Valley! Participate in the Water Conservation Consultation Program today.

¡Haga su parte, proteja el agua este instante!

En el Valle de P jaro usamos más de dos veces de toda el agua que hay disponible cada año. Este desequilibrio es aproximadamente 6.5 mil millones de galones de agua. Esto ha causado la filtración de agua salada del océano pacifico a las aguas subterráneas causando contaminación de pozos a lo largo de la costa.

El exceso de agua de irrigación de los jardines lleva el aceite de motor, la basura, los pesticidas y los fertilizantes a la calle donde entran a las alcantarillas y corren directamente a los ríos, pantanos y al mar. Este escurrimiento de agua contaminada afecta la salud de nuestras aguas.

¡Sea parte de la solución para conservar agua y proteger la calidad del agua para las futuras generaciones en el Valle de Pájaro! Participe en el Programa de Consulta para la Conservación de Agua.

Who is eligible?

- City of Watsonville water service customers
- All homes and businesses

For more information, call the City of Watsonville Public Works & Utilities Customer Service at **768-3133** Monday-Friday, 8am-4:30pm, or visit our website at **watsonvilleutilities.org**

CITY OF WATSONVILLE

¿Quienes califican?

- Clientes del servicio de agua de la Ciudad de Watsonville
- Todos los hogares y comercios

Para m s informaci n, llame a la División de Servicios al Cliente del Departamento de Obras Publicas de la Ciudad de Watsonville al **768-3133** Lunes-Viernes, 8am-4:30pm o visite nuestra página web **watsonvilleutilities.org**

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WATSONVILLE
Water Conservation Consultation
Consulta para la Conservaci n de Agua

What is a water consultation?

The City of Watsonville offers customers free consultations to help you save water and money. Our trained staff will visit your home or business to evaluate your landscape and indoor water use. We will make specific recommendations tailored to your needs.

It's absolutely FREE!

To schedule an appointment for your home or business, call the Public Works and Utilities Customer Service at **768-3133** TODAY!

¿Que es una consulta de agua?

La Ciudad de Watsonville ofrece consultas gratis para ayudar a clientes ahorrar agua y dinero. Nuestros especialistas visitarán su hogar o comercio para evaluar el uso de agua en el jardín y dentro de su vivienda. Nuestros expertos ofrecerán recomendaciones específicas para sus necesidades.

`Es absolutamente GRATIS!

Para una Consulta Gratis de Conservación de Agua en su hogar o negocio llame HOY a la División de Servicios al Cliente del Departamento de Obras Públicas al **768-3133**.

How will it help me?

During a Water Conservation Consultation, a water conservation specialist will:

- Evaluate the efficiency of your irrigation system, identify irrigation problems and help you find solutions.
- Provide an irrigation schedule and water budget based on your landscape.
- Explain how to read your water meter, so you can manage your water use and detect leaks.
- Provide Water Smart landscaping advice about low water use and low maintenance plants, healthy lawn care and ecological options for yard waste recycling.
- Inform you if you qualify for a toilet replacement rebate or a high efficiency washer rebate.

¿Cómo me ayudará?

Como parte de su Consulta para la Conservación de Agua, un especialista en conservación de agua:

- Inspeccionará la eficiencia de su sistema de irrigación para identificar problemas y encontrar soluciones.
- Proveerá un horario de riego y presupuesto de agua basado en su jardín.
- Explicará como leer su contador de agua para que usted pueda controlar su uso de agua y detectar fugas.
- Proveerá consejos de Jardinería Eficiente tales como la selección de plantas de bajo uso de agua y mínimo mantenimiento, como crecer un césped sano y opciones ecológicas para el reciclaje de desperdicios del jardín.
- Le informará si usted califica para un reembolso de reemplazo de inodoro o un reembolso de lavadora de alta eficiencia.

Conserve and save money!

New multi-tiered water conservation rates took effect April 1, 2009.

These new conservation rates make it more important than ever to conserve water and save money.

New rates for 2009	**Inside City** $/billing unit	**Outside CIty** $/billing unit
Tier 1 0–6,732 gal/month	**$1.05**	**$1.52**
Tier 2 6,733–14,959 gal/month	**$1.65**	**$2.28**
Tier 3 above 14,960 gal/month	**$2.33** 55% more than Tier 1	**$3.22** 53% more than Tier 1

¡Conserve y ahorre dinero!

Nuevas tarifas para los niveles múltiples de agua tomaron efecto el 1 de abril del 2009.

Con estas nuevas tarifas para la conservación de agua, ahora más que nunca es importante ahorrar agua y dinero.

Precios nuevos efectivos abril 2009	**Adentro de la Ciudad** $/costo unitario	**Afuera de la Ciudad** $/costo unitario
Nivel 1 0–6,732 gal/mes	**$1.05**	**$1.52**
Nivel 2 6,733–14,959 gal/mes	**$1.65**	**$2.28**
Nivel 3 más de 14,960 gal/mes	**$2.33** 55% más que los precios en el nivel 1	**$3.22** 53% más que los precios en el nivel 1

How We Get Our Water

When rainfall hits the ground in the Pajaro Valley, a portion of the water is absorbed into the ground and eventually reaches the groundwater table. City-owned and private wells then pump the water out for residential, agricultural, and business uses. About 80% of Watsonville's water supply is groundwater, primarily taken from the Aromas Red Sands Aquifer. The remainder is collected from Corralitos and Browns Creeks and treated at a plant in Corralitos.

The City's water meets the strict standards set by the State. However, each year more water is pumped out of the groundwater supplies than is replaced by rainfall. Over-pumping causes saltwater intrusion, the process where ocean water seeps underground into wells, rendering them useless. The City is working with the Pajaro Valley Water Management Agency on water conservation efforts and on projects to increase water supplies in the Pajaro Valley.

While the City of Watsonville uses only 10% of the groundwater pumped in the Pajaro Valley, we must all begin to deal with the challenges created by this shortage. Let's all maintain our precious resources for future generations by continuing to practice water conservation.

¿De dónde proviene el agua potable?

Cuando la lluvia cae en el suelo del Valle del Pájaro, una porción de la lluvia es absorbida por el suelo y ésta a la larga llega al subsuelo. Los pozos municipales y privados bombean el agua para los usos residenciales, agrícolas y comerciales. Cerca del 80% del suministro del agua del subsuelo proviene del acuífero *Aromas Red Sands*. El agua restante proviene de los arroyos Corralitos y el arroyo Browns y pasa por un tratamiento en la planta de filtración de Corralitos.

El agua potable de la Ciudad excede las normas estrictas establecidas por el estado. Sin embargo, hay una escasez de agua en el Valle del Pájaro: cada año se bombea más agua del subsuelo de la que es reemplazada por la lluvia. El bombeo demás causa la intrusión de agua salada (es cuando el agua del océano se filtra por el subsuelo a los pozos convirtiéndolos inservibles y los echa a perder.

Mientras que Watsonville usa solamente el 10% de todo el agua subterránea en el Valle del Pájaro, todos debemos empezar a afrontar los retos ocasionados por la escasez de agua. Hay que mantener nuestros recursos para las generaciones futuras, y así hemos de continuar con el ahorro de agua.

For more information about your water, call Beau Kayser at 768-3193. Additional copies of this report are available at City Hall, or call 768-3133, or online at www.watsonvilleutilities.org. The City Council is the governing body for the City water system. The City Council meets on the second and fourth Tuesday of each month at 4:00 p.m. and 6:30 p.m. in the Council Chambers, 275 Main Street, Fourth Floor. The City welcomes your participation in these meetings.

FREE High Efficiency Toilets

If you have a toilet installed before 1992, you could be using up to 30% of your indoor water for flushing.

Central Coast Energy Services (CCES), through the sponsorship of the City of Watsonville, is offering low-flow, high efficiency toilets to all residents and businesses whose water service is provided by the City of Watsonville. CCES will replace high-water-use toilets with low-flow toilets **FREE OF CHARGE.** They can replace multiple toilets per dwelling, and handicapped toilets if needed. They will also install other money-saving devices such as faucet aerators and low-flow showerheads.

Call CCES today for more information

(831)761-7998

GRATIS Tazas de baño de alta eficacia

Si tiene una taza de baño que se instaló antes del 1992, podría estar usando hasta el 30% de su consumo de agua interior.

Central Coast Energy Services (CCES), mediante el patrocinio de la Ciudad de Watsonville está ofreciendo tazas de baño de bajo consumo y alta eficacia a todos los residentes y negocios a los cuales les suministra servicio de agua. CCES reemplazará **GRATIS** las tazas de alto consumo con tazas de bajo consumo. Pueden reemplazar tazas múltiples por vivienda e instalar tazas para personas discapacitadas, si se necesitan. También instalarán otros dispositivos que le ahorrarán dinero como rociadores para llaves de agua y regaderas de bajo consumo.

Llame a CCES hoy para obtener más información

How to tell if your toilet is low-flow: Older toilets use 3.5 to 7 gallons with each flush. If your toilet is not marked 1.6 Gpf, it is not a low-flow toilet. If it has not been changed since 1992, it is not a low-flow toilet.

Cómo puede saber si su taza de baño es de bajo consumo: Las tazas de baño usan de 3.5 a 7 galones cada vez que baja el agua. Si la taza no está marcada 1.6 Gpf, no es una taza de bajo consumo. Si no se ha cambiado la taza desde 1992 entonces no es una taza de baño de bajo consumo.

he City of Vatsonville ffers 3 ways or homes and usinesses to:

Lower water bills

Save water and energy

Conserve groundwater

a Ciudad de Vatsonville frece 3 formas n que hogares y omercios pueden:

Rebajar su recibo de agua

Ahorrar energía y agua

Conservar agua subterránea

Who is eligible?

- City of Watsonville water service customers
- All homes and businesses

Any restrictions?

- No income restrictions
- Laundry facilities, restaurants, homes and motels are included

For more information, call the City of Watsonville Public Works & Utilities Customer Service at **768-3133** Monday-Friday, 8am-4:30pm or visit our new website at **watsonvilleutilities.org**

CITY OF WATSONVILLE

Para más información, llame a la División de Servicios al Cliente del Departamento de Obras Publicas de la Ciudad de Watsonville al **768-3133** Lunes-Viernes, 8am-4:30pm o visite nuestra nueva página web **watsonvilleutilities.org**

¿Quiénes califican?

- Clientes del servicio de agua de la Ciudad de Watsonville
- Todos los hogares y comercios

¿Hay alguna restricción?

- Sin restricciones de ingresos
- También válido para lavanderías, restaurantes, hogares y moteles

WATSONVILLE

Toilet & Washer Rebates

Reembolsos por Inodoros y Lavadoras

New!

'ree toilet replacement

cludes free installation!

L pre-1992 high flow toilets in your home or business
ll be replaced at no charge. The City purchases the
lets (two styles) and contracts with Central Coast
ergy Services to install them. Toilets marked
6 gpf (gallons per flush) are not eligible
free replacement.

is program has no income restrictions.
ll Energy Services at **1-888-728-3637**
see if your toilets qualify.

¡Nuevo!

eemplazo de
odoro gratuito

cluye instalación gratis!

DOS los inodoros de alto flujo de su casa o comercio
eriores a 1992 podrán ser reemplazados sin cargo.
Ciudad compra los inodoros (dos estilos) y contrata a
ntral Coast Energy Services para instalarlos. Los inodoros
rcados con 1.6 gpf (galones por descarga) no califican
a el reemplazo gratuito.

e programa no tiene restricciones de ingresos.
me a Energy Services al **1-888-728-3637**
a ver si sus inodoros califican.

$100 toilet rebate

Choose your own toilet!

ALL toilets now sold in California are 1.6 gpf or less. Purchase and install any new toilet and you will receive a rebate of up to **$100**. **You must save your receipt and your old, high-flow (over 1.6 gpf) toilet!**

Call Public Works & Utilities Customer Service at **768-3133** for more information and a rebate application.

Reembolso de $100 por inodoro

¡Elija su propio inodoro!

TODOS los inodoros que se venden actualmente en California son de 1.6 gpf o menos. Compre e instale cualquier inodoro nuevo y obtenga un reembolso de hasta **$100**. **Debe guardar su recibo y su inodoro viejo de alto flujo (más de 1.6 gpf)**.

Para obtener más información y una solicitud de reembolso, llame a la División de Servicios al Cliente del Departamento de Obras Públicas al **768-3133**.

$100 washer rebate

Keep it clean, save energy!

Purchase a new Energy Star certified washing machine, save your receipt and get a **$100 rebate**. These washers use 50% less water and energy. Check with PG&E for additional rebates. Call Public Works & Utilities Customer Service at **768-3133** for more information and a rebate application.

Reembolso de $100 por lavadora

¡Mantenga todo limpio, ahorre energía!

Compre una lavadora nueva certificada de Energy Star, guarde su recibo y obtenga un **reembolso de $100**. Estas lavadoras usan un 50% menos de agua y de energía. Consulte con PG&E para reembolsos adicionales. Para obtener más información y una solicitud de reembolso, llame a la División de Servicios al Cliente del Departamento de Obras Públicas al **768-3133**.

City of Watsonville

High Efficiency Clothes Washer Rebate Program

Application

Important: Complete application and submit with your original receipt.

Name ______________________ Telephone ______________________

Account Number ____

Mailing Address ____

Address Where Clothes Washer Is Installed ____________________________

Clothes Washer Manufacturer ________________________________

Model Number ____

Date Purchased ______________________ Date Installed ______________________

Purchased From ____

Purchase Price (Not Including Sales Tax) ____________________________

Signature ______________________ Date ______________________

Attach original sales receipt and return completed application to:

City of Watsonville
Customer Service Division
320 Harvest Drive
Watsonville CA 95076-5103

For more information, call 768-3133

Official Use Only:

Application ◯ Approved ◯ Denied

City of Watsonville
High-Efficiency Clothes Washer Rebate Program

Rebate Eligibility Requirements

- Rebates are given only on Energy Star labeled clothes washers.
- The rebate amount is **$100.**
- The clothes washer **must be purchased new.**
- The clothes washer must be **installed at a location serviced by the City of Watsonville Water Division.** All residents and businesses that pay a water bill to the City of Watsonville, whether located inside or outside city limits, are eligible for the rebate.
- An on-site inspection by a representative of the Customer Service Division may be required to verify installation before rebate is paid.

Procedures:

1. Purchase and install your new clothes washer. Verify with the appliance retailer that the clothes washer you are purchasing qualifies as an Energy Star labeled appliance.
2. Complete this rebate form and attach the **original sales receipt** showing the model of the washing machine and the date of purchase. Return to the Water Division for processing.
3. A representative of the Customer Service Division will contact you and verify installation of the qualifying clothes washer.
4. Allow four to six weeks to receive your rebate check.
5. More information about energy-efficient clothes washers and other appliances is available at `www.energystar.gov`.
6. The City **does not** pick up the old clothes washer.
7. For additional information about the washer rebate program, disposal of old washers, the toilet rebate program, and other water conservation devices, such as low-flow shower heads and hose nozzles, call 768-3133.

The City of Watsonville does not endorse or recommend specific brands, products, materials, or dealers; acceptance of such is customer's responsibility. Installation of the washer is the sole responsibility of the applicant. The City of Watsonville assumes no responsibility or liability for any damage to property that may occur as a result of participation in the high-efficiency clothes washer rebate program. It is expected but cannot be guaranteed that installation of a high-efficiency clothes washer will result in lower utility bills.

CITY OF WATSONVILLE

LANDSCAPE WATER CONSERVATION PROGRAM
SITE EVALUATION FORM

Date of Water Conservation Evaluation:____________________Evaluation Staff:_________________________

Contact Name: ____

Check one: ☐ Tenant ☐ Property Owner ☐ Business Owner ☐ Property Manager

Site Address:____

Contact Phone:__________________________ Alternate phone/e-mail:_______________________________

Landscape Maintenance Service Provider: ____

Contact Name:____ Phone:_________________________

Account Number:_______________________________Meter Serial Number:___________________________

Survey Meter Reading:__________________________Leaks Detected (cf/minute):_____________________

Toilet(s) Make and Model:____

☐ Qualifies for toilet replacement/rebate program (circle one)? ☐ Qualifies for HE washer rebate?

Total Landscaped Area: ____

Existing Irrigation Controller(s) Make and Model: ____

Existing Irrigation Hardware Make and Model: Rotor:____

Fixed Spray:_______________________________Drip:____

COMMENTS: ____

____

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____

Instruction Given on Irrigation Controller Programming? ☐ Yes ☐ No

Irrigation Schedule Requested? ☐ No ☐ Yes Water Budget Requested? ☐ No ☐ Yes

Water waste documented/reported at this site? ☐ No ☐ Yes If yes, type: ☐ Overspray ☐ Run-off ☐ Broken equipment ☐ Other ___________________________________

Follow-up visit recommended? ☐ No ☐ Yes Date of follow-up visit: ___________________________

RESOURCE MATERIALS PROVIDED

☐ Rebate Brochure	☐ Watsonville Plant List	☐ LWC Local Resources
☐ OWOW Fact Sheets	☐ LWC Water-wise tips	☐ Other:_______________
☐ Faucet Aerators:	☐ Irrigation Schedule Guide	☐ Other:_______________
☐ Hose Shut-off Nozzles:	☐ Showerhead Aerators:	☐ Other:_______________

LANDSCAPE WATER CONSERVATION PROGRAM
SITE EVALUATION FORM

Quantity:__________ Quantity:__________

A water budget for the ________________________________ property was calculated in accordance with AB 1881, The Water Conservation in Landscaping Act. The landscape water budget shall be no more than 70 percent of reference evapotranspiration per square foot of landscaped area. The landscape water budget was calculated using the equation below:

Landscape Water Budget = (0.7) (ETo) (.00083) (LA), where:

Water Budget = the predicted amount of water needed to maintain your site in a healthy and viable condition and the annual upper limit of irrigation water allowed (HCF/year; HCF = one hundred cubic feet, the standard measure of water equal to 748 gallons.)

0.7 = ET adjustment factor

ETo = Reference evapotranspiration (inches per year); Historical ETo for Watsonville is 37.7 inches/year. Evapotranspiration is the combined process of water loss by evaporation and water transfer to the air through plant tissues.

0.00083 = Conversion factor that translates inches to HCF

LA = Landscape area (square feet)

Records from the Watsonville Public Works and Utilities department document that 20__ annual irrigation water use at the __________________________ was ________ HCF (________________ gallons). The site is currently using ____________________________ the water budgeted. **When the irrigation site tune-up improvements recommended in this report are completed and the site is maintained on budget, estimated annual water savings are calculated to be ____________ HCF (____________________ gallons) compared to 20___ water usage**. This annual savings in water translates to a potential **$**____________ per year compared to 20___ water usage at current water rates.

Watsonville Municipal Code

6-3.432 Wasting of water.

It is unlawful for any person to use water for any of the following:

(a) Watering of grass, lawn, ground cover, shrubbery, open ground, crops, trees, including agricultural irrigation, or an indiscriminate running of water or washing with water in a manner or to an extent which allows water to run to waste;

(b) Permit the loss of water through leaks, breaks, or malfunction within the customer's plumbing;

(c) The use of a hose without a quick-acting positive shut-off nozzle;

(d) Maintenance or operation of any new ornamental fountain which does not recirculate 100 percent of water used;

(e) Operation of a new car wash that does not use the best available water conservation technology;

(f) Irrigation of turf, lawns, gardens or ornamental landscaping between 9:00 a.m. and 5:00 p.m., except by drip irrigation or hand watering with a quick-acting shut-off nozzle. (§ 1, Ord. 1088-00 C-M, eff. April 14, 2000)

6-3.433 Water conservation in development.

All development shall utilize water conservation, water recycling, and xeriscaping to the maximum extent possible. (§ 1, Ord. 1088-00 C-M, eff. April 14, 2000)

6-3.434 Landscape water meters.

Separate landscape water meters shall be required in locations with a combined landscaped area greater than 5,000 square feet. (§ 1, Ord. 1088-00 C-M, eff. April 14, 2000)

6-3.435 Landscape irrigation systems.

Irrigation systems shall be designed and maintained to avoid runoff, over-spray, low head drainage or other similar conditions where water flows to waste. (§ 1, Ord. 1088-00 C-M, eff. April 14, 2000)

6-3.436 Turf restrictions.

Turf shall not be used in median strips, parking islands, or in areas less than eight (8') feet wide, or on slopes that will result in excess irrigation water runoff. These limitations may be exempted if required for storm water erosion control by the Public Improvement Standards. (§ 1, Ord. 1088-00 C-M, eff. April 14, 2000)

6-3.437 Water use in landscaped areas.

Water use, in combined landscaped areas greater than 5,000 square feet, shall be monitored for comparison to the MAWA. Landscaped areas with water use lower than or equal to the MAWA shall be designated as water efficient. Landscaped areas with water use greater than MAWA will require an audit. The Director shall determine the appropriate mitigation measure to reduce water usage so as not to exceed the MAWA. Failure to implement such mitigation measure is a violation of this Code. (§ 1, Ord. 1088-00 C-M, eff. April 14, 2000)

LANDSCAPE WATER CONSERVATION PROGRAM
TIPS FOR A BEAUTIFUL AND WATER-WISE LANDSCAPE

Commercial and residential water users have successfully implemented many of the following water use efficiency tips to save water and money – and you can too! Review this list with your landscape professional to insure that your property is maintained with resource efficient and pollution prevention practices.

Plant Selection and Gardening Practices

- Apply 4-6 inches of mulch in all non-turf planted areas to retain soil moisture, suppress weeds, and add organic matter to the soil. Reapply 2-3 inches once per year.
- Use turf only where actually necessary: immediate picnic areas, sports fields, golf courses, and parks/yards designed for active play. Generally, turf should not comprise more than 25% of total landscaped area.
- Replace nonfunctional turf with drought-tolerant plants to reduce outdoor water use. Drought-tolerant grasses and groundcovers that may be suitable lawn substitutes include: *Deschampsia caespitosa, Festuca idahoensis, Festuca rubra, Koeleria macrantha, Poa secunda*, *Achillea tomentosa*, and *Thymus praecoxarcticus*.
- In areas where functional turf will remain, mow when the grass is dry. During the summer months, cut the grass higher to retain soil moisture. Remove no more than 1/3 of the leaf blade at one cutting.
- Aerate the soil. Grasscycle clippings or top-dress with fine compost on turf. This can provide most of the nutrients needed by a lawn.
- If you need to fertilize, use natural, balanced, slow-release fertilizers. Fertilizers, if misapplied, can kill soil life, ruin soil structure, and lead to pollution of our local waterways through runoff.
- Select water conserving California native plants or low-water use, climate-appropriate plants. Choose plants that will not require supplemental irrigation when established.
- Prune only to rejuvenate and restore plant health. If heavy pruning is necessary, replace the plant with one that will mature at a smaller size.
- Use hydrozoning; group plants with similar water needs on the same irrigation valve.
- Use a broom instead of water to clean sidewalks, decks, driveways, and parking lots. For deep cleaning use a pressure washer or water broom that uses 2-gallons per minute or less.
- Check soil moisture level with a soil probe, shovel, or trowel. Don't assume the plants need water just because the soil surface looks dry.

Irrigation System Design

- The irrigation system must be designed to prevent runoff, low head drainage, overspray, or other similar conditions where irrigation water flows onto non-targeted areas, such as adjacent property, non-irrigated areas, hardscapes, roadways, or structures.
- Design dual watering systems with sprinklers for turf and low-volume irrigation for flowers, shrubs, and trees.
- Use sprinklers and emitters with matched precipitation rates; don't mix different types of sprinklers on one valve. Space sprinklers to achieve the highest possible distribution uniformity (DU).
- Narrow and/or irregularly shaped areas, including turf, less than eight-feet wide in any direction must be irrigated with subsurface irrigation or low volume irrigation system. Observe a 24-inch setback between overhead sprinklers and any non-permeable surface.
- Convert overhead sprinklers to drip irrigation. Often, the easiest and most affordable conversion is with a retrofit kit that threads onto an existing ½ inch riser. These units should contain built-in pressure regulators and filters.
- Irrigation systems on slopes greater than 10% should not exceed a precipitation rate of 0.75 inches per hour. The clay soils in our area absorb water slowly and will send water to waste at higher precipitation rates.
- Install sprinkler bodies with drain check valves in areas of lowest elevation to prevent low head drainage and water waste.
- For large properties, install master valve and high flow shut-off or flow sensor to reduce the amount of water lost due to high external leakage from broken irrigation equipment.
- Use either evapotranspiration (ET) or soil moisture sensor devices for irrigation scheduling. Install rain shut-off devices to your controller to shut off the system during and directly after rain.
- Utilize rainwater or gray water for landscape irrigation. Contact the City of Watsonville Building Permit Division at 831-768-3050 for more information. Permits may be required.
- Use an automatic timer when watering with a hose end sprinkler. Use a quick acting shut off nozzle or watering can when watering by hand.

LANDSCAPE WATER CONSERVATION PROGRAM
TIPS FOR A BEAUTIFUL AND WATER-WISE LANDSCAPE

Irrigation System Maintenance

- Perform a visual inspection of the entire irrigation system at least once every two weeks and/or after each mowing to identify obvious problems such as leaky, broken, or clogged, equipment. Repair and adjust within 24 hours with the correct parts.
- Adjust the arc and radius pattern of all sprinklers to avoid overspray onto hardscapes. Adjust tilted sprinkler heads to be perpendicular with grade.
- Inspect drip tubing and emitters for clogging and breakage. Flush out drip system and clean filters once per year.
- Make sure the irrigation system is operating at the correct pressure. Too high pressure will result in misting and wear or failure of parts. Too little pressure will prevent adequate coverage.

Irrigation System Management

- **Turn off all irrigation stations during the rainy season (November through March).**
- Develop an irrigation system map that indicates where all essential components are located, including faucets, irrigation controller(s), solenoids, booster pumps, sprinklers, and bubblers.
- Operate sprinkler system between 10 pm and 8 am to reduce water loss from evaporation and wind drift.
- Utilize multiple start times during irrigation cycles to allow sufficient soak-in time and encourage deep root growth. This is especially important on slopes, in clay soils, and areas that are compacted.
- Use longer run times for drip irrigation than for rotors or fixed spray sprinklers because drip emitters have very low application rates.
- Adjust the total run time of each program to correspond with the seasons by using the "percent adjust" or "seasonal adjust" feature on your irrigation timer.
- Develop a site-specific water budget. Your local water conservation specialist can assist in this task. For more information or to schedule a FREE Landscape Water Conservation Consultation, call 831-768-3133.

Water-wise resources and ordinances

- Wasting water is a violation of the California Model Water Efficient Landscape Ordinance (www.water.ca.gov/wateruseefficiency/landscapeordinance/) and Watsonville Municipal Code Section 6-3.432. Penalties for reoccurring outdoor water waste may include doubling of water rates and, in extreme cases, service disruption until the specific problem areas are code compliant.
- The Monterey Bay Green Gardener Program provides professional training and certification in ecological landscaping. The program goals are to reduce reliance on synthetic fertilizers and pesticides, reduce water pollution and encourage water conservation. Classes are available in English and Spanish. More information about the Green Gardener Program can be found at www.green-gardener.org.
- To learn more about landscaping strategies that reduce storm water runoff and retain water on-site, refer to the publication *Slow it. Spread it. Sink it!* prepared by the Resource Conservation District of Santa Cruz County. It can be found at www.rcdsantacruz.org.
- The Water Smart Gardening website and CD are available with many resources to help you with garden planning. This interactive tool features low water-use plants and allows you to create a customized plant list that is suitable for your particular site. You can find the website by using the link at www.watersavingtips.org. The CDs will be available to City of Watsonville water customers in summer 2010.

The City of Watsonville does not endorse or recommend specific companies or contractors, nor does it guarantee materials or workmanship; acceptance of such is the customer's responsibility. The ideas presented here are not intended to be an endorsement by the City of Watsonville of any specific method, process, or product but are merely suggestions for saving and using water more efficiently. Compliance with all state and local ordinances is mandatory.

Revised 7/2010

LANDSCAPE WATER CONSERVATION PROGRAM
Local Landscaping Resources

Water-wise landscaping Internet resources

- The Monterey Bay Green Gardener Program provides professional training and certification in ecological landscaping. Students receive instruction on preventing water pollution from fertilizers and pesticides, water-wise plant selection, and efficient irrigation systems. Evening classes are available in English and Spanish. More information about the Green Gardener Certification Program can be found at www.green-gardener.org.

- To learn more about landscaping strategies that reduce storm water runoff and retain water on-site, refer to the publication *Slow it. Spread it. Sink it!* prepared by the Resource Conservation District of Santa Cruz County. It can be found at www.rcdsantacruz.org.

- The Water Smart Gardening website and CD are available with many resources to help you with garden planning. This interactive tool features low water-use plants and allows you to create a customized plant list that is suitable for your particular site. You can find the website by using the link at www.watersavingtips.org.

Water-wise landscaping publications

Check your local library or bookstore for these valuable gardening resources.

- *Sunset Western Garden Book,* Sunset Publishing Corporation
- *Plants and Landscapes for Summer-Dry Climates of the San Francisco Bay Region,* East Bay Municipal Utility District
- *Designing California Native Gardens,* Glenn Keator & Alrie Middlebrook
- *California Native Plants for the Garden,* Carol Bornstein, David Fross, & Bart O'Brien
- *Sustainable Landscaping for Dummies,* Owen E. Dell
- *Bay-Friendly Gardening Guide: From Your Backyard to the Sea,* Bay-Friendly Landscaping and Gardening Coalition
- *Simplified Irrigation Design,* Pete Melby

The City of Watsonville offers customers FREE Landscape Water Conservation consultations to help you save water and money. To schedule an appointment for your home or business, call the Public Works & Utilities Customer Service at 768-3133.

The City of Watsonville does not endorse or recommend specific companies or contractors, nor does it guarantee materials or workmanship; acceptance of such is the customer's responsibility.

Appendix F - Adoption of the 2010 City of Watsonville UWMP

RESOLUTION NO. 111-11 (CM)

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF WATSONVILLE APPROVING THE CITY OF WATSONVILLE 2010 URBAN WATER MANAGEMENT PLAN

WHEREAS, Section 10620 of the California Water Code mandates that every supplier providing water to more than 3,000 customers prepare and adopt an Urban Water Management Plan ("Plan"); and

WHEREAS, the Plan needs to be reviewed every five (5) years and must be adopted after a public review and hearing; and

WHEREAS, notice has been properly given as required by and according to the provisions of Section 6066 of the Government Code; and

WHEREAS, on June 14, 2011, the Council afforded every interested person an opportunity to comment on the Plan either in writing or orally.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF WATSONVILLE, CALIFORNIA, AS FOLLOWS:

1. That the City of Watsonville 2010 Urban Water Management Plan, a copy of which is attached hereto and incorporated herein by this reference, is hereby approved.

2. That the Public Works Director, or his designee, is hereby directed to submit a copy of this Plan no later than thirty (30) days after adoption to the California Department of Water Resources (DWR), the California State Library, and the County of Santa Cruz, pursuant to Subsection (a) of Section 10644 of the California Water Code.

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The foregoing resolution was introduced at a regular meeting of the Council of the City of Watsonville, held on the **14th** day of **June**, **2011**, by Member **Bersamin**, who moved its adoption, which motion being duly seconded by Member **Hurst**, was upon roll call carried and the resolution adopted by the following vote:

AYES:	COUNCIL MEMBERS:	**Bersamin, Hurst, Martinez, Montesino, Rios, Dodge**
NOES:	COUNCIL MEMBERS:	**None**
ABSENT:	COUNCIL MEMBERS:	**Bilicich**

Daniel Dodge, Mayor

ATTEST:

City Clerk

APPROVED AS TO FORM:

City Attorney