APPENDIX A

RESOLUTION TO PREPARE A GROUNDWATER MANAGEMENT PLAN

RESOLUTION NO. 2002-43

A RESOLUTION OF THE LINCOLN CITY COUNCIL OF INTENTION TO DRAFT A GROUNDWATER MANAGEMENT PLAN PURSUANT TO THE GROUNDWATER MANAGEMENT ACT (WATER CODE, §§ 10750 et seq.)

WHEREAS, the City of Lincoln (City) owns and operates the municipal drinking water wells (Wells) that utilize groundwater to provide a safe and reliable source of drinking water to the City's customers; and

WHEREAS, the continued operation of the Wells by the City is necessary to provide an emergency backup and supplement to Placer County Water Agency surface water supply; and

WHEREAS, more effective groundwater management is necessary to protect the City's source of water supply and health and safety of its customers; and

WHEREAS, the Legislature has found and declared that groundwater is a valuable natural resource in California, and should be managed to ensure both its safe production and its quality; and

WHEREAS, it is the expressed intent of the Legislature to encourage local agencies to work cooperatively to manage groundwater resources within their jurisdictions; and

WHEREAS, the Groundwater Management Act (Water Code, §§ 10750 *et seq.*) authorized a local agency whose service area includes a groundwater basin which is not subject to groundwater management pursuant to other provisions of law or a court order, to adopt and implement a Groundwater Management Plan; and

WHEREAS, the City is a local agency authorized to adopt a Groundwater Management Plan pursuant to the provisions of the Groundwater Management Act; and

WHEREAS, Water Code section 10753.2 requires that, before preparing a Groundwater Management Plan, a local agency must first hold a public hearing to consider whether to adopt a Resolution of Intention to Draft a Groundwater Management Plan; and

WHEREAS, following the publication of notice required by law, the City held a public hearing on March 26, 2002, to receive public comment on whether or not it should adopt a resolution of intention to draft a Groundwater Management Plan; and

WHEREAS, after considering the public comment and other information presented at the hearing, the Lincoln City Council determined that it is in the best interest of the City to draft a Groundwater Management Plan.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF LINCOLN DOES HEREBY RESOLVE AS FOLLOWS:

1. The Lincoln City Council deems it advisable and in the best interest of the City to draft a Groundwater Management Plan.

2. The City hereby declares its intention to draft a Groundwater Management Plan pursuant to Water Code section 10750 et seq.

3. The Director of Public Works is directed to take any additional action necessary and appropriate to implement this resolution.

PASSED, APPROVED and ADOPTED this 26th day of March, 2002, by the following roll call vote:

AYES:	COUNCILMEMBERS:	Santini, Short, Cosgrove, Storz, Sprague
NOES:	COUNCILMEMBERS:	NONE
ABSENT:	COUNCILMEMBERS:	NONE

MAYOR

ATTEST:

CITY CLERK

APPROVED AS TO FORM:

CITY ATTORNEY

APPENDIX B

GROUNDWATER QUALITY DATA

City of Lincoln Groundwater Quality Data

			1998		2000	2001				2002			
Units	Constituent	MCL	Well 2	Well 4	West-wood	Well 2	Well 4	West-wood	Moore Road	Well 2	Well 4	West-wood	Moore Road
mg/L	Hardness (CaCO3)	NS	109	64	120	120	70	130	90				
mg/L	Calcium	NS	19	13.3	24	22	14	26	16				
mg/L	Magnesium	NS	14.3	8.4	16	16	8.6	17	12				
mg/L	Sodium	NS	35.3	53.2	64	38	45	54	35				
mg/L	Potassium	NS	0.6	1	ND	ND	ND	ND	ND				
mg/L	Alkalinity (Total)	NS			140	96	94	130	100				
mg/L	Alkalinity (Hydroxide)	NS	<1.0	<1.0	ND	ND	ND	ND	ND				
mg/L	Alkalinity (Carbonate)	NS	<1.0	<1.0	ND	ND	ND	ND	ND				
mg/L	Alkalinity (Bicarbonate)	NS	126	123	140	96	94	130	100				
mg/L	Sulfate	250	16.1	18.7	8.5	17	16	13	8.9				
mg/L	Chloride	250	41.5	30.4	70	40	27	53	25				
mg/L	Nitrate (NO3)	45	14.6	3.55	8	15	5	8	5.7	16	3.2	8.9	9.2
mg/L	Fluoride	1.4-2.4	0.1	0.2	ND	0.4	0.4	0.2	ND				
Units	pH	NS	7.1	7.5	7.3	6.9	7.4	7	7.3				
mg/L	TDS	500	331	297	320	270	230	310	220				
NTU	Turbidity	5	<0.10	0.75	ND	ND	5.4	0.2	<0.5		0.69		
Units	Color	15	<3	4	ND	ND	10	ND	0				
TON	Odor Threshold	3	<1	1	ND	1	1	1	0				
mg/L	MBAS	0.5	<0.05	<0.05	ND				ND				
mg/L	Aluminum	1	<0.05	0.24	ND	ND	0.63	ND	ND				
mg/L	Antimony	0.006	0.006	<0.006	ND	ND	ND	ND	ND				
mg/L	Arsenic	0.01	<0.002	0.0048	ND	0.002	0.004	0.002	ND				
mg/L	Barium	1	0.109	<0.14	ND	0.06	0.06	0.05	ND				
mg/L	Beryllium	0.004	0.001	<0.001	ND	ND	ND	ND	ND				
mg/L	Boron	NS			0.65					0.4	0.6	0.5	0.4
mg/L	Cadmium	0.005	<0.001	<0.001	ND	ND	ND	ND	ND				
mg/L	Chromium	0.05	<0.01	<0.01	ND	0.007	ND	0.005	ND	0.004	0.006	0.0014	0.0038
mg/L	Copper	1	<0.05	<0.05	ND	ND	0.16	ND	ND		ND		
mg/L	Iron	0.3	<0.1	0.179	ND	ND	1.8	ND	ND		0.08		
mg/L	Lead	0.05	<0.005	0.009	ND	ND	0.015	ND	ND		ND		
mg/L	Manganese	0.05	<0.03	0.031	ND	ND	0.07	ND	ND		ND		
mg/L	Mercury	0.002	<0.001	<0.001	ND	ND	ND	ND	ND				
mg/L	Nickel	0.1	0.01	<0.01	ND	ND	ND	ND	ND				
mg/L	Selenium	0.05	<0.005	<0.005	ND	ND	ND	ND	ND				
mg/L	Silver	0.1	<0.01	<0.01	ND	ND	ND	ND	ND				
mg/L	Thallium	0.002	0.001	<0.001	ND	ND	ND	ND	ND				
mg/L	Zinc	5	0.05	<0.02	ND	ND	ND	ND	ND				
mg/L	Nitrite as (N)	1	<0.05	<0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND
mg/L	Cyanide	0.2	0.002	<0.002	ND	ND	ND	ND	ND				
ug/L	Methylene chloride	5							2				
umho/cm	Specific Conductivity (EC)									390	300	500	320
mg/L	Total Trihalomethanes	0.1	ND	ND	0.0073	ND	0.0022	ND					
pCi/L	Alpha activity	15	<1.0	<1.0	ND	<1.0	0.15	<1.0					
ug/L	MtBE	13			ND				ND	ND	ND	ND	ND
ug/L	Dichlorodifluoromethane	NS								ND	ND	ND	ND
ug/L	Ethyl t-Butyl Ether	NS								ND	ND	ND	ND
ug/L	Nitrobenzene	NS								ND	ND	ND	ND
ug/L	t-Amyl Methyl Ether	NS								ND	ND	ND	ND
ug/L	tert-Butyl Alcohol	NS								ND	ND	ND	ND
ug/L	Perchlorate	NS								ND	ND	ND	ND
ug/L	Vanadium	NS								25	22	16	23
ug/L	1,2,3-Trichloropropane	NS								ND	ND	ND	ND
ug/L	DCPA Diacid + Monoacid									ND	ND	ND	ND
ug/L	2,4-Dinitrotoluene	NS								ND	ND	ND	ND
ug/L	2,6-Dinitrotoluene	NS								ND	ND	ND	ND
ug/L	4,4-DDE	NS								ND	ND	ND	ND
ug/L	Acetochlor	NS								ND	ND	ND	ND
ug/L	EPTC	NS								ND	ND	ND	ND
ug/L	Molinate	20								ND	ND	ND	ND
ug/L	Terbacil									ND	ND	ND	ND
% Rec	Bromoform									110	330	110	520
% Rec	DCPAA									100	110	110	110
% Rec	1,3-Dimethyl-2-nitrobenzene									120	120	110	110

NS = no standard
ND = none detected
mg/L = milligrams per liter
ug/L = micrograms per liter
pCi/L = picoCuries per liter
NTU = Nephelometric Turbidity Units
MCL = Maximum contaminant level
% Rec = Percent Recovered (surrogates)

APPENDIX C

RESOLUTION ADOPTING THE GROUNDWATER MANAGEMENT PLAN

RESOLUTION NO. 2003-225

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LINCOLN ADOPTING THE GROUNDWATER MANAGEMENT PLAN PURSUANT TO THE GROUNDWATER MANAGEMENT ACT (WATER CODE, §§ 10750 et seq.)

WHEREAS, the City of Lincoln (City) owns and operates the municipal drinking water wells (Wells) that utilize groundwater to provide a safe and reliable source of drinking water to the City's customers; and

WHEREAS, the continued operation of the Wells by the City is necessary to maintain overall City water supplies and system reliability; and

WHEREAS, more effective groundwater management is necessary to protect the City's source of water supply and health and safety of its customers; and

WHEREAS, the Legislature has found and declared that groundwater is a valuable natural resource in California, and should be managed to ensure both its safe production and its quality; and

WHEREAS, it is the expressed intent of the Legislature to encourage local agencies to work cooperatively to manage groundwater resources within their jurisdictions; and

WHEREAS, the Groundwater Management Act (Water Code, §§ 10750 *et seq.*) authorizes a local agency whose service area includes a groundwater basin which is not subject to groundwater management pursuant to other provisions of law or a court order, to adopt and implement a Groundwater Management Plan; and

WHEREAS, the City is a local agency authorized to adopt a Groundwater Management Plan pursuant to the provisions of the Groundwater Management Act; and

WHEREAS, the City has developed, with input from the public and a City of Lincoln Groundwater Management Plan Advisory Committee; and

WHEREAS, Water Code section 10753.2 requires that, before preparing a Groundwater Management Plan, a local agency must first hold a public hearing to consider whether to adopt a Resolution of Intention to Draft a Groundwater Management Plan; and

WHEREAS, following the publication of notice required by law, the City held a public hearing on November 12, 2003, to receive public comment on whether or not it should approve a resolution adopting a Groundwater Management Plan; and

WHEREAS, after considering the public comment and other information presented at the hearing, the Lincoln City Council determined that it is in the best interest of the City to adopt a Groundwater Management Plan.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF LINCOLN DOES HEREBY RESOLVE AS FOLLOWS:

Section 1. The Lincoln City Council declares its intention to adopt a Groundwater Management Plan pursuant to Water Code section 10750 et seq.

Section 2. The Director of Public Works is directed to take any additional action necessary and appropriate to implement this resolution.

Section 3. This resolution shall take effect immediately.

PASSED ANDADOPTED this 12th day of November, 2003, by the following roll call vote:

AYES: COUNCILMEMBERS: Nakata, Sprague, Short, Santini

NOES: COUNCILMEMBERS: None

ABSENT: COUNCILMEMBERS: Cosgrove

MAYOR

ATTEST:

CITY CLERK

APPROVED AS TO FORM:

CITY ATTORNEY

APPENDIX D

WRITTEN STATEMENT: PUBLIC PARTICIPATION

Draft groundwater plan to be discussed

The city of Lincoln will conduct a public meeting on Thursday, July 31st from 6-8 p.m. at the Lincoln Conference Center, 580 6th St., Lincoln, to discuss the city's draft Groundwater Management Plan.

The plan will help guide the city's use of groundwater for drought protection and emergency supply.

The city has historically used its current wells and available storage space to supply water to western portions of town and to residents and businesses during occasional water supply outages.

The draft plan calls for additional study of the subsurface and monitoring of groundwater levels and quality in order to better understand how to most efficiently use available groundwater without causing significant adverse impacts.

An Advisory Committee comprised of local elected officials, business leaders and other stakeholders has been assembled to provide input into the development and implementation of the Groundwater Management Plan.

The July 31st meeting is the second of three public meetings that will culminate in a public hearing at a Lincoln City Council meeting later this summer where the council will consider adopting the plan as presented or as amended.

Copies of the Plan are available for review at City Hall and the Lincoln Public Library.

For more information about the plan or the meeting, contact John Pedri, director of Public Works, at (916) 645-8576.

Farmers asked to help with water plan

By Patty McAlpin
Lincoln News Messenger

Keeping water flowing to Lincoln homes, businesses and agricultural operations and meeting future needs are among the reasons the city is crafting a groundwater management plan.

The majority of Lincoln's water, approximately 80 percent is supplied by Placer County Water Agency. The remainder comes from four city wells.

The city of Lincoln Groundwater Management Plan Advisory Committee conducted its final public meeting July 31 to get input on the plan, which is expected to go to the Lincoln City Council for adoption in the next couple of months.

"A key element is the city is going on the hypothesis that it is using groundwater for back up and emergencies," said Greg Young, senior water resources engineer for Saracino Kirby Snow, the consultant putting together the plan. "If the data is wrong, it could affect the city's growth. We need answers within the next year."

The puzzle pieces the city, county and participating agencies are trying to pick up is the historical use of wells in the Lincoln sphere of influence.

Members of the agricultural community are being asked to voluntarily contribute information on wells for the Groundwater Management Plan so those putting together the plan can have as complete a picture as possible.

"I know there is some discomfort on the part of the ag community," said Young. "The city wants to understand the basin better. They want to be good neighbors and invite information on historical ag uses and access to wells for monitoring. This would be invaluable. We invite the cooperation of the ag community and farmers."

Placer County Farm Bureau Second Vice President Don Derobertis asked how far outside the city sphere of influence wells will be monitored and in how many different directions.

Young said it is unknown.

Wayne Vineyard and other local farmers at the meeting pointed out that the historical agricultural groundwater uses in Lincoln need to be revised to reflect the actual usage for rice and oat hay.

Lincoln Councilman Spencer Short asked for clarification on what well systems are in place and what is currently being drawn by the county.

Short said he wants to know the impact of residential and agricultural wells on the aquifer.

Placer County Supervisor Robert Weygandt said the policy of the county is new urbanization has to develop on surface water.

"We want to make sure agriculture has access and well water is protected," said Weygandt.

Weygandt said the two areas designated urban are Placer Vineyards and Sunset Industrial. Both are in the southwestern part of the county.

Placer County Water Agency Planning Director Mal Toy said PCWA's Groundwater Management Plan was crafted in 1998. The plan is being updated for new state standards. The update will include a focus on the feasibility of aquifer storage.

Toy said the agency is working with the city of Roseville and will be working with the city of Lincoln to coordinate information.

"We all fit together," said Toy.

Completion of the American River Pump project is estimated at 2005.

Lincoln Mayor Primo Santini said the agency has conveyed to the city there will be an adequate supply to meet the city's needs within the existing General Plan boundaries.

Lincoln Public Works Director John Pedri said Lincoln may have to augment with a little more well water.

RWA
Regional Water Authority
BUILDING ALLIANCES IN NORTHERN CALIFORNIA

5620 Birdcage Street, Suite 180
Citrus Heights, CA 95610
(916) 967-7692

Lincoln Moves Ahead with Groundwater Plan

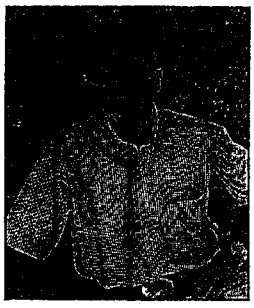
The City of Lincoln expects to adopt a groundwater management plan (GMP) at a public hearing November 11. The plan, developed with input from the public and an Advisory Committee of local stakeholders, will help guide management of the basin for long-term groundwater sustainability for the city and local users.

The City of Lincoln invites the public to review the current draft of the GMP. It is available on-line at www.ci.lincoln.ca.us, under *City Departments*, under *Public Works/Engineering*.

Vol. 1 Summer 2003

Bureau Talk

PLACER COUNTY FARM BUREAU NEWS



President's Message

Summer has finally arrived in Placer County. With summer comes fair time. I would like to encourage all children of Farm Bureau members to work hard on their 4-H, FFA and Grange animal projects. The Farm Bureau is doing add-ons for all Farm Bureau members during the Placer County Fair and the Gold Country Fair. If our members know of children with animal projects who are not currently Farm Bureau members, please encourage their families to become members to take advantage of these rewards. The Farm Bureau works hard to support children in agriculture.

It is important for our members to support our 4-H, FFA and Grange youth in agriculture projects. These young people are important in keeping agriculture alive and strong. I encourage our members to attend the Junior Livestock Auctions and become buyers if possible. Any of our members can sponsor their own "add-ons". If you or your company is interested, please contact your local fair office.

During the month of May, Auburn Valley Ranch and Bruin Ranch sponsored the Second Annual Special Roundup. This round up was held in conjunction with Pine View School in Newcastle. This round up allowed disabled children to come and experience a working cattle ranch and spend the day with their friends taking hay rides, watching the cattle being worked and being visited by Cody Wyoming the rodeo clown. The day was a special event for the children. The Cool Hollow 4-H Club participated as a Community Service project, showing the children the ranch, spending time talking about the animals and just having fun.

Agricultural land in Placer County is disappearing at an alarming rate. New developments are being approved on what is now agricultural-use land. Land that has been used for agriculture for hundreds of years is now succumbing to commercial developments and shopping malls. The reason that people move to Placer County is to enjoy our agricultural land and our 'open-space'. At the rate development is being approved, there will be no more agricultural land to appreciate.

We need to encourage and support our young people to get involved and build a strong commitment to agriculture. We need to teach them the importance of keeping Placer a rural county and not allow it to become another 'concrete jungle'.

Placer County Farm Bureau President
– Mike Watson

Board of Directors

2002 OFFICERS

President ..... **Michael Watson**
First Vice President ..... **James Bachman**
Second Vice President ..... **Don Derobertis**
Executive Director ..... **Sandy Schwartzler**

2002 DIRECTORS

EXECUTIVE DIRECTOR ..... **Sandy Schwartzler**

Michael Watson	Allen Stonesifier	Jarol Moore
Jim Bachman	Wayne Vineyard	Blaine Eslinger
Don Derobertis	John Wilson	Carol Scheiber
Bob Irvine	Robert Wiswell	Nick Greco
Daryl Oest	Dan Wiswell	

Contents

News Flash!!!

Linclon's Ground Water Management Plan

The City of Lincoln will hold another public meeting in July to discuss the City's draft Groundwater Management Plan. The Plan will help guide the City's use of groundwater for drought protection and emergency supply. The City has historically used its current wells and available storage space to supply water to western portions of town and to residents and businesses during occasional water supply outages. The draft plan calls for additional study of the subsurface and monitoring of groundwater levels and quality in order to better understand how to most efficiently use available groundwater without causing significant adverse impacts.

An Advisory Committee comprised of local elected officials, business leaders and other stakeholders has been assembled to provide input into the development and implementation of the Groundwater Management Plan.

The July meeting is the second of three public meetings that will culminate in a public hearing during a City Council meeting later this summer at which the Council will consider adopting the Plan as presented or as amended.

For more information contact: John Pedri 645-8576

Copies of the Plan are available for review at City Hall and the Public Library. For more information contact John Pedri, City Director of Public Works at 645-8576 or check "What's New" on the City's web site http://www.ci.lincoln.ca.us/.

Growers Sought for Farmers' Markets

The Foothill Farmers' Market Association is looking for vendors for its 2003-2004 season. Incorporated in 1989, the Foothill Farmers' Market Association is dedicated to promoting agriculture in Placer County through certified farmers' markets and educational programs. A self-governing nonprofit, the Association offers farmers, craftspeople, bakers and food producers the opportunity to come together with townspeople and tourists in a vibrant market atmosphere. Annual membership dues in the Association are $50. A year-round Market Manager provides management and marketing services for eight weekly and several special engagement markets. Currently, the Association runs a year-round market in Auburn and weekly seasonal markets in Tahoe City, Homewood, Truckee, Colfax, Rocklin, Lincoln and Roseville. Additional limited-run markets are planned for Squaw Valley, Sun City Roseville and Downtown Roseville on Tuesday nights

The Foothill Farmers' Markets are producer-based; therefore, only applicants offering goods for sale which they have produced themselves will be considered. For more information, call (530) 823-6183 or send an email to foothill_farmers_market@yahoo.com.

Contact Information:
Christina Abuelo, Market Manager
Foothill Farmers Market
P.O. Box 3343 • Auburn, CA 95604
Tel: 530.888.6665
Email: foothill_farmers_market@yahoo.com

Farm Supply **NEWS**

Placer County Farm Supply
President's Report

BY JIM BACHMAN

After one of the wettest April's ever it seems we have finally settled into summer. The rain seems to be over and May 2003 will be remembered as one of the highest in sales for PLACER COUNTY FARM SUPPLY with over $300,000 in total sales. All in the month of May! WOW! Our leader in sales (of course) is fencing along with chemical sales, pesticide sales, clothing sales and vet supplies. June is looking pretty good too! Ron and Pam along with all of the employees are doing a good job keeping up with the demand.

Last year PLACER COUNTY FARM SUPPLY set up a BOB MOORE SCHOLARSHIP to honor the memory of Mr. Bob Moore and to help further education in agriculture. Mr. Jarol Moore presented this year's winner, Ms. Jessica Vodopich with a check and a few gifts from PLACER COUNTY FARM SUPPLY. Ms. Vodopich graduated from Lincoln High School and plans on continuing her education in agriculture with the help of our scholarship. GO JESSICA!

Once again in March we hosted our Annual Customer Appreciation Day. The weather was wonderful and we had a turn out of approximately 400 customers that enjoyed free BBQ hot dogs, sodas, chips, cake and a free gift for each and every one of them. Everyone seemed to enjoy themselves.

We would like to share an incident that happened with one of our Directors, Mr. Jarol Moore. By sharing this story we hope to cause caution to everyone to BE CAREFUL! Jarol is one of the many rice farmers in this area that is planting late because of the rainy weather. Jarol started the water and clearing of the roads that are overgrown with blackberry vines using his backhoe. Suddenly he dropped into a washed out area and before he knew what happened he found himself in the water with the blackberries and the backhoe on its side. Luckily Jarol came out of this incident with just a few scratches and a sore back and in a few days was back at work. Everyone please BE CAREFUL!

Please stop by the store anytime and see what new things we have on hand. Also, we have re-arranged the store so please stop by and check it out! Thanks to all of you for your support. We hope to see you soon. ★

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Doing Business in Lincoln
Recreation and Facilities
The Lincoln Community
Community Calendar
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City of Lincoln
640 Fifth Street
Lincoln, CA 95648
(916) 645-3314

Home

What's New?

Groundwater Management Plan Meeting

The City of Lincoln will hold a public meeting July 31, 2003 from 6 p.m. to 8 p.m. at the Lincoln Conference Center, 580 6th Street, to discuss the City's draft Groundwater Management Plan. The Plan will help guide the City's use of groundwater for drought protection and emergency supply.

The City has historically used its current wells and available storage space to supply water to western portions of town and to residents and businesses during occasional water supply outages. The draft plan calls for additional study of the subsurface and monitoring of groundwater levels and quality in order to better understand how to most efficiently use available groundwater without causing significant adverse impacts.

An Advisory Committee comprised of local elected officials, business leaders and other stakeholders has been assembled to provide input into the development and implementation of the Groundwater Management Plan.

The July meeting is the second of three public meetings that will culminate in a public hearing at a Lincoln City Council meeting later this summer where the Council will consider adopting the Plan as presented or as amended.

Copies of the Plan are available for review at City Hall and the Lincoln Public Library.

For more information contact John Pedri, Director of Public Works, at 645-8576.

APPENDIX E

ADVISORY COMMITTEE

AGENDAS AND MEETING NOTES

City of Lincoln Groundwater Management Plan
Advisory Committee Meeting

Wednesday April 23, 2003
4 p.m. – 5:30 p.m.

Beermann's Restaurant, Upstairs
McBean Room
645 Fifth Street, Lincoln, CA

Please note change in meeting location.

Agenda

1. **Introductions** – Harrison Phipps, Resource Planner with Saracino-Kirby-Snow

2. **Background** – the City's Draft Groundwater Management Plan – Presentations by Harrison Phipps and John Pedri, Director of Public Works, City of Lincoln

3. **Role of the Advisory Committee** – Harrison Phipps, Facilitated by Greg Young, Resource Planner with Saracino-Kirby-Snow

    a. Increase knowledge of local groundwater
    b. Provide input on City Goals
    c. Bring a variety of management perspectives
    d. Guide GMP development and implementation
    e. Assist with developing Basin Management Objectives
    f. Plan for public participation
    g. Forum for resolution of controversies

4. **Basin Management Objectives** – Discussion of desired groundwater conditions - Harrison Phipps, Greg Young

5. **Committee Membership** – Discussion of additional committee members – Greg Young

6. **Establish schedule and focus of additional meetings** – Greg Young

7. **Meeting Summary and Next Meeting** – Greg Young

City of Lincoln Groundwater Management Plan
Advisory Committee Meeting

Wednesday April 23, 2003
4 p.m. – 5:30 p.m.

Beermann's Restaurant, Upstairs
McBean Room
645 Fifth Street, Lincoln, CA

Meeting Summary

Participants

City of Lincoln
Spencer Short, Lincoln City Council
Jerry Johnson, Lincoln City Manager
John Pedri, Lincoln Public Works Director

Consultants
Frank Bradham, City of Lincoln
Jerrie Gasch, Gasch and Associates
Harrison Phipps, Saracino-Kirby-Snow
Earl Stephens, Applied Engineering and Geology, Inc.
Greg Young, Saracino-Kirby-Snow

Other Committee Members
Robert Weygandt, Placer County
Mal Toy, Placer County Water Agency
Tim Hackworth, Placer County Department of Public Works
Ed Winkler, Regional Water Authority/Sacramento Groundwater Authority
Dan Cross, Gladding McBean, Lincoln Planning Commission
Mark Sauer, Mackay and Somps

1. Introductions

Attendees introduced themselves.

2. Background

John Pedri provided an overview of the City's water system strategy (handout of the City's Strategic Water Plan was distributed). Emphasis was placed on the desired reliance on PCWA surface water into the future, but that a drought contingency plan – using local groundwater resources – was necessary to ensure highly reliable deliveries to the City's customers. This plan is described in the City's adopted Urban Water Management Plan. John noted that a new wastewater treatment plant was being developed with 100 percent of the treated waste stream targeted for reclaimed uses.

Harrison Phipps provided background on the City's groundwater conditions as documented in the current Advisory Committee Draft of the City's *Groundwater Management Plan* (GMP). A key driver of the timing to draft and adopt a GMP is to help position the City to compete for upcoming grant funding available through the State. Recent legislation – AB 1938 – requires water suppliers preparing GMPs to

address additional elements. The competitive grant application process – which is based on a scoring system – includes points for Cities with adopted GMPs that meet the new elements required by AB 1938.

Committee members posed a few questions regarding the source of recharge and possible implications of activities such as Camp Far West and changes in local agricultural production on recharge rates and recent groundwater elevations. Harrison indicated that additional studies and monitoring would occur as part of the City's current groundwater related investigations. The figure on page 2-17 in the draft GMP indicates the approximate recharge boundary for the City.

PCWA has received a grant from the State to perform a groundwater storage feasibility study. Montgomery Watson Harza has been retained for this work. No indication was provided as to when this work will commence, however PCWA would like to coordinate their investigations with the City.

3. Role of the Advisory Committee

The roles of the Advisory Committee (AC), as identified on the agenda, were discussed. No additional roles were suggested and the participants generally agreed that the listed roles were appropriate.

Discussions transitioned to several topics ranging from how to effectively solicit public participation to the fundamental objectives of the City's GMP. The following bullets are intended to capture some of this additional discourse:

- A suggestion was made to focus attention at any public meeting on the following primary points:
  - The GMP is not regulatory in nature – it is a planning tool to help guide study and monitoring of local groundwater and ensure reliable water supplies for the City of Lincoln.
  - Summarize existing groundwater uses in the basin – City, rural domestic, industry, and agriculture – to educate the public on current conditions.
  - The City's primary water source is and will continue to be PCWA surface water (treated and untreated).
  - The City's goal is to provide a level of drought protection for its community by conjunctively managing surface and groundwater resources such that groundwater is available to meet 75 percent of the average daily demand if surface water resources are partly or fully constrained because of drought conditions or other supply interruptions.
  - Communicate that a GMP will stress the need for improving the City's understanding of the local aquifers and their response to different conditions.
  - The City realizes the need for a better understanding of the groundwater basin and increased monitoring of groundwater levels and quality.

- PCWA noted that the Placer County General Plan prohibits urban growth if that growth is primarily reliant on groundwater resources. The County, it was indicated, also is committed to preserving the local agricultural economy – especially to the extent that economy is reliant on groundwater resources, and encourages conjunctive use.

4. Basin Management Objectives

Greg Young lead a brief discussion regarding Basin Management Objectives (BMOs). The AC is being asked to help define BMOs for inclusion in the GMP, but the City is responsible for adoption and implementation of the GMP and associated BMOs. A suggestion was made that draft BMOs be circulated to the AC and that discussion of these should be the focus of the next meeting.

5. Committee Membership

Membership in the Advisory Committee was discussed, which resulted in the following suggestions

1. A representative from the local farming community – who relies on groundwater – should be invited along with the Placer County Ag Commissioner would be a good addition to the team.
2. A hydrologist that has knowledge of local contaminant conditions should be included – e.g. staff from the office of Placer County Environmental Health.

The City agreed to take these suggestions into consideration and will decide on additional members to invite.

Note that a few members of the AC were not present at this first meeting but will continue to receive mailings of agendas, meeting notes and other documents distributed at AC meetings.

- Ed Winkler, Executive Director of the Sacramento Groundwater Authority, provided a brief overview of the SGA's similar effort to draft and adopt a GMP. Ed noted that the SGA has established both a Policy Committee and Technical Review Committee to assist in their efforts. Similar to the City's efforts, the SGA consultant will be drafting initial BMOs for the committees' review.
- Several suggestions were provided to help advertise future public meetings of the Advisory Committee. These include using the City's standard procedures of newspaper ads and City web site, alerts on the local cable channel, providing an insert to the Chamber of Commerce's monthly newsletter and contacting the local Farm Bureau and rice growers association.

6. Establish schedule and focus for additional meetings

It was agreed upon to hold the next meeting on Thursday May 29, 2003 from 6 to 8 pm (location to be determined). Prior to this meeting, draft basin management objectives will be circulated to the members of the Advisory Committee. These draft BMOs will be used to focus discussion.

Discussions indicated that the next scheduled meeting should again be limited to the members of the Advisory Committee and focus on drafting BMOs. Subsequent meetings would be widely advertised to the public to allow discussion of BMOs in a more public setting.

7. Meeting Summary

Action Items

- Harrison Phipps will prepare a draft set of BMOs to distribute to the AC
- John Pedri will reserve a meeting location for the next meeting on May 29th at 6 pm
- John Pedri will invite the Placer County Ag Commissioner and one representative of the farming community to join the Advisory Committee
- Greg Young will prepare a meeting summary at have it distributed for review

City of Lincoln Groundwater Management Plan
Advisory Committee
Meeting #2

Thursday May 29, 2003
6 p.m. – 8 p.m.

Solarium Room, Orchard Creek Lodge
Sun City Lincoln Hills
965 Orchard Creek Lane
Lincoln, CA

Agenda

Refreshments served

1. **Introductions, Agenda Review** - Greg Young

2. **Review Notes from April 23, 2003 meeting** – Greg Young

3. **Local Groundwater Conditions** – Jerrie Gasch, Gasch & Associates
   15 Minute presentation

4. **Status of City's Conjunctive Use Program – John Pedri and Jim Ray**
   10 Minute presentation

5. **Basin Management Objectives** – Harrison Phipps & Greg Young
   a. Discussion of desired groundwater conditions
   b. Example BMOs from other planning efforts
   c. Draft BMOs for Lincoln

6. **Public Outreach** - Greg Young
   a. How to announce public meetings
   b. Mechanisms for public input into planning process
   c. Focus of public meeting

7. **Meeting Summary and Next Meeting** – Greg Young

City of Lincoln Groundwater Management Plan
Advisory Committee Meeting #2

Thursday May 29, 2003
6 pm to 8:15 pm

Solarium Room, Orchard Creek Lodge
Sun City Lincoln Hills
965 Orchard Creek Lane
Lincoln, CA

Meeting Summary

Participants

City of Lincoln
John Pedri, Lincoln Public Works Director

Consultants
Frank Bradham, City of Lincoln
Jerrie Gasch, Gasch and Associates
Harrison Phipps, Saracino-Kirby-Snow
Earl Stephens, Applied Engineering and Geology, Inc.
Greg Young, Saracino-Kirby-Snow

Other Committee Members
Robert Weygandt, Placer County
Paul Ferrari, Ferrari Ranches
Christine Turner, Placer County Ag Commissioner
Ed Winkler, Regional Water Authority/Sacramento Groundwater Authority
Dan Cross, Gladding McBean, Lincoln Planning Commission
Mark Sauer, Mackay and Somps
Chuck Wing, Lincoln Chamber of Commerce and Lincoln Rural MAC
Tim McCall, Nevada Irrigation District

1. Introductions

Attendees introduced themselves. Greg Young welcomed two new members to the committee; Christine Turner, County Agricultural Commissioner and Paul Ferrari, a local farmer and groundwater user, then reviewed the meeting objectives and reminded attendees of the role of the advisory committee.

2. Background

Jerrie Gasch provided an overview of local groundwater conditions, presenting the results of various geologic investigations and analysis as the basis for the City's current understanding of the basin. Jerrie noted that the current understanding would benefit from additional data and analysis. Based on current analysis, the primary water-bearing strata underlying the City starts around Highway 65 and thickens westward, with wells in the western areas generally having higher production rates than those to the east.

John Pedri provided an overview of the City's multi-phased conjunctive use program. Phase II activities, slated to begin within the year, focus on improving the City's knowledge of the underlying basin and its response to various conditions. The current phase, which includes development, adoption and implementation of the Groundwater Management Plan, is the necessary to help direct additional technical

analysis. John noted that the primary driver for the City's interest in a conjunctive use program is the risk associated with inability to meet water demands during certain conditions. These conditions occur when surface supplies are: (1) reduced due to drought conditions, (2) unexpectedly shutoff due to a PCWA system outage, or (3) not sufficient to meet a peak demand that exceeds the contractual flow of PCWA water. John noted that the current four City wells have proven extremely valuable during several outages situations over the past few years. Other points included:

- The City charges developers a per-connection fee associated with the cost of providing groundwater for the above stated purposes
- The City is within two years of completing their reclamation facility, which will provide reclaimed water for several landscape projects, irrigated agriculture and local industrial needs. This water will be conveyed to uses through (1) the Auburn Ravine – the City has a position paper on this topic, and (2) new conveyance pipelines for developments and industrial areas
- The importance of water conservation efforts.

Robert Weygandt from Placer County again raised the point that the County has a policy prohibiting the use of groundwater for urbanization. The intent of this policy is to help the agricultural community within the County remain sustainable. The County is not opposed to conjunctive use and understands the City's desire to utilize underlying groundwater.

3. Basin Management Objectives

Greg Young reviewed the two documents relating to BMOs: *Discussion of Basin Management Objectives for Glenn County*, and *The City of Lincoln Groundwater Management Plan Basin Management Objectives*. This provided context for the discussion of BMOs for inclusion in the City's Groundwater Management Plan. The following highlights comments on the proposed BMOs and other relevant points:

- After some refinement and suggested additions, the AC generally concurred with the language and level of detail in the draft BMOs. The language will be modified and circulated for concurrence prior to the public meeting scheduled for June 26, at which time the BMOs will be presented to the public.
- A suggestion was made to tie the principle of "shall not adversely impact adjacent areas" specifically to each of the BMOs. Furthermore, this principle should specifically refer to agriculture in the adjacent areas.
- A suggestion was made to specifically refer to the Lincoln subunit users within each BMO. These users include urban – as met by City supplies, rural residential, industrial and agricultural.
- Rural residential users both in the Lincoln subunit and adjacent thereto are sensitive to minor fluctuations in groundwater levels. The City may need to consider mitigation strategies if future BMOs specifically result in fluctuations that impact these users.
- A suggestions was made to incorporate the concept of avoiding the loss of lands overlying geology with high rates of recharge.
- A suggestion was made to incorporate the concept of avoiding the placement of new City wells in locations that would exacerbate any known contamination plume
- A suggestion was made to incorporate the concept of long-term versus short-term implications of BMOs. For instance, a BMO could help the City to manage within a pre-set range of groundwater levels. However, the establishment of a pre-set range must account for the long-term response to the basin for given hydrologic conditions, such as an extended drought. If not, the pre-set fluctuation may not recognize a potential decline in groundwater levels as the result of an extended drought with many users turning to the groundwater basin.

During the discussion of the principle of not adversely impacting neighboring subunits, several participants indicated the need for and interest in developing arrangements between neighboring institutions. Specifically, the idea of an MOU between Placer County and the City was raised. An MOU

would allow for formal collaboration on establishing and periodic revisions of BMOs as well as creating an avenue for data and analysis sharing.

A question was raised as to how BMOs would or could be enforced. The discussion that followed noted that enforcement could range from regulation – such as the circumstances in an adjudicated basin – to "peer" pressure to self-policing. Ed Winkler noted that SGA's enforcement is economically based, using extraction fees that vary associated with a member's groundwater use. For Lincoln, enforcement of the City's BMOs will primarily be through self-policing. However, to the extent another user within the Lincoln subunit is causing non-conformity to BMOs, the City will need to engage them and find amiable solutions.

4. Public Outreach

Greg Young reviewed points discussed at the previous AC meeting regarding methods to advertise a public meeting and the focus of the meeting. A suggestion was made that the meeting be able to answer for the public "What does this mean for me and my pump?" The following points were noted:

- Advertisement for the meeting will be through standard City methods, but will also include: posting on the City and County web sites; an insert in the Lincoln Chamber of Commerce newsletter; circulation to Placer County Farm Bureau and the local Rice Growers Association, alerts on the local cable channel; and, circulation by AC members per their discretion.
- The public meeting will focus on (1) providing context of existing groundwater conditions and uses, (2) stressing the non-regulatory approach to groundwater management planning, (3) describing the purpose for the City's GMP and how revisions will be made on an on-going bases, (4) describing elements of the GMP, (5) specifically articulating the BMOs and how they will become more specific over time, and (6) obtaining public comment on the GMP and the BMOs.

5. Meeting Summary

Participants agreed that, with revisions as summarized, there was general concurrence on the language of the currently drafted BMOs.

The next meeting was set for June 26th. Robert Weygandt noted that he was unavailable. The City and Robert agreed to make sure the County and PCWA were in attendance at the next meeting.

Action Items

- Harrison Phipps will revise the set of BMOs and distribute to the AC for concurrence
- John Pedri will reserve a meeting location for the next meeting on June 26th at 6 pm
- Harrison Phipps will work with the City to craft a press release for announcing the public meeting on June 26th. The draft language will be circulated to AC members to flag any potentially volatile terms. Final press release will be provided to the City and AC members for distribution
- Greg Young will prepare a meeting summary and have it distributed for review
- Harrison will contact PCWA to learn whether or not they are considering BMOs in their effort to revise their GMP
- Harrison Phipps and Greg Young will draft an approach for the public meeting, and based on City acceptance, will craft a presentation

City of Lincoln Groundwater Management Plan
Advisory Committee
Meeting #3

Thursday June 26, 2003
6 p.m. – 8 p.m.

The City Annex
580 Sixth Street, Lincoln, CA

Agenda

Refreshments served

1. **Introductions, Agenda Review** - Greg Young

2. **Review Meeting Notes from May 29, 2003 meeting** – Greg Young

3. **Current Local Groundwater Conditions** – Harrison Phipps

4. **Purpose of Proposed Groundwater Management Plan** – Harrison and Greg
   a. Non regulatory
   b. Annual review and update
   c. Elements of a Groundwater Management Plan

5. **Basin Management Objectives** – Harrison and Greg
   a. Maintain groundwater quality
   b. Maintain groundwater levels
   c. Maintain groundwater flow direction

6. **Public Comment** – Greg Young

7. **Meeting Summary and Next Meeting** – Greg Young

City of Lincoln Groundwater Management Plan
Advisory Committee Meeting # 3

Thursday June 26, 2003
6 pm to 8:15 pm

The City Annex
580 Sixth Street
Lincoln, CA

Meeting Summary

Participants

City of Lincoln
Spenser Short, Mayor Pro Tem
Jerry Johnson, City Manager
Kent Nakata, City Council
John Pedri, Lincoln Public Works Director

Consultants
Frank Bradham, City of Lincoln
Jerrie Gasch, Gasch and Associates
Harrison Phipps, Saracino-Kirby-Snow
Earl Stephens, Applied Engineering and Geology, Inc.
Greg Young, Saracino-Kirby-Snow

Other Committee Members
Tim Hackworth, Placer County (representing Robert Weygandt)
Paul Ferrari, Ferrari Ranches
Ed Winkler, Regional Water Authority/Sacramento Groundwater Authority
Mark Sauer, Mackay and Somps
Chuck Wing, Lincoln Chamber of Commerce and Lincoln Rural MAC

Public Attendees
Patty McAlpin, Lincoln News Messenger
Patti Beard, Placer County Agricultural Commission
Jerry More, rancher
William Morebeck, Placer County Agricultural Commission
Tony Aguilar, Placer County Agricultural Commission

1. Introductions and Review of Meeting Notes from 5-26-03

Attendees introduced themselves. Greg Young welcomed everyone, then reviewed the meeting objectives and reminded attendees of the role of the advisory committee and the objective of this public meeting.

2. Background

Harrison Phipps provided an overview of current local groundwater conditions for the benefit of the public attendees. Several members of the Advisory Committee added additional points. Key points included 1) our understanding of the basin underlying Lincoln is limited because of insufficient data, 2) through the Groundwater Management Plan (GMP) the City is intended to improve data collection and analysis, and 3) Phase 2 of the City's plan will likely focus on implementing a comprehensive monitoring plan, as recommended in the current draft of the GMP.

Some members of the public commented that they think there is very little groundwater in the Lincoln area and turning to groundwater to provide supplies for the City is going in the wrong direction. John Pedri responded to this comment:

- The City's primary water source is and will continue to be PCWA surface water (treated and untreated). A second pipeline from PCWA is being investigated to bring more supplies to the area.
- The City's goal is to provide a level of drought protection for its community by conjunctively managing surface and groundwater resources such that groundwater is available to meet 75 percent of the average daily demand if surface water resources are partly or fully constrained because of drought conditions, PCWA contract provisions or other supply interruptions.
- The City is within two years of completing their water reclamation facility, which will provide reclaimed water for several landscape projects, irrigated agriculture and local industrial needs. This water will be conveyed to uses through (1) the Auburn Ravine – the City has a position paper on this topic, and (2) new conveyance pipelines for developments and industrial areas.
- Two of the City's four wells are used fully for local needs in an area not currently connected to the surface water distribution system, but new infrastructure will be bringing PCWA water to these areas and reducing their reliance on groundwater.

Tim Hackworth from Placer County again raised the point that the County has a policy prohibiting the use of groundwater for urbanization. The intent of this policy is to help the agricultural community within the County remain sustainable. The County is not opposed to conjunctive use and understands the City's desire to utilize underlying groundwater.

3. Purpose of Groundwater Management Plan

Harrison Phipps reviewed the purpose of the City's GMP and its primary elements. The GMP is not regulatory in nature – it is a planning tool to help guide the study and monitoring of local groundwater and ensure reliable water supplies for the City of Lincoln. The City will review and update the GMP annually or more often as needed. A key element of the GMP is the recommendations. This section will set the stage for Phase 2 work, including but not limited to expanded data collection and analysis of the basin.

Harrison noted that an added focus of this year's GMP is to prepare a plan that helps the City pursue state grant funds. A member of the public raised the question whether the City has a contingency plan if grant money to pursue the GMP recommendations is not obtained. John Pedri stated that the City has budgeted matching funds required for grants and would pursue additional sources of funding is grant funding is not obtained.

Additionally, as an approach to further improve public outreach – a necessary component of the GMP – a suggestion was made to include an insert in the local water bills. The insert could advertise upcoming public meetings and provide an overview of the GMP purpose and process.

4. Basin Management Objectives

Greg Young led a discussion of the *City of Lincoln Groundwater Management Plan Basin Management Objectives*. The following highlights comments on the proposed BMOs and other relevant points:

- Spenser Short questioned whether Placer County is required to develop a GMP or whether they may follow the concepts embodied by PCWA or City of Lincoln. This question was raised under the context of BMOs structured such that there is "no adverse impact on adjacent areas." Tim Hackworth stated that the County is not required to prepare a GMP. There is a process they follow for each new well permit they issue. Tim noted that the use of groundwater within the

County is subject to the parcel size – once parcels get to a smaller size, groundwater cannot be used. No clarification was provided as to the specifics of this or other County criteria. The County will provide the Advisory Committee with more information regarding these issues prior to the next meeting.

- Also under the context of "no adverse impacts to adjacent areas", a public comment was made that the City should not allow additional development and drilling of wells until data is available to ascertain whether an impact is occurring or not. In response to this comment, John Pedri stated that the City acquires additional surface water from PCWA associated with new developments. Groundwater is used to mitigate the risk of drought or system outages and to manage daily peak demands that are not contractually met by PCWA supplies (PCWA supplies are delivered on a 3-day running average, which can result in demand on any particular day exceeding the PCWA deliveries). In addition, several of the new developments are occurring on lands that were previously irrigated at one time – therefore, the change in water relates more to use – i.e. "growing houses" instead of crops – than to volume of water.
- A question was raised as to how new wells are monitored with respect to their potential impact on other well users. Frank Bradham responded that the City's wells are very deep in comparison to local users. This fact, coupled with rapid recovery – within minutes – to previous groundwater levels has resulted in the City not anticipating impacts to local users of current wells. However, the City has been in contact with local users and has requested them to notify the City immediately if any issues arise. The concept of the GMP's recommended monitoring plan would initiate a more formal monitoring effort that would create a robust history of groundwater levels and production volumes for several wells within the City's sphere of influence.
- John Pedri noted that the City is also moving toward completion of their recycled water facility that also is intended to help reduce the need for groundwater for, system outage or peaking needs or during droughts. The City's preference is that the recycled water be used for agriculture.
- A question was raised as to whether, under the voluntary participation of Advisory Committee members, the local Indian tribe operating the casino has been involved. The City responded that they have approached the tribe and had some conversations but they are not involved in the GMP process. The City would like to deliver surface water to them in the near future, so that they are not fully reliant on groundwater.
- With respect to the BMO targeting groundwater gradients, Paul Ferrari stated that he has not noted any change in the gradient in all of his years of farming in the local area. Tim Hackworth stated that the County does not anticipate any changes to the gradient as a result of how the City is planning to use groundwater. The County stated their support of the City's planning efforts.
- With respect to the BMO targeting water quality, it was noted that many contamination sites are known and the City should use this BMO to place wells away from these locations. A question was raised as to whether the GMP will identify clean-up requirements or not. Harrison Phipps noted that the identified sites fall under the jurisdiction of the local Regional Water Quality Control Board or the California Department of Toxics. These agencies are responsible for regulating initiation and oversight of clean-up activities.

4. Public Discussion

After discussing the BMOs, Greg Young led discussion on two issues that were tabled from earlier comments and opened the floor for additional public comments. The following is a summary of key points:

- Tabled Item 1 – A question was raised as to what the City will do if it causes somebody's well to go dry. The City responded by stating that the intent of the BMOs is to work with adjacent areas and users within the sphere of influence to ensure the objectives are not violated. Data is needed to understand the response of the basin to different conditions. Once these are known, more specific BMOs can be drafted that pledge more specific actions and/or mitigation measures to be triggered under different conditions. The City wants to place additional wells in locations that have the least potential of causing impacts. A question was asked of Jerrie Gasch regarding his

characterization of the basin. Jerrie responded by stating the aquifer is a myriad of sand lens. The City's best opportunity for efficient wells is to locate them in the western portion of the sphere of influence. This comment generated a public response that the City will need to interact with agriculture if it places wells in the western portion of the City's sphere of influence.

- Tabled Item 2 – A question was raised as to the purpose of groundwater use – should the City limit its demands to that established in the PCWA contracts? The City responded by reiterating that new demands require the City to acquire additional surface water from PCWA. PCWA has stated that it has supply to meet the 2020 projected demands of the City. Groundwater is for emergency needs. The question was restated by asking whether "emergency needs" were the result of allowing too much growth or system outages. Information regarding the base levels versus peak day demands and the frequency of demands not met would help clarify the City's contention of using groundwater for emergency use. John Pedri stated that the City has a resolution stated that groundwater will not be used to meet more than 20 percent of the demand that may result from peaking. An example of peaking was provided using recent temperature changes: a few days ago, temperatures were in the mid 80's, today they are over 100 degrees. That changes the demand, but the supplies from PCWA, which have limitations on their fluctuation, cannot meet the changed demand. This peak is met with groundwater.
- A question was raised as to whether additional studies – anticipated under Phase 2 – indicate planned growth cannot occur without violating BMOs. The City responded that the contract with PCWA allows for 34,000 acre-feet annually to be available for the City at "build-out". PCWA says the water will be available. Furthermore, new laws – SB 610 and SB 221 – require the City to demonstrate sustainable water supplies as part of approvals for new developments. Tim Hackworth stated that Placer County is in full support of the City's General Plan, which identifies the anticipated growth. The City also noted that they have an Urban Water Management Plan (UWMP) – also required under state law – that identifies water supplies, water demands, and conservation measures. The UWMP outlines how the City will scale-back water use with conservation mandates given drought or other shortage conditions. The planned conjunctive use operations would provide the City with added flexibility to meet local demands when issues arise with PCWA water.
- A statement was made by the public that the Placer County Farm Bureau opposes the City's GMP. Upon further clarification, the intent of the statement is that the Farm Bureau opposes the potential impacts to agriculture that could occur as the City seeks to expand its conjunctive use program and periodic use of groundwater resources. A question was raised in response challenging whether the Farm Bureau's position would change if use of groundwater was in compliance with the BMOs. The response indicated the need for clarification regarding how compliance is implemented and who governs the monitoring and implementation of any mitigation.

5. Meeting Summary

The next meeting was set for Thursday, July 31st.

Action Items

- John Pedri will reserve a meeting location for the next meeting on Thursday July 31 at 6 pm
- Harrison Phipps will work with the City to craft a press release announcing the next public meeting.
- Greg Young will prepare a meeting summary and have it distributed for review
- Placer County will provide information to John Pedri and Harrison Phipps regarding the County's process and criteria for permitting new wells and to what extent information in GMPs from PCWA or Lincoln affect those activities.
- Harrison Phipps and Greg Young will craft a presentation on the City's UWMP for the next meeting

City of Lincoln Groundwater Management Plan
Advisory Committee
Meeting #4

Thursday July 31, 2003
6 p.m. – 8 p.m.

The City Annex
580 Sixth Street, Lincoln, CA

Agenda

Refreshments served

1. **Introductions, Agenda Review** - Greg Young

2. **Review Meeting Notes from June 26, 2003 meeting** – Greg Young

3. **Purpose of Proposed Groundwater Management Plan** – Harrison Phipps and Greg Young
    a. Non regulatory
    b. Annual review and update
    c. Elements of a Groundwater Management Plan
    d. Basin Management Objectives

4. **Recommendations** – Harrison Phipps and Greg Young
    a. Characterize, model and monitor groundwater systems
    b. Augment water supply
        i. Additional recharge
        ii. Develop water budget and estimate basin yield
        iii. Opportunities with PCWA and NID
        iv. Increased use of reclaimed water
    c. Protect groundwater quality
    d. Public participation

5. **Potential projects for grant funding** – Harrison Phipps and Greg Young
    a. Complete geophysical testing to characterize the basin
    b. Develop groundwater monitoring network
    c. Develop groundwater model
    d. Research feasibility of conjunctive use projects and prioritize
    e. Groundwater protection program
    f. Establish long-term advisory body

6. **Public Comment** – Greg Young

7. **Meeting Summary and Next Meeting** – Greg Young

City of Lincoln Groundwater Management Plan
Advisory Committee Meeting # 4

Thursday July 31, 2003
6 pm to 8:30 pm

The City Annex
580 Sixth Street
Lincoln, CA

Meeting Summary

Participants

City of Lincoln
Primo Santini, Mayor
Spencer Short, Mayor Pro Tem
Jerry Johnson, City Manager
Kent Nakata, City Council
John Pedri, Lincoln Public Works Director

Consultants
Frank Bradham, City of Lincoln
Jerrie Gasch, Gasch and Associates
Harrison Phipps, Saracino-Kirby-Snow
Earl Stephens, Applied Engineering and Geology, Inc.
Greg Young, Saracino-Kirby-Snow

Other Committee Members
Robert Weygandt, Placer County
Mal Toy, Placer County Water Agency
Paul Ferrari, Ferrari Ranches
Jim Ray, Mackay and Somps (representing the Building Industry Association)
Chuck Wing, Lincoln Chamber of Commerce and Lincoln Rural MAC
Tim Hackworth, Public Works Director for Placer County

Public Attendees
Patty McAlpin, Lincoln News Messenger
Patti Beard, Placer County Agricultural Commission
William Morebeck, Placer County Agricultural Commission
Tony Aguilar, Placer County Agricultural Commission
Mike Lee, Placer County Water Agency
Greg Nau, PRCD
Bill Mellerup, Lewis Company
Wayne Vineyard, Placer County Ag Commission and Placer County Farm Bureau
Jane Tahti, WPCARE and Placer County Ag Commission
Carol Scheiller, rancher and Placer County Farm Bureau
Don Derobertis, Placer County Farm Bureau
Marilyn Jasper, Clover Valley Foundation and Sierra Club
Dennis Coulter, Moore Farm
Gayle Moore Coulter, Moore Farm

1. Introductions and Review of Meeting Notes from 6-26-03

Attendees introduced themselves. Greg Young welcomed everyone, then reviewed the meeting objectives and reminded attendees of the role of the advisory committee and the objective of this public meeting. Highlights of the meeting summary from the 6-26-03 meeting were reviewed.

2. Review of Action Items from 6-26-03

Of the multiple action items that resulted from the 6-26-03 meeting, one involved a request for Placer County to clarify their procedures on approving permits for new wells and to understand what data the County used for assessing the potential implications to local groundwater conditions of permitting a new well. Mal Toy stated that the County, PCWA, and the City of Roseville have teamed to work on groundwater management issues, which includes the collection of data. The County relies on PCWA to provide data to help with decisions regarding new well permits. However, data is limited – groundwater production data is estimated based on interpretation of aerial photos and use of assumed crop irrigation requirements. Robert Weygandt stated that the County delegated the gathering of data and investigations relating to groundwater use in the County to PCWA about 7 years ago.

Spencer Short clarified that what the City of Lincoln is interested in is groundwater related data for lands in proximity to the City's Sphere of Influence. Data and location information for wells that have recently been approved for agricultural and rural residences would be appreciated. Mal Toy stated that the data would be made available to the City, but stressed again that the data on assumed groundwater use – which is estimated to be about 50,000 acre-feet annually – is based on aerial photos and use of assumed crop water demand values.

A member of the public stated that the Ag Commissioner's office may have data from back in 1950s and 1960s that show groundwater levels dropping prior to the completion of Camp Far West and the initiation of surface water deliveries to the region.

3. Urban Water Management Plan Background

Harrison Phipps provided an overview of the City's Urban Water Management Plan (UWMP) that the City adopted in December 2002. Key highlights included:

- The UMWP is updated every 5 years and will be revised in 2005
- The State requires a completed UMWP as one consideration when agencies apply for various grant funding
- The UWMP articulates conservation and supply augmentation measures being undertaken or investigated by the City
- A component of the UWMP requires an investigation into groundwater conditions, if groundwater is a component of the water resources
- Agencies preparing their UWMP are strongly urged to include a Groundwater Management Plan (GMP) to define their intended uses and understanding of local groundwater resources

John Pedri expanded on information regarding efforts by the City to augment supplies by describing the current $70 million water recycling facility and infrastructure that will provide a new local source of water – up to 25,000 acre-feet – to be used for irrigated agriculture, landscapes, industry and golf courses. The project is about 60% complete. Water is being treated to comply with Title 22 drinking water quality standards.

A question was raised by a member of the public regarding the UWMP's limitation in addressing the relationship between Sacramento County groundwater conditions and what the City is doing. Jim Ray, a member of the Sacramento area's Water Forum – a group that is working to solve local water issues – noted that agencies in the Sacramento area have agreed to operate within agreed upon groundwater basin constraints – i.e. total pumping from the basin on a given year has been set at 130,000 acre-feet. The Sacramento Groundwater Authority (SGA) has the capacity to govern the compliance of the local water

agencies through use of a "club". At this time, the club is in the form of fees imposed upon the water agencies when they exceed their pumping allocations – intended as a major disincentive. Recent efforts are resulting in a stabilization and improvement in groundwater conditions within that part of the basin.

A note was made that the City of Lincoln's efforts to establish Basin Management Objectives (BMOs) for their immediate area do not include any enforcement actions and, if there were any, they would only be self-imposed upon the City since the City is developing BMOs by and for themselves. This is in contrast to the SGA who embodies many urban water agencies and thus enforcement actions help ensure equality among the SGA members.

4. Purpose of Groundwater Management Plan

Greg Young provided an overview of the intent and content of the City's GMP. A review of the City's Basin Management Objectives (BMOs) was also provided.

One portion of the presentation included a map attempting to depict historic irrigated ag lands within the City's Sphere of Influence. The intent was to draw attention to the fact that historically, there was ag groundwater pumping from the basin. It is gone and now the City is pumping groundwater for peak demands, backup and emergency supplies. Several public members provided input to help the City's consultants refine the map to more accurately represent historic ag lands and their use of groundwater resources. Improved information will be included in the final GMP to help set context for discussions regarding the City's use of groundwater for peaking, backup and emergency purposes.

5. Recommendations in the GMP

Greg Young continued the discussion from the previous topic by presenting the recommendations currently included in the City's GMP (available on-line at www.ci.lincoln.ca.us). The recommendations are intended to guide the City's in implementing local water management efforts as they relate to groundwater resources. Recommendations were described in four general categories: 1) characterize, model and monitor groundwater systems, 2) augment water supplies, 3) protect groundwater quality, and 4) continue public participation. Text in the GMP describes activities the City should undertake under each of these categories.

Robert Weygandt recommended that South Sutter ID be added to the list of local agencies with surface water resources with whom the City should look to for supply augmentation opportunities.

The discussion of recommendations led into the final major agenda item – identifying potential projects for grant funding. Spencer Short requested City staff to provide a "project priority" list to assist the Council with determining what projects to pursue given current statewide budget issues. Jim Ray asked for clarification as to how the City, PCWA and the County would work together. Mal Toy responded by stating the PCWA wants to improve data sharing and be "visible partners". PCWA is updating their GMP to address new State standards. They also have an advisory committee. A key element they are investigating is the ability to store water in the groundwater basin and recover it later that same season or in subsequent years. Their theme is to keep the aquifer whole.

A concern was raised by a member of the public regarding the City's "short-term" use of water, as described in the GMP. Clarification of the City's daily operations and use of storage facilities and wells to meet peak – short-term – daily needs will be provided in the revised GMP.

6. Public Discussion

Members of the public raised a few additional items under this agenda item. The following is a summary:

- How big of a monitoring network does the City plan to develop? The monitoring network needs to be defined, and likely would adjust over time. However, too much data is not a problem. The City really wants to work with local landowners – especially in agriculture – to allow monitoring

of groundwater levels as one aspect of a monitoring program. It was noted that improved data sharing between PCWA, the County and the City would help improve overall understanding of the basin, which is the fundamental purpose for a monitoring network.

- Please clarify who has the ordinance regarding no urbanization on groundwater and how does the City handle this. Robert Weygandt explained that the County's General Plan contains a policy that no urbanization will occur on groundwater. The City and County General Plans are for separate areas and do not overlap. The County admits that the policy is very conservative, but it is intended to protect agriculture's water supply. The County may want to refine the policy to address conjunctive use – the effective use of both groundwater and surface resources – which is how the City operates. Spencer Short noted that the City is not developing on groundwater. The City is developing on PCWA surface water and that the City will focus use of groundwater for backup, emergency and peaking needs.
- (related) Will use of groundwater as a backup supply enhance growth in the City? Primo Santini, the Mayor of Lincoln, noted that PCWA has stated they have enough surface water rights available to provide the City with surface water to meet the projected demands when Lincoln reaches its planned buildout population. This is on the order of 34,000 acre-feet. The actual surface water requested by the City would likely be less as a result of the planned water from recycling and conservation measures that have yet to be implemented.

7. Meeting Summary

The next meeting will be set by the City and will be a Public Hearing during a City Council meeting. The City Council will be voting to adopt the GMP at this meeting.

Greg Young noted that the City would seek letters from members of the Advisory Committee and the public that support the City's pursuit of grant funds for particular projects as identified in the GMP. The actual projects included in grant applications will be shared, as applications are prepared later this fall.

In closing, Jim Ray commended the City for proactively addressing groundwater resources before problems occur.

Action Items

- John Pedri will set the Public Hearing date
- Harrison Phipps will work with the City to craft a press release announcing the Public Hearing
- Greg Young will prepare a meeting summary and have it distributed for review
- PCWA will provide data on local groundwater use and well locations to the City
- PCWA will provide a more recent aerial photo – preferably in electronic format – for the City to use for maps and graphics
- Frank Bradham and staff from Saracino-Kirby-Snow will work with some of the public attendees to better define historic ag locations, crop types and whether or not groundwater was used for irrigation
- Saracino-Kirby-Snow will refine the current draft of the GMP to reflect further comments received at this meeting.
- All attendees who indicated a desire to be personally alerted when the Public Hearing is scheduled will be contacted

APPENDIX F

PUBLIC PARTICIPATION PROGRAM

BACKGROUND

One of the indicators of an effective groundwater management plan is that the plan is implemented without substantial challenge. Key to this outcome is that the groundwater management plan reflects the goals and objectives of people who work, live, and have interests in the groundwater basin.

A public participation program is the avenue for the involvement of the groundwater stakeholders. To be effective, a public participation program must allow for meaningful involvement of a broad array of voices from the community. Such meaningful involvement includes expressing concerns, digesting data, and shaping provisions of the proposed plan.

Among the reasons to integrate an effective public participation program into development of the groundwater management plan are to:

- Increase the likelihood of successful implementation of the plan
- Build strong and effective working relationships among stakeholders
- Increase stakeholder knowledge of the groundwater system, including constraints on its management
- Decrease the possibility of a costly legal challenge
- Create a shared information base about the groundwater resources and their status
- Enhance the smooth adoption of the completed groundwater management plan

Framework of the Public Participation Program

Below is the framework of the public participation program.

Step 1 (Month 1): Identification of Stakeholders and Key Players

With the assistance of the City of Lincoln, a preliminary list of stakeholders and key players will be created. This list may be composed of related agencies, government representatives, community organizations, businesses, nonprofit organizations, and individual community members. Among the considerations for the inclusion on the list are whether any individual or entity:

- Has a stake in the groundwater management of the basin;
- Has the capacity to block the adoption of the final plan;
- Has a business (including agricultural) interest connected to the groundwater of the area;
- Has a regulatory interest in the groundwater management of the basin; or
- Has a history of influencing the community on other community-wide issues.

An initial list of stakeholders includes the following:

- City of Lincoln Public Works Department
- City of Lincoln Planning Department
- Lincoln City Council
- Placer County Water Agency
- Placer County Board of Supervisors
- Rural residents near the City Sphere of Influence
- Regional water authority
- Lincoln Chamber of Commerce
- Gladding McBean
- Development community

Step 2 (Months 1, 2, 3): Advisory Committee Meetings

During the first, second and third months, the consulting team will facilitate meetings of the Advisory Committee. The purposes of these meetings will be to:

- Inform key players of the groundwater management plan process and timeline;
- Encourage involvement in the public participation program;
- Gather information from the key players on the elements of the groundwater management plan and any concerns they have; and
- Gather contact information on other stakeholders to include as the process continues.

During this period a statement will be provided to the public explaining how they can participate in the development of the Groundwater Management Plan through involvement in the Advisory Committee.

During this period the Advisory Committee will assist with the development of a process for resolving conflicts that may arise.

Step 3 (Month 2): Working Relationships With Other Agencies

Consistent with the statutes establishing the procedures for a groundwater management plan, this step focuses on the fostering of effective working relationships with PCWA, and other appropriate agencies. Fostering of these working relationships may include additional meetings and exchanges of information.

Step 4 (Month 4): Circulate Final Proposed Groundwater Management Plan

Based on input from the Advisory Committee, the consultants will revise the groundwater management plan. The draft will be made available for review at the Library and City Hall. Announcements will be published in the paper describing the nature of the draft and locations where the draft plan may be reviewed.

Step 5 (Month 4): Public Hearing on Final Groundwater Management Plan

After appropriate noticing by the City of Lincoln, the required public hearing on the final groundwater management plan will be conducted.

Step 6 (Month 4): Adoption of Groundwater Management Plan

In this step, the City of Lincoln will adopt the groundwater management plan as presented or amended during a properly noticed public hearing developed with input from and broadly owned by groundwater stakeholders.

Step 7 (Month 4 on): Implementation of Groundwater Management Plan

With guidance from the City of Lincoln, the people who live, work, and have interests in the groundwater basin will implement the plan.

Public Participation Program Implementation

Implementation of the public participation program will require City of Lincoln dedication to meaningful stakeholder involvement and to such resources as meeting

space, database management assistance, logistical assistance, and preparation of materials and graphics.

Implementation will also require significant scientific and facilitator involvement. The benefits of a successful public participation program include a stronger groundwater management plan and an atmosphere of cooperation on groundwater resource issues.

APPENDIX G

DRINKING WATER SOURCE ASSESSMENT ELEMENTS

The Drinking Water Source Assessment (see Section 4 for further details) developed for the City of Lincoln (Saracino – Kirby – Snow, 2002) contains the following elements:

Location of all Drinking Water Sources

A. The locations of the four active production wells were determined using a Global Positioning System receiver.

B. The well locations (latitude and longitude) were entered into a Geographic Information System database.

Delineation of Source Area and Protection Zones

C. The recharge area boundaries were determined by reviewing topographic and hydrogeologic information for the region.

D. Wellhead protection zones were delineated using the Modified Calculated Fixed Radius method.

Drinking Water Physical Barrier Checklist

The Physical Barrier Effectiveness was calculated using characteristics of the site and the wells. The data and information were used to complete the appropriate DHS forms.

Inventory of Possible Contaminating Activities

Potential Contaminating Activities (PCAs) in the delineated protection zones were identified through a site investigation, review of maps and environmental databases. The PCAs found in the zones were noted on the DHS PCA check sheets.

Vulnerability Ranking

Each PCA was evaluated in terms of its risk ranking, location and the physical barrier effectiveness of the source. PCAs were prioritized to identify those to which the source is most vulnerable.

Source Assessment Map

Maps were prepared that show the locations of the four drinking water sources, the source areas, depth to groundwater contours and the protection zones. A prioritized listing of PCAs found in the protection zones accompanies the Assessment Map.

Public Notification

A statement was prepared for inclusion in the annual Lincoln Consumer Confidence Report. The statement includes information required by DHS indicating that an assessment was conducted and where a copy of the assessment can be found.

Report and Summary

A. The relevant data were assembled and all DWSAP forms completed. A draft report with maps and recommendations was prepared.

B. The draft assessment was submitted to the City of Lincoln for review.

ADDENDA

Since adoption of the City's Groundwater Management Plan in November 2003, the City has developed and adopted Monitoring Protocols and an Implementation Schedule for the plan's Management Action Plan.

The City of Lincoln is a member of the Regional Water Authority (RWA). The Sacramento Groundwater Authority, an entity closely related to RWA, has developed a draft set of monitoring protocols for its member agencies. In order to collect data in a manner consistent with other agencies in the groundwater basin, Lincoln will adopt the same monitoring protocols. These are contained in Addendum A.

A schedule for implementation of the City's Groundwater Management Action Plan is included in Addendum B.

The Monitoring Protocols and Implementation Schedule were formally adopted at the January 13, 2004 City Council meeting. A resolution adopting the protocols and schedule follows on the next page.

RESOLUTION NO. 2004 - 10

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LINCOLN ADDING THE CITY OF LINCOLN GROUNDWATER MANAGEMENT PLAN IMPLEMENTATION SCHEDULE AND MONITORING PROGRAM

WHEREAS, the City of Lincoln (City) owns and operates the municipal drinking water wells (Wells) that utilize groundwater to provide a safe and reliable source of drinking water to the City's customers; and

WHEREAS, the continued operation of the Wells by the City is necessary to maintain overall City water supplies and system reliability; and

WHEREAS, more effective groundwater management is necessary to protect the City's source of water supply and health and safety of its customers; and

WHEREAS, the Groundwater Management Act (Water Code, §§ 10750 *et seq.*) authorizes a local agency whose service area includes a groundwater basin which is not subject to groundwater management pursuant to other provisions of law or a court order, to adopt and implement a Groundwater Management Plan; and

WHEREAS, following the publication of notice required by law, the City held a public hearing on November 12, 2003, to receive public comment on whether or not it should approve a resolution adopting a Groundwater Management Plan; and

WHEREAS, on November 12, 2003 the City Council adopted the Groundwater Management Plan pursuant to the Groundwater Management Act.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF LINCOLN DOES HEREBY RESOLVE AS FOLLOWS:

Section 1. The Lincoln City Council adopts the attached Monitoring protocols.

Section 2. The Lincoln City Council adopts the Implementation Schedule for its Groundwater Management Plan.

PASSED AND ADOPTED this 13th day of January, 2004, by the following roll call vote:

AYES:	COUNCILMEMBERS:	Sprague, Nakata, Santini, Cosgrove, Short
NOES:	COUNCILMEMBERS:	NONE
ABSENT:	COUNCILMEMBERS:	NONE

MAYOR

ATTEST:

CITY CLERK

APPROVED AS TO FORM:

CITY ATTORNEY

I hereby certify that this is a true & correct copy of Res. 2004-10 adopted by the Lincoln City Council on 1/13/04.

City Clerk

ADDENDUM A

GROUNDWATER MONITORING PROTOCOLS

ATTACHMENT A
FIELD MANUAL

STANDARD OPERATING PROCEDURE

For

MANUAL WATER LEVEL MEASUREMENTS

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1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to set guidelines for the determination of the depth to water and separate phase chemical product (i.e., gasoline or oil) in a water supply well, monitoring well, or piezometer. These standard operating procedures may be varied or changed as required, dependent on site conditions , and equipment limitations. In all instances, the actual procedures employed will be documented and described on the field form. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Generally, water-level measurements taken in piezometers, or wells are used to construct water table or potentiometric surface maps and to determine flow direction as well as other aquifer characteristics. Therefore, all water level measurements in a given district should preferably be collected within a 24 hour period and SGA's area within one week. However, certain situations may produce rapidly changing groundwater levels that necessitate taking measurements as close in time as possible. Large changes in water levels among wells may be indicative of such a condition . Rapid groundwater level changes may occur due to:

- Atmospheric pressure changes
- Changes in river stage, impoundments levels, or flow in unlined ditches
- Pumping of nearby wells
- Precipitation
- Tidal influences

2.0 METHOD SUMMARY

A survey mark should be placed on the top of the riser pipe or casing as a reference point for groundwater level measurements. If the lip of the riser pipe is not flat, the reference point may be located on the grout apron or the top of the outer protective casing (if present). The measurement reference point should be documented on the groundwater level data form. All field personnel must be made aware of the measurement reference point being used in order to ensure the collection of comparable data. Before measurements are made, water levels in piezometers and monitor wells should be allowed to stabilize for a minimum of 24 hours after well construction and development. Measurements in water supply wells need to be noted as questionable if pumping has or is occurring. In low yield situations, recovery of water levels to equilibrium may take longer. All measurements should be made as accurately as possible, with a minimum accuracy of 0.1 feet. Future measurements may have to be more accurate (measurements to the nearest 0.01 foot may be needed for conjunctive use projects, ect.). Ideally, the minimum measurement accuracy is 0.1 feet and the recommended accuracy is 0.01 feet.

If there is reason to suspect groundwater contamination, water level measuring equipment must be decontaminated and, in general, measurements should proceed from the least to the most contaminated wells. This SOP assumes an absence of contamination and no need for air monitoring or decontamination.

Open the well and monitor the headspace with the appropriate air monitoring instrument if the presence of volatile organic compounds is suspected. For electrical sounders lower the device into the well until the water surface is reached as indicated by a tone or meter deflection. Record the distance from the water surface to the reference point. Measurement with a chalked tape will

necessitate lowering the tape below the water level and holding a convenient foot marker at the reference point. Record both the water level as indicated on the chalked tape section and the depth mark held at the reference point The depth to water is the difference between the two readings. Remove measuring device, replace riser pipe cap, and decontaminate equipment as necessary. Note that if a separate phase is present, an oil/water indicator probe is required for measurement of product thickness and water level.

3.0 POTENTIAL PROBLEMS

1. Cascading water, particularly in open-hole or rock wells, may interfere with the measurement.
2. Some older types of electric sounders are only marked at five-foot intervals. A surveyor's tape is necessary to extrapolate between the 5-foot marks.
3. Oil or other product floating on the water column can insulate the contacts of the probe on an electric sounder and give false readings. For accurate level measurements in wells containing floating product, a special oil/water level indicator is required, and the corrected water level must be calculated.
4. Tapes (electrical or surveyor's) may have damaged or missing sections, or may be spliced inaccurately.
5. An airline may be the only available means to make measurements in sealed production wells but the method is generally accurate only to approximately 0.2 foot.
6. When using a steel tape, it is necessary to lower the tape below the water level in order to make a measurement. This assumes knowledge of the approximate groundwater level.

4.0 EQUIPMENT

The electric water level indicator and the chalked steel tape are the devices commonly used to measure

water levels. Both have an accuracy of 0.01 feet. Other field equipment may include:

- Air monitoring instrumentation
- Well depth measurement device (sounder)
- Chalk
- Ruler
- Site logbook
- Paper towels and trash bags
- Decontamination supplies (assumed unnecessary)
- Groundwater level data forms

5.0 PROCEDURES

5.1 Preparation

1. Determine the number of measurements needed, the methods to be employed, and the equipment and supplies needed.
2. Decontaminate or pre-clean equipment, and ensure that it is in working order.

3. Coordinate schedule with staff and regulatory agency, if appropriate.
4. If this is an initial visit, perform a general site survey prior to site entry in accordance with a current approved site specific Health and Safety Plan (id applicable).
5. Identify measurement locations.

5.2 Procedures

Procedures for determining water levels are as follows:

1. If possible, and when applicable, start at those wells that are least contaminated and proceed to those wells that are most contaminated.
2. Rinse all the equipment entering the well.
3. Remove locking well cap, note well ID, time of day, and date on the groundwater level data form.
4. Remove well cap.
5. If required by site-specific condition, monitor headspace of well with a photoionization detector (PID) or flame ionization detector (FID) to determine presence of volatile organic compounds, and record results in logbook.
6. Lower water-level measuring device into the well. Electrical tapes are lowered to the water surface whereas chalked steel tapes are lowered generally a foot or more below the water surface. Steel tapes are generally chalked so that a 1-to 5-foot long section will fall below the expected water level.
7. For electrical tapes record the distance from the water surface, as determined by the audio signal or meter, to the reference measuring point and record. For chalked tapes, an even foot mark is held at the reference point, once the chalked section of the tape is below the water level. Both the water level on the tape and the foot mark held at the reference point is recorded. The depth to the water is then the difference between the two readings. In addition, note the reference point used (top of the outer casing, top of the riser pipe, ground surface, or some other reproducible position on the well head). Repeat the measurement.
8. Remove all downhole equipment, replace well cap and locking steel caps.
9. Rinse all downhole equipment and store for transport to the next well.
10. Note any physical changes, such as erosion or cracks in protective concrete pad or
11. Note any physical changes, such as erosion or cracks in protective concrete pad or variation in total depth of well on groundwater level data form.

6.0 CALCULATIONS

To determine groundwater elevation above mean sea level, use the following equation:

where:

$$E_w = E - D$$

E_W = Elevation of water above mean sea level (feet) or local datum

E = Elevation above sea level or local datum at point of measurement (feet)

D = Depth to water (feet)

7.0 QUALITY ASSURANCE/QUALITY CONTROL

The following general quality assurance/quality control (QA/QC) procedures apply:

1. All data must be documented on the groundwater level data forms.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified.
3. Each well should be tested at least twice in order to compare results. If results do not agree to within 0.02 feet, a third measurement should be taken and the readings averaged. Consistent failure of consecutive readings to agree suggests that levels are changing because of one or more conditions as indicated in Section 1, and should be noted on the field form.
4. Results should be compared to historical measurements while in the field and significant discrepancies noted and resolved if possible.
5. Wells for which no or questionable measurements are obtained need to have the codes entered on the field form as follows:

No Measurement		Questionable Measurement	
0	Discontinued	0	Caved or deepened
1	Pumping	1	Pumping
2	Pumphouse locked	2	Nearby pump operating
3	Tape hung up	3	Casing leaking or wet
4	Can't get tape in casing	4	Pumped recently
5	Unable to locate well	5	Air or pressure gauge measurement
6	Well destroyed	6	Other
7	Special	7	Recharge operation at nearby well
8	Casing leaking or wet	8	Oil in casing
9	Temporarily inaccessible		
D.	Dry well		
F.	Flowing well		

6. The surveyor(s) must complete all fields on the field form and initial. Upon return from the field, appropriate corrective actions need to be communicated and completed prior to the next survey event.
7. All data entered into electronic spreadsheet or database should be double-keyed or hard copy printed and proofed by a second person.
8. Questionable wells or measurements noted during data compilation need to result in corrective actions if applicable.

8.0 HEALTH AND SAFETY

This SOP assumes that only uncontaminated wells are being measured. If not, a current approved site Health and Safety Plan should be consulted..

9.0 REFERENCES

Driscoll, F.G. 1986. Groundwater and Wells. Second Edition. Chapter 16. *Collection and Analysis of Pumping Test Data.* pp 534-579. Johnson Filtration Systems Inc. St. Paul, Minnesota.

U.S. Environmental Protection Agency (USEPA), 1986. RCRA Groundwater Monitoring Technical Enforcement Guidance Document, pp. 207.

USEPA, 1987, A Compendium of Superfund Field Operations Methods. EPA/540/p-87/001 Office of Emergency and Remedial Response Washington, D.C. 20460.

USEPA, 2000. Environmental Response Team SOP 2043, 10 pages Feb. 11 2000.

ATTACHMENT B

COLLECTION, PRETREATMENT, STORAGE

AND TRANPORTATION OF WATER

AND WASTEWATER SAMPLES

COLLECTION, PRETREATMENT, STORAGE AND TRANSPORTATION OF WATER AND WASTEWATER SAMPLES

STATE OF CALIFORNIA

DEPARTMENT OF HEALTH SERVICES

DIVISION OF DRINKING WATER AND ENVIRONMENTAL MANAGEMENT

SANITATION AND RADIATION LABORATORIES BRANCH

NORTHERN AND SOUTHERN CALIFORNIA SECTIONS

May 1, 1995

OF CALIFORNIA—HEALTH AND WELFARE AGENCY
PETE WILSON, *Governor*

ARTMENT OF HEALTH SERVICES
ISION OF DRINKING WATER AND ENVIRONMENTAL MANAGEMENT
TATION AND RADIATION LABORATORIES BRANCH
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NGELES, CALIFORNIA 90026-5698
) 580-5795

May 1, 1995

This is the fifth edition of the manual for the "Collection, Pretreatment, Storage and Transportation of Water and Wastewater Samples", prepared by the California Department of Health Services.

The four prior editions (Navone, 1953; Greenberg, 1958; and Tamplin, 1971 and 1985) no longer reflect present practices and should be discarded. The current edition was necessitated by recent additions and changes to the Safe Drinking Water Act and Title 22, California Code of Regulations, and endeavors to reflect sampling requirements up to and including Phases II and V of the Safe Drinking Water Act.

Although sampling, container, preservative and transportation requirements are universally applicable, this manual specifically outlines these steps for samples taken for submittal to the Sanitation and Radiation Laboratories of the California Department of Health Services.

The following contributors to this manual are hereby gratefully acknowledged:

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I. SAMPLING

Sampling or sample collection is the process of collecting a portion of the environmental medium (such as water) so that the amount collected is representative of the material being sampled. Not all aspects of sampling can be covered in their entirety here. However there are several documents available from standard setting agencies that deal with the subject in detail. Here we have excerpted some information that is central to this activity from *Standard Methods for the Examination of Water and Wastewater,* 18th edition, 1992.

A. Sampling Objective

"The objective of sampling is to collect a portion of material small enough in volume to be transported conveniently and handled in the laboratory while still accurately representing the material being sampled. This objective implies that the relative proportions or concentrations of all pertinent components will be the same in the samples as in the materials being sampled, and that the sample will be handled in such a way that no significant changes in composition occur before the tests are made.

"A sample may be presented to the laboratory for specific determinations with the collector taking responsibility for its validity. Often, in water and wastewater work, the laboratory conducts or prescribes the sampling program, which is determined in consultation with the user of the test results. Such consultation is essential to insure selecting samples and analytical methods that provide a true basis for answering the questions that prompted the sampling.

"The sampling program defines the portion of the whole to which the test results apply. Account must be taken of the variability of the whole with respect to time, area, depth, and in some cases, rate of flow.

B. General Precautions

"Obtain a sample that meets the requirements of the sampling program and handle it in such a way that it does not deteriorate or become contaminated before it reaches the laboratory. Before filling, rinse sample bottle out two or three times with the water being collected, unless the bottle contains a preservative or dechlorinating agent. Depending on determinations to be performed, fill container full (most organics determinations) or leave space for aeration, mixing, etc. (microbiological analyses). For samples that will be shipped, preferably leave an air space of about 1% of the container capacity to allow for thermal expansion.

"Sample carefully to insure that analytical results represent the actual sample composition. Important factors affecting results are the presence of suspended matter or turbidity, the method chosen for its removal, and the physical and chemical changes brought about by storage or aeration. Particular care is required when processing (grinding, blending, sieving, filtering) samples to be analyzed for trace constituents, especially metals and organic compounds. Some determinations, particularly of lead,

can be invalidated by contamination from such processing. Treat each sample individually with regard to the substances to be determined, the amount and nature of turbidity present, and other conditions that may influence the results.

"It is impractical to give directions covering all conditions, and the choice of technique for collecting a homogeneous sample must be left to the professional's judgment.

"Make a record of every sample collected and identify every bottle, preferably by attaching an appropriately inscribed tag or label. Record sufficient information to provide positive sample identification at a later date, including the name of the sample collector, the date, hour, and exact location, the water temperature, and any other data that may be needed for correlation, such as weather conditions, water level, stream flow, post-sampling handling, etc. Provide space on the label for the initials of those assuming sample custody and for the time and date of transfer. Fix sampling points by detailed description, by maps, or with the aid of stakes, buoys, or landmarks in a manner that will permit their identification by other persons without reliance on memory or personal guidance.

"Before collecting samples from distribution systems, flush lines sufficiently to insure that the sample is representative of the supply, taking into account the diameter and length of the pipe to be flushed and the velocity of flow.

"Collect samples from wells only after the well has been pumped sufficiently to insure that the sample represents the groundwater source. Sometimes it will be necessary to pump at a specified rate to achieve a characteristic drawdown, if this determines the zones from which the well is supplied. Record pumping rate and drawdown.

"When samples are collected from a river or stream, observed results may vary with depth, stream flow, and distance from shore and from one shore to the other. If equipment is available, take an "integrated" sample from top to bottom in the middle of the stream or from side to side at mid depth, in such a way that the sample is integrated according to flow. If only a grab or catch sample can be collected, take it in the middle of the stream and at mid-depth.

"Lakes and reservoirs are subject to considerable variations from normal causes such as seasonal stratification, rainfall, runoff, and wind. Choose location, depth, and frequency of sampling depending on local conditions and the purpose of the investigation. Avoid surface scum.

"Use only representative samples (or those conforming to a sampling program) for examination. The great variety of conditions under which collections must be made makes it impossible to prescribe a fixed procedure. In general, take into account tests or analyses to be made and the purpose for which the results are needed.

C. Types of Samples

Grab or catch samples:

"Strictly speaking, a sample collected at a particular time and place can represent only the composition of the source at that time and place. However, when a source is known to be fairly constant in composition over a considerable period of time or over substantial distances in all directions, then the sample may be said to represent a longer time period or a larger volume, or both, than the specified point at which it was collected. In such circumstances, some sources may be represented quite well by single grab samples.

"When a source is known to vary with time, grab samples collected at suitable intervals and analyzed separately can document the extent, frequency, and duration of these variations. Choose sampling intervals on the basis of the frequency with which changes may be expected, which may vary from as little as 5 minutes to as long as 1 hour or more.

"When the source composition varies in space rather than time, collect samples from appropriate locations.

"Use great care in sampling wastewater sludges, sludge banks, and muds. No definite procedure can be given, but take every possible precaution to obtain a representative sample or one conforming to a sampling program.

Composite samples:

"In most cases, the term "composite sample" refers to a mixture of grab samples collected at the same sampling point at different times. Sometimes the term "time-composite" is used to distinguish this type of sample from others. Time-composite samples are most useful for observing average calculations that will be used, for example, in calculating the loading or the efficiency of a wastewater treatment plant. As an alternative to the separate analysis of a large number of samples, followed by computation of average and total results, composite samples represent a substantial saving in laboratory effort and expense.

"To evaluate the effects of special, variable, or irregular discharges and operations, collect composite samples representing the period during which such discharges occur.

"For determining components or characteristics subject to significant and unavoidable changes on storage, do not use composite samples. Make such determinations on individual samples as soon as possible after collection and preferably at the sampling point. Use time-composite samples only for determining components that can be demonstrated to remain unchanged under the conditions of sample collection and preservation.

"If preservatives are used, add them to the sample bottle initially so that all portions of the composite are preserved as soon as collected. Analysis of individual samples sometimes may be necessary.

"It is desirable, and often essential, to combine individual samples in volumes proportional to flow. A final sample volume of 2 to 3 L is sufficient for sewage, effluents, and wastes.

"Automatic sampling devices are available; however, do not use them unless the sample is preserved as described below. Clean sampling devices, including bottles, daily to eliminate biological growths and other deposits.

Integrated samples:

"For certain purposes, the information needed is provided best by analyzing mixtures of grab samples collected from different points simultaneously, or as nearly so as possible. Such mixtures sometimes are called integrated samples. An example of the need for such sampling occurs in a river or stream that varies in composition across its width and depth. To evaluate average composition or total loading, use a mixture of samples representing various points in the cross-section, in proportion to their relative flows.

"Both natural and artificial lakes show variations of composition with both depth and horizontal location. However, under many conditions, neither total nor average results are especially significant, local variations are more important. In such cases, examine samples separately rather than integrate them.

"Preparation of integrated samples usually requires special equipment to collect a sample from a known depth without contaminating it with overlying water. Knowledge of the volume, movement, and composition of the various parts of the water being sampled usually is required. Therefore, collecting integrated samples is a complicated and specialized process that cannot be described in detail.

D. Methods of Sampling

Manual sampling:

"Manual sampling involves no equipment but may be unduly costly and time-consuming for routine or large-scale sampling programs.

Automatic sampling:

"Automatic samplers are being used increasingly. They are effective and reliable and can increase significantly the frequency of sampling. Various devices are available but no one sampler is universally ideal. Consult manufacturer's specifications to select the sampler best suited to the need.

E. Quantity

"Collect a 2-L sample for most physical and chemical analyses. For certain determinations, larger samples may be necessary. Do not use the same sample for chemical, (organic and inorganic) bacteriological, and microscopic examinations because methods of collecting and handling are different.

F. Preservation

"Complete and unequivocal preservation of samples, whether domestic wastewater, industrial wastes, or natural waters, is a practical impossibility. Regardless of the sample nature, complete stability for every constituent can never be achieved. At best, preservation techniques only retard chemical and biological changes that inevitably continue after sample collection.

Nature of Sample Changes:

"Some determinations are more likely than others to be affected by sample storage before analysis. Certain cations are subject to loss by adsorption on, or ion exchange with, the walls of glass containers.

"Temperature changes quickly; pH may change significantly, in a matter of minutes dissolved gases (oxygen, carbon dioxide) may be lost. Determine temperature, pH, and dissolved gases in the field.

"Iron and manganese are readily soluble in their lower oxidation states but relatively insoluble in their higher oxidation states; therefore, these cations may precipitate out or they may dissolve from a sediment, depending upon the redox potential of the sample. Microbiological activity may be responsible for changes in the nitrate-nitrite-ammonia content, for decreases in phenol concentration and BOD, or for reducing sulfate to sulfide. Residual chlorine is reduced to chloride. Sulfide, sulfite, ferrous iron, iodine, and cyanide may be lost through oxidation. Color, odor, and turbidity may increase, decrease, or change in quality. Sodium, silica, and boron may be leached from the glass container. Hexavalent chromium may be reduced to chromic ion.

"Biological changes taking place in a sample may change the oxidation state of some constituents. Soluble constituents may be converted to organically bound materials in cell structures, or cell lysis may result in release of cellular material into solution. The well-known nitrogen and phosphorus cycles are examples of biological influences on sample composition.

"The foregoing discussion is by no means exhaustive and comprehensive. Clearly, it is impossible to prescribe absolute rules for preventing all possible changes. Additional advice will be found in the discussions under individual determinations, but to a large degree the dependability of an analytical determination rests on the experience and good judgment of the person collecting the sample.

Time interval between collection and analysis:

"In general, the shorter the time that elapses between collection of a sample and its analysis, the more reliable will be the analytical results. Changes caused by growth of microorganisms are greatly retarded by keeping the sample in the dark and at a temperature. When the interval between sample collection and analysis is long enough to produce changes in either the concentration or the physical state of the constituent to be measured, follow the preservation practices given.

"Record time elapsed between sampling and analysis, and which preservative, if any, was added."

Preservation methods:

Sample preservation is difficult because almost all preservatives interfere with some of the tests. Immediate analysis is ideal. Storage at low temperature (4°C) is perhaps the best way to preserve most samples until the next day. Use chemical preservatives only when they are shown not to interfere with the analysis being made. When they are used, add them to the sample bottle initially so that all sample portions are preserved as soon as collected.

"Methods of preservation are relatively limited and are intended generally to retard biological action, retard hydrolysis of chemical compounds and complexes, and reduce volatility of constituents.

"Preservation methods are limited to pH control, chemical addition, the use of amber and opaque bottles, refrigeration, and freezing.

"Clearly it is impossible to prescribe absolute rules for the preventing of all possible changes. Additional advice will be found in the discussions under individual determinations, but to a large degree the dependability of analytical determination rests on the experience and good judgment of the person collecting the sample."

II. SAMPLE CONTAINERS AVAILABLE FROM THE LABORATORY

The proper sample container along with preservative (when applicable) should be chosen for each parameter. Table I provides the sample container types and volumes for most of the required tests.

Table II lists the containers for each parameter and the preservatives in each.

III. ANALYSIS REQUEST FORMS AVAILABLE FROM THE LABORATORIES

Each sample submitted to the laboratory must be accompanied with a Request for Sample Analysis. The table below identifies these forms:

Northern Section:	
LAB-808 (7/92)	Request for Sample Analysis (General and Inorganic)
LAB-809 (7/92)	Request for Sample Analysis (Organic)
LAB-803 (12/92)	Request for Sample Analysis (Radiological)
LAB-N-807 (8/93)	Microbiological Determinations
LAB-801 (6/91)	Shellfish Determinations
Southern Section:	
SRLform26 (9/22/94)	Analysis Request Form (All analyses)

The sample collector must complete all pertinent information in the above forms. If the information is not complete, sample analysis cannot begin and may warrant recollection of the samples. Laboratories have listed the tests they perform only to help the sample collectors recall what the testing parameters are. Request only those tests that are essential for the particular objective. Selecting all tests within a category will not automatically result in their analyses. When questions remain, the laboratories will call sample collectors to verify analytical requests prior to analysis.

If chain-of-custody is required, the sample collector must initiate the process in the field at the time of sample collection.

California State Department of Health Services
Division of Drinking Water and Environmental Management—SRLB

Legend: Full = Full bottle G1/G2 = G1 or G2

Constituent	Type of Bottle	Required Volume (mL)	Constituent	Type of Bottle	Required Volume (mL)
Ammonia-Nitrogen	N	200	PCBs	E	Full
BOD	G2	Full	Pesticides	E	Full
BOD (for seed) Collect before chlorination	G1	100	Petroleum HC (TPH)	H	Full
			pH	G1/G2	25
BNA	E	Full	Phenol	P	Full
Boron (B)	G1/G2	50	Phenols, chlorinated	E	Full
BTEX	V/VT	Two full vials	Phosphate, ortho	M	100
Calcium (Ca)	G1/G2	200	Phosphate, total	M	200
Chloride	G1/G2	200	Potassium (K)	G1/G2	50
COD	N	100	Radiochemical	2 × G2	Full
Color	G1	100	Residual chlorine	R	200
Cyanide	C	Full	Settleable matter	G2	1000
EDB/DBCP	V	Two full vials	Sodium (Na)	G1/G2	50
Fluoride	G1	25	Specific conductance	G1/G2	200
General Mineral	G2	Full	Sulfate	G1/G2	50
Hardness	G1/G2	200	Sulfide	S	50
Herbicides	E	Full	Suspended solids	G1/G2	200
Iron (Fe)	G1/G2	50	TDS	G1/G2	200
Kjeldahl-Nitrogen	N	200	Total alkalinity including: Bicarbonate Carbonate Hydroxide	G1/G2	200
Magnesium (Mg)	G1/G2	50			
Manganese (Mn)	G1/G2	50			
MBAS	M	200	Total nitrogen	N	Full
Nitrate, Nitrate-N	N	50	Trace elements	T,t	Full
Nitrite, Nitrite-N	N	50	Turbidity	G1/G2	50
Odor	D	Full	Volatiles (Non-chlorinated)	V	Two full vials
Oil & Grease	O	1000			
Organic Nitrogen	N	200	Volatiles (Chlorinated)	VT	Two full vials

For solid samples such as soils, sediments and sludges, collect the sample in one container (bottle type: W) for any type of analyses.

Table I

INFORMATION ON USING THE SAMPLE CONTAINERS

All samples must be kept cool after sampling except for Trace Elements. Do not rinse the sample bottles before use.

Bottle Type	To be used in sampling for:	Preservative added:
B	Microbiological tests	Sodium thiosulfate
C	Cyanide	Sodium hydroxide
D	Odor	None
E	Extractables such as: BNA, EDB/DBCP, Herbicides, PCBs, pesticides	None (solvent washed)
G 1 (pint) G 2 (½ gallon)	(For general use) BOD, Boron, Color, General Mineral, Hexavalent Chromium, Settleable Solids, Specific Conductance, Sulfite, Suspended Solids, Turbidity.	None
H	Petroleum Hydrocarbons	Sulfuric acid
M	MBAS and Phosphate	None (HCl acid washed)
N	Nitrogens: Ammonia & Kjeldahl Nitrogen, Nitrate, Nitrite, Organic Nitrogen, Total Nitrogen, COD	Sulfuric acid
O	Oil & Grease	Sulfuric acid
P	Phenol	Sulfuric acid
R	Residual Chlorine (put in 200 mL only)	PAO and acetate buffer
S	Sulfide (only)	Zinc acetate and sodium hydroxide
T,t	Trace Elements Take two, one big and one small.	Nitric acid (big) None (small)
V	VOC for non-chlorinated water. Two vials for each sample site.	None (heated)
VT	VOC for chlorinated water. Take two vials for each sample site.	(heated); Sodium thiosulfate
W	Solid wastes: soil, sediments, sludge	None
For other types of analyses, please contact the laboratory.		

General Mineral includes:

Total Alkalinity (Bicarbonate, Carbonate, Hydroxide), Calcium, Chloride, Fluoride, Total Hardness, Iron, Magnesium, Manganese, Nitrate, pH, Potassium, Sodium, Sulfate, Specific Conductance and TDS.

Trace Elements include:

Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Selenium (Se), Silver (Ag), Zinc (Zn).

Heavy Metals include:

Arsenic (As), Barium (Ba), Cadmium (Cd), Chromium (Cr), Lead (Pb), Mercury (Hg), Selenium (Se), Silver (Ag).

Please avoid submitting samples for:	Microbiological tests	on Thursday and Friday.
	Residual Chlorine	on Friday (after 12:00 noon).
Please submit samples for:	BOD	by appointment only.

Notes: If you know in advance that the samples contain high level of toxic or dangerous compounds *e.g.*, cyanide, sulfide, etc., please note on Analysis Request Form under "Warning"

IV. BIOLOGICAL SAMPLES AND DETERMINATIONS

Before collecting large numbers of samples, or for more information, communicate with the laboratory. In northern California, call Ray Bryant at (510) 540-2077 or Dr. Daniel C. Mills at (510) 540-2172 in the Microbial Diseases Laboratory. The laboratory's general number is (510) 540-2242. In southern California, call Bill Steeber in the Sanitation and Radiation Laboratory (South) at (213) 580-5739 or (213) 580-5795.

A. Coliform Group

Sample Bottle

The laboratory can provide prenumbered sterile four (4) oz. wide-mouth containers containing enough sodium thiosulfate to give a concentration of 100 mg/L of sample.

Collection of Samples

Care must be used to protect the sample from contamination. Permit only the water sample to contact the inside of the bottle and the bottle cap.

DO NOT RINSE OUT BOTTLE PRIOR TO FILLING.

To collect a sample other than from a tap, hold jar near the bottom, remove bottle cap; plunge jar mouth downward, to an appropriate depth moving hand and jar in a wide arc away from the body. If the water being sampled is flowing, direct the mouth of the jar against the flow.

To collect a sample from a tap, select a tap in frequent use and run the water for 2-3 minutes or until temperature has stabilized before filling the bottle. Avoid leaky taps since water flowing over the external surface of the tap may contaminate the sample.

About 1/4 to 1/2 inch of air space should be left above the sample.

Sample Identity:

Identify samples by filling out the report forms (Form LAB-807 (8-93)). Request dilutions and tubes per dilution required. Use same sample request form for determination of total coliform, fecal coliform (EC), fecal enterococci, and standard plate count. If fecal streptococci is requested, check appropriate box on slip and write in fecal strep.

Sample Transportation and Storage

Examine samples as soon as possible after collection. Not more than 30 hours may elapse between sampling and analysis. Thirty hours is acceptable for samples mailed from treatment systems; otherwise, 6 hours are specified in EPA's *Microbiological Methods*.

Keep samples at 1-4°C during storage, but do not freeze. Use reusable freezing gels in portable insulated box for cooling and shipping. Avoid using ice or dry ice.

Schedule sample collection with delivery services to minimize delays. Do not send samples by U.S. Mail without refrigeration.

B. Standard (Heterotrophic) Plate Count

Collect samples using same procedure and containers as for the coliform determination.

Not more than 6 hours may elapse between sampling and analysis.

C. Sewage-Swab Samples (for Salmonella) by Prior Arrangement with EMBS-MDL

Sampling Materials

- Bagged sterile swab with attached string.
- Sterile 8 oz bottle for transportation of swab.

Collection of Samples

Take care to protect the swab and the samples from contamination. Prepare sampling site for the swab; carefully remove the swab from the bag touching only the free end of the string, insert the swab into the flowing sewage, and securely fasten the free end of the string. After an appropriate period of time (1-5 days), carefully remove the swab from the sewage and place it in the sterile bottle.

Sample Transportation

With minimum delay ship directly to the Environmental Microbial Diseases Section - Microbial Diseases Laboratory (EMDS-MDL) in Berkeley. Refrigerate the sample in transit. (See IV.A above: *Sample Transportation and Storage.*)

D. Giardia and Cryptosporidium Samples

Large volume (400-4000 liters) sampling of water sources is required to achieve acceptable sensitivity for the detection of these parasites. Water is filtered through the 1 micron pore size cartridge filter using motorized or hand-driven pump.

Sample Size

Consult the EMDS-MDL for guidance in determining the volume of water to filter.

Submit the entire filter cartridge and water remaining in the filter housing in a clean, sturdy plastic bag. Store samples refrigerated until examined, usually within 72 hours.

E. Shellfish Samples for Bacteriological Analysis

Samples of shell stock and shucked but unfrozen shellfish must be examined within 6 hours after collection. Store frozen samples at less than 10°C, but never exceed 24 hours.

Shell stock samples should be collected in clean, dry containers. Provide 10-12 shellfish or a minimum weight of about 200 g of meat and shell liquor.

Shucked shellfish are preferably collected in the final container for retail sale.

F. Samples for Marine Biotoxin Analysis

Examine shellfish as soon as possible after collection. Shell stock may be collected in clean, plastic bags providing at least 150 g of meat. Shucked shellfish may be collected in the final container for retail sale.

Samples which cannot be analyzed promptly should be shucked, drained for 5 minutes and frozen. At least 15 to 20 individuals (150 g of meat) should be collected per sample. Analyses are made only in the EMDS-MDL in Berkeley.

See attachment 1 for more information on sampling.

G. Iron Bacteria

Any wide mouth bottle is suitable. The bottle need not be sterile. In collecting the sample include a significant amount of iron-containing slime. Use no preservative. The sample should be held no longer than 2 days.

H. Plankton

Sampling for plankton requires proper equipment and training. This is activity routinely performed by the Shellfish Biotoxin Section of the Environmental Management Branch. If you need information or assistance for plankton sampling contact that section.

V. GENERAL AND INORGANIC CHEMICAL DETERMINATIONS

Prior to collecting large numbers of samples, or unusual samples, make arrangements with the laboratory. Submit sufficient sample using appropriate containers for the test. Table I on page 8 summarizes containers and sample volumes for many common analytes. To conserve space, the table and the section below list only the most common analytes. The laboratory can answer questions about others.

Do not rinse sample bottles containing preservative—simply fill them. Completely and correctly fill in the "Request for Sample Analysis" forms, specifying the analyses desired. For further information about the analyses please contact Ms. Tina Parangalan (SRLB-North) at (510) 540-2751 or 2201, or Mr. Bill Steeber (SRLB-South) at (213) 580-5739.

Acidity and Alkalinity

Completely fill a 500 mL plastic (G1) bottle. Have the analysis done as soon as possible, preferably within one day after sample collection. Refrigerate sample during storage.

Aluminum

Collect 500 mL in a plastic bottle and analyze within 1 day. If the analysis is to be for soluble aluminum, filter the sample in the field through a membrane filter (0.45 μm pore diameter) and submit the filtrate for analysis.

Biochemical Oxygen Demand 5 days (BOD_5)

Because of rapid changes in the BOD, arrange for analysis the day the sample is collected. Collect 1/2 gallon in a (G2) plastic bottle, keep refrigerated, and do not add any preservatives. Indicate the expected BOD range in completing the report form.

Boron

Collect sample in 500 mL plastic (G1) bottles.

Carbon, Organic and/or Inorganic

Collect sample in 4 oz organic free glass bottle. Keep cool and analyze as soon as possible.

Chemical Oxygen Demand (COD)

The analysis should be made within seven days of collection and preservation. Use an N bottle, which already contains sulfuric acid as a preservative. Alternatively, samples should be refrigerated or may be preserved by acidifying with H_2SO_4 to pH 2.

Chlorine, Residual

If the laboratory will analyze the sample, collect in an **R** bottle, ice it, and submit it as soon as possible. Alternatively, analyze residual chlorine in the field, using field kits provided by the laboratory.

Chlorophyll

Collect sample in 500 mL plastic bottle. Submit to lab as soon after sampling as possible.

Chromium

New 500 mL plastic bottles should preferably be used to collect samples. This will minimize adsorption of the chromium on the surface. If hexavalent chromium is to be determined, the sample must be refrigerated and analyzed within 24 hours after collection. For total chromium, collect sample in 500 mL plastic bottle containing 0.8 mL reagent grade or higher purity HNO_3.

Color

Collect samples in 500 mL glass bottles and refrigerate at 4°C. Determination must be made within one day.

Cyanide

Cyanides are very unstable and should be analyzed as soon after sample collection as possible. Fill one (1) liter or larger plastic sample bottle completely, and if immediate analysis is not possible, preserve the sample by adding NaOH to raise the pH to 12 or more. (Usually 10 mL or 50% NaOH per 500 ml sample). A **C** bottle is available, which already contains the preservative.

Fluorescein (or Other Dye Tracers)

Collect in solvent-washed 500 mL glass bottle. Refrigerate and analyze on the same day as collected. A sample of the dye used should be submitted along with a sample of untreated water.

General Mineral Analysis: total dissolved solids, hardness, alkalinity, calcium, magnesium, iron, manganese, sodium, potassium, chloride, sulfate, fluoride, nitrate, pH and specific conductivity (as part of QC)

Collect ½ gallon in a glass or plastic container (**G2** bottle). Refrigerate and deliver to the laboratory as soon as possible or within 3 days. To sample for individual analytes in the group which are not covered specially in this section, use a plastic bottle without preservative (**G1** or **G2**). Observe the volume requirements listed in Table 1 (page 8) to ensure there is sufficient sample for *all* analytes.

Manganese

Because manganese is adsorbed on glass, delays between sampling and analysis should be eliminated. Collect sample in 500 mL plastic bottle, and add Suprapur® HNO_3 to pH 2. Preferably, use the T bottles, and sample as for metals, described below.

MBAS (Methylene Blue Active Substances) - Detergents

Collect sample in an M bottle, which has no preservatives, but has been specially cleaned. It is necessary to use a glass container of at least 500 mL capacity. Cool to 4°C.

Metals

The laboratory is capable of analyzing for a wide spectrum of metals. If requesting only metal analysis, the general procedure is to submit *two* containers. The actual analysis for metals will be done on the liquid in the T bottle, which contains nitric acid preservative. The smaller t bottle contains no preservative, and enables the analyst to evaluate the water for quality control purposes.

Metals, Heavy (Cobalt, Molybdenum, Titanium, Vanadium)

Serious errors can be introduced during sampling and storage. Allow samples to contact only acid-washed plastic. Collect sample in two T bottles (one large and one small). The large bottle contains nitric acid preservative. It is permissible to take sample in 500 mL plastic bottle and add 0.8 mL Suprapur® HNO_3.

Metals, Trace (Arsenic, Antimony, Barium, Beryllium, Cadmium, Copper, Iron, Lead, Nickel, Thallium, Zinc)

Sample collection is the same as the prior paragraph.

Nitrogen: Ammonia, Nitrate, Nitrite, and Organic Nitrogen

The form in which nitrogen appears can be changed by biological activity. Collect in an N bottle, which contains sulfuric acid preservative. Transport or store as close to 0°C as possible. Alternatively collect in a 1/2 gallon plastic bottle and add 1 mL concentrated H_2SO_4/L.

Odor (and Taste)

Collect sample by completely filling a clean and odor free 1 liter glass bottle (D bottle). Refrigerate. Analyze on the day collected.

Oil & Grease

Collect in an **O** bottle, which contains sulfuric acid preservative. Refrigerate and submit as soon as possible to the laboratory. Sludge samples may be preserved with 1 mL concentrated H_2SO_4 per 80 g of sludge. Acidified samples may be stored for 3 weeks under refrigeration.

Oxygen, Dissolved

Collect sample with minimal aeration. Completely fill the BOD bottle. Analyze in the field using kit appropriately calibrated according to manufacturer instructions. If the laboratory will do the analysis, the sample should be submitted without delay.

pH

Bring a refrigerated sample back to laboratory as soon as possible after collection. If possible make pH measurements in the field using pH meters available from the laboratory.

Phenol

Collect in **P** bottle, which contains sulfuric acid as a preservative. Cool the sample to 4°C for transport to the laboratory. If a **P** bottle is not available, and sampling is imperative, use a clean glass container, cool to 4°C, and deliver immediately to the laboratory.

Phosphate

Collect sample in an M bottle, which has no preservative. If soluble phosphates are to be differentiated, field-filter the sample through a membrane filter (0.45 μm pore diameter) and preserve by adding 2 mL of conc. H_2SO_4.

Silica

Collect samples in 500 mL plastic bottles. May be kept 3 weeks under refrigeration.

Sludge and Bottom Sediments

Analyses should be made as soon as possible. If stored, preserve by adding 5 g sodium benzoate or 1 mL concentrated H_2SO_4 per 80 g sample. Check first with laboratory for possible interferences and to schedule sampling. Four-oz bottles (subsection 2.1.2) are convenient for samples of this kind.

Solids, Settlable

Collect one half gallon in a container without preservative (G2 bottle). Cool to 4°C and deliver to the laboratory on the same day.

Solids, Suspended

Collect one half gallon in a container without preservative (**G2** bottle).

Sulfides

Collect 500 mL with minimal aeration in a plastic bottle. For dissolved sulfides determine in the field within 3 minutes of collection with a field kit suitably calibrated according to manufacturer instructions. Total sulfide samples must be preserved, and the laboratory provides **S** bottles for this purpose.

Temperature

Contact laboratory for calibrated thermometers to be used at the time of sample collection. Determine on site.

Turbidity

If the laboratory will perform the test, take sample in a 500 mL or larger plastic bottle, without preservative (**G1** or **G2** bottle), hold in the dark, and submit to the laboratory on the same day. Turbidity may be analyzed in the field. Determine turbidity in the field using a portable turbidimeter which the laboratory has calibrated.

VI. RADIOLOGICAL DETERMINATIONS

The Radiochemistry Unit of the Sanitation and Radiation Laboratories Branch-North (SRLB-N/RCU) serves a number of different clients. These include, but are not limited to, the Division of Drinking Water and Environmental Management (DDWEM), the Radiologic Health Branch (RHB), and the Environmental Management Branch (EMB). Considering the large number of programs which the laboratory supports, it is important to coordinate sample collection to best utilize the laboratory resources. Before sampling, the collector should contact Carolyn Wong in the laboratory at (510) 540-2209 or 2513 (8-571-2513). The sample collection must be scheduled so samples arrive at a time when the laboratory may accomodate them. The call also serves to request delivery of necessary sample collection supplies and to obtain additional information.

The laboratory maintains supplies of appropriate containers for each type of analysis carried out in this laboratory. Any supplies the collector needs can be obtained from the laboratory. They are sample containers, packing materials, shipping chests, labels, and Request for Sample Analysis (Form 803) forms.

General Procedures

Preauthorization to submit samples to the laboratory is required. All sample collection activities must be prearranged with the laboratory, with the exception of the following routine programs:

- Environmental samples from four nuclear power plants
- Water samples from special projects - Division of Drinking Water and Environmental Management
- Special project environmental samples - Low Level Radioactive Waste, Office of Radon, U.S. Department of Energy
- Performance evaluation and interlaboratory comparison study samples - U.S. EPA
- Quality assurance samples - SRL (blind, internal)

Sample collectors will wear disposable gloves to avoid sample contamination.

All tools, including trowels, forceps, etc., for manipulating samples must be either single-use and therefore disposed of directly, or cleaned of contamination by or adequately rinsing with detergent and deionized water and drying, and the waste disposed of properly.

Submit a Request for Sample Analysis (Form 803) with each sample. The name, address and telephone number of the person requesting the analysis should be filled in legibly in the appropriate box on the Request for Sample Analysis. Complete in full all of the boxes on the form that ask for the sampling site, sample type, analyses requested, collection date and time.

If the samples were taken from a contaminated area as indicated by a survey meter, report the survey meter measurements on the Request for Sample Analysis.

Clearly state any known hazardous components in a sample in the comment section on the Request for Sample Analysis. Examples of the hazardous components are medical wastes, sewage, radioactive ore, reclaimed water, carcinogens, sharp objects, etc.

Note any preservatives added to the samples on the Request for Sample Analysis.

Do not insert the Request for Sample Analysis form in the same bag or container as the sample. Instead, place it in a small Ziplock® bag by itself. Zip the bag closed and place in it in the same shipping box with the sample, but not in the sample bag or container. Place the self adhesive label with the R number, accompanying the Request for Sample analysis, on the sample container.

If the sample contains water, put the sample in an air-tight plastic container with a screw cap. Then place the container in a plastic bag to avoid leakage.

Tie plastic bags with twist ties, not with paper tape. Paper tape does not adhere adequately to the plastic bags and can come apart during transit.

Package the samples securely in a shipping box to withstand the rigor of transportation.

Since all samples may potentially end up as evidentiary material in a court of law, documentation for chain-of-custody is important. Proper chain-of-custody must be maintained from the time of sampling until the generation of laboratory report(s) to adequately support chain-of-custody for litigation purposes. The U.S. Postal Service is adequate for samples that do not require stringent chain-of-custody. If stringent chain-of-custody is required the collector should deliver the samples directly to the laboratory.

Package samples to be transported to meet the U.S. Department of Transportation guidelines specified in the Code of Federal Regulations. Common carriers the samples collectors deal with routinely may be used for sample transportation.

Ship or deliver the samples to the following address:

California State Department of Health Services
Sanitation & Radiation Laboratories - Radiochemistry Unit
2151 Berkeley Way, Room 119
Berkeley, Ca 94704-1011

The collector should call the laboratory at 510-540-2513 upon shipping the samples so that the laboratory can track the arrival of the samples. If the samples are not received in due time, the laboratory personnel can call the collector to apprise him of the problem.

The following table summarizes the volume requirements, preservatives and recommended transit times for radiological analytes. The specified volumes are required for the analysis itself and for routine quality control. The recommended transit time is the maximum time that should elapse between sampling and submission to the laboratory. Samples that exceed these times might not be analyzed. The laboratory may have to reject an analytical request depending on the radionuclide sought, the decay of short half-life radionuclides and/or sample spoilage.

Analysis	Volume	Container	Preservative	Recommended Transit Time
Gross α	0.5-3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
Gross ß	0.5-3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
Gross α/ß	0.5-3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
Gamma scan	3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
^{3}Hydrogen/^{14}Carbon	500 mL	Glass	None	3-5 days
^{89,90}Strontium	3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
^{131}Iodine	1-3.8 L	Plastic	None	3 days
^{226,228}Radium	3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
Natural Uranium-Radiometric	3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
Natural Uranium-Laser Phosphorimetry	100 mL	Plastic	Conc. HNO_3 to pH<2	3-5 days
Plutonium	1-3.8 L	Plastic	Conc. HNO_3 to pH<2	3-5 days
Radon	160 mL	French square bottles - glass	None	1 day

Table III

Procedures for Water

Gross Alpha and Gross Beta Analysis

Materials

- Request for Sample Analysis (Form 803)
- Plastic Bottle - 1 Liter (1 Quart) with cap or
- Cubitainer - 1 gallon polyethylene with cap
- Nitric Acid, 70% (conc.) - analytical grade

Sample Size - 1 Liter (1 Quart), 1 liter of sample is generally enough for gross alpha and gross beta analysis; however, if other analyses are required, a 1 gallon sample should be submitted.

Field Preservation - Add enough nitric acid (70%, conc.) to bring the sample to pH < 2 (2 ml nitric acid per liter is generally enough). Preserved samples may be held for 6 months. If nitric acid is not available in the field, ship the sample to the laboratory immediately.

Procedure - Collect a "representative" sample of the body of water under study. Preserve as above, and label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803).

Tritium and Carbon-14 Analysis

Materials

- Request for Sample analysis (Form 803)
- 250 mL Boston round glass bottle, with cap

Sample Size - 250 mL

Field Preservation - Do not add any preservatives to this sample. Ship the sample to the laboratory immediately.

Procedure - Collect a "representative" sample of the body of water under study. Label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803). A separate sample must be collected for tritium and carbon-14 analysis since adding nitric acid as a preservative would make it impossible to run these analyses.

Radon-222 Analysis

Materials

- Request for Sample Analysis (Form 803) and Labels - one for each duplicate sample set. A duplicate sample set consists of two (2) French square bottles (A,B) taken from the same sampling bucket.
- Small plastic bucket
- Tygon® tubing with sampling adapter(s)
- 6-oz. French Square bottle with rubber-lined cap.

Sample Size - Duplicate 6-oz samples taken from the same sampling bucket.

Field Preservation - Do not add any preservatives to this sample. Ship the sample to the laboratory immediately (The half-life of ^{222}Rn is 3.8 days).

Procedure

- Keep sample bottles cold, by making sure the ice pack is frozen and the box containing the bottles is stored away from the sun.
- Purge the system for 15 minutes to ensure collection of a water sample representative of the aquifer. This protocol is consistent with that for VOCs (AB 1803) and for the Division of Drinking Water and Environmental Management (DDWEM) proposed Monitoring Regulations.
- At sampling point attach a Tygon® tubing to port, faucet, tap, etc. using appropriate adapter as necessary. Direct delivery end to the bottom of the bucket and slowly run the water into the bucket for approximately 5 minutes. Discard the water in the bucket at least once and allow the water to overflow during the remainder of the sampling.
- Remove the bottle cap, and with the bottle in an upright position, carefully submerge the bottle and cap. Avoid agitating the water to minimize creation of bubbles. With the bottle underwater, insert the end of the tubing into the bottle and allow the water to exchange to assure a fresh sample. Remove the tubing and cap the bottle tightly while cap and bottle are both under water.
- After removing the capped bottle from the bucket, invert the bottle and check to see if any bubbles are present. If bubbles are present, empty the bottle and start this sample collection procedure over. Collect at least two separate samples (duplicates) from the same sampling bucket.
- Wipe bottles thoroughly, tape the cap with electrical tape in a clockwise direction (the same way the cap screws on), and attach an identification label to each dry bottle. Fill in the Request for Sample Analysis (Form 803) completely. Due to the short half-life of radon ($_{86}Rn^{222}$ $t_{1/2}$ = 3.8 d), it is essential that the date and time of collection be exact.
- Return the samples and any empty bottles with the frozen ice pack to the laboratory by overnight carrier.

Gamma Analysis (for water when gross β > 50 pCi/L)

Materials

- Request for Sample Analysis (Form 803)
- Plastic Bottle - 2 Liter (2 Quart) with cap or
- Cubitainer - 1 gallon polyethylene with cap
- Nitric Acid, 70% (conc.) - analytical grade

Sample Size - 2 Liters (2 Quarts), 2 liters of sample is generally enough for gamma analysis, however if other analyses are required, submit a 1 gallon sample.

Field Preservation - Add enough nitric acid (70%, conc.) to bring the sample to pH < 2 (2 ml nitric acid per liter is generally enough). Preserved samples may be held for 6 months. If nitric acid is not available in the field, ship the sample to the laboratory immediately.

Procedure - Collect a "representative" sample of the body of water under study. Preserve as above, and label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803).

Radiochemical Analysis (Uranium, Radium and Strontium)

Materials

- Request for Sample Analysis (Form 803)
- Cubitainer - 1 gallon polyethylene with cap
- Nitric Acid, 70% (conc.)- analytical grade

Sample Size - 3.8 Liters (1 Gallon)

Field Preservation - Add enough nitric acid (70%, conc.) to bring the sample to pH < 2 (2 ml nitric acid per liter is generally enough). Preserved samples may be held for 6 months. If nitric acid is not available in the field, ship the sample to the laboratory immediately.

Procedure - Collect a "representative" sample of the body of water under study. Preserve as above, and label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803).

Procedure for Sewage Effluent

Gross Alpha and Gross Beta Analysis

Materials

- Request for Sample Analysis (Form 803)
- Plastic Bottle - 500 ml (1 Pint) with cap or
- Cubitainer - 1 gallon polyethylene with cap

Sample Size - 500 ml (1 Pint), 500 ml of sample is generally enough for gross alpha and gross beta analysis; however, if other analyses are required, submit a 1 gallon sample.

Field Preservation - Do not add preservatives to these samples. If possible keep the samples refrigerated to prevent undue decomposition. Ship the samples to the laboratory immediately.

Procedure - Collect a "representative" sample of the body of water under study. Label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803).

Gamma Analysis

Materials

- Request for Sample Analysis (Form 803)
- Plastic Bottle - 2 Liter (2 Quart) with cap or
- Cubitainer - 1 gallon polyethylene with cap

Sample Size - 2 Liters (2 Quarts), 2 liters of sample is generally enough for gamma analysis; however, if other analyses are required, submit a 1 gallon sample.

Field Preservation - Do not add preservatives to these samples. If possible, keep the samples refrigerated to prevent undue decomposition. Ship the samples to the laboratory immediately.

Procedure - Collect a "representative" sample of the body of water under study. Label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803).

Radiochemical Analysis

Materials

- Request for Sample Analysis (Form 803)
- Cubitainer - 1 gallon polyethylene with cap

Sample Size - 3.8 Liters (1 Gallon)

Field Preservation - Do not add preservatives to these samples. If possible, keep the samples refrigerated to prevent undue decomposition. Ship the samples to the laboratory immediately.

Procedure - Collect a "representative" sample of the body of water under study. Label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803).

Procedure for Sewage Sludge

Gross Alpha and Gross Beta Analysis

Materials

- Request for Sample Analysis (Form 803)
- Plastic Specimen Container - 100 ml

Sample Size - 75 ml

Field Preservation - Do not add preservatives to these samples. If possible, keep the samples refrigerated to prevent undue decomposition. Ship the samples to the laboratory immediately.

Procedure - Fill the plastic specimen container 3/4 full with a "representative" sample. Label with the sample control number, location, date and time of collection. Complete the Request for Sample Analysis (Form 803).

Gamma Analysis

Gamma analyses are performed on the same sample as for gross alpha and beta.

Radiochemical Analysis

Not generally performed on these samples.

VII. SAMPLING FOR ORGANICS ANALYSIS

Prior to collecting large numbers of samples, or unusual samples, make arrangements with the laboratory. Use the containers indicated for the test. Completely and correctly fill in the "Request for Sample Analysis" forms, specifying the analyses desired. If you have any questions about the analyses please contact Dr. Bill Draper (510) 540-2201 or 3050 (SRLB-North) or Mr. Bill Steeber (213) 580-5739 (SRLB-South).

Various processes can change the organic chemicals in sampled water before the laboratory analyzes it. **Chemical processes** include hydrolysis and autoxidation and may be very rapid for some compounds. Examples include carbamate and phosphate hydrolysis, disulfoton and aldicarb oxidation. Halogenated compounds are subject to dehydrohalogenation. Oxidants used for disinfection not only sterilize the water, but may also react with dissolved organics to form other compounds. **Photochemical processes** break down compounds like metam-sodium, PAH or trifluralin when the sample is exposed to sunlight. **Microbiological metabolism** may decompose some organics, especially aromatics and unsaturated compounds. **Volatilization** is the loss of compounds from the water to the air, sometimes rapidly.

In devising a sampling protocol, the above issues must be taken into account. There are several ways to ensure that water samples change minimally before submission to the laboratory. These include keeping the sample cold (usually 4°C), getting the samples to the laboratory quickly, adjusting the pH, protecting the sample from sunlight (use brown bottles), removing oxidants by adding reducing agents like sodium thiosulfate, ascorbic acid or ammonium chloride.

General Sampling Procedure

In general, organic chemicals dissolved in water can be grouped into two classes. One group is the purgable compounds, substances which may be volatilized from the water. The non-purgables include base/neutral and acid extractables, organochlorine pesticides, other pesticides, like carbamates, and PCBs. In either case, sample should be taken from a tap at the well head prior to any treatment or storage. The well must be pumped for at least 15 minutes before sampling. Open the sampling tap and allow the water to run until the temperature is stable. Adjust the flow to about 500 mL/minute and collect samples as outlined below.

Sampling VOCs

Of utmost importance are proper collection of the sample, keeping the sample cool in an ice chest, and quick delivery to the laboratory.

To minimize change in the sample, a preservative may be added to the sample. There are two main types of preservative. To remove residual chlorine that may be present in treated samples, use a reducing agent like ascorbic acid or sodium thiosulfate. The reducing agent must be present in the sample container before sampling.

The other kind of preservative prevents biological degradation of the sample. For this purpose, the EPA specifies the use of hydrochloric acid as a biocide. Addition of HCl must be done after sampling, because otherwise it may react with the reducing agent. Use care adding the preservative. It is very corrosive to both person and property. There is also some potential for contamination through excessive handling of the sample.

To sample for VOCs, use the laboratory-provided VOC vials (there may be either clear or amber vials labeled **VC** and **VA**, respectively). Follow these steps while taking the sample:

- All samples are to be taken in duplicate.
- If samples are to be analyzed for THMs and/or are suspected to contain residual chlorine, make sure that a reducing agent is present in the laboratory-provided vial. Or add 25 mg of ascorbic acid or 3 mg of sodium sulfite per 40 mL of sample to all sample bottles before the samples are collected.
- Fill the bottles just to overflowing, being careful not to flush out the rapidly dissolving reducing agent.
- If the samples are to be analyzed for VOCs, they may preserved by adding one drop of 1:1 HCl per 20 mL of sample to the already full sample bottles.
- Seal the sample bottles, making sure the Teflon® side of the septum faces toward the sample. Shake the sample vigorously for one minute. Invert the sample and observe whether any air bubbles are trapped in it. If bubbles are apparent, the sample is invalid and a new one must be collected.
- Immediately cool the samples to 4°C. Samples must be stored at this temperature in an area free from any organic solvent vapors until analysis. Holding times vary by method.
- By the time the sample arrives at the lab, a small bubble may have developed. As long as this is no larger than a pea, the sample may be considered valid.

The methods used by the laboratory to examine the sample are extremely sensitive. The levels of organic compounds typically in the low parts per billion may easily be obscured by contaminants. To avoid artifacts (contamination) during and after sampling, bear in mind the following:

- Use appropriate containers and closures.
- Use properly cleaned, rinsed and dried containers.
- Store samples (especially VOAs) away from solvents, gasoline, etc.
- Store drinking water samples separate from waste samples.
- Avoid rubber and plastic tubing (i.e., Tygon®), plastic containers and inappropriate cap liners.
- Avoid unnecessary handling of samples with plastic gloves.

Sampling Other Organics

Non-purgeables (EPA Method 504)

Collect samples in 40 mL vials containing 3 mg sodium thiosulfate. Cap bottles with Teflon®-lined cap. Samples must be refrigerated at 4°C from the time of collection and analyzed within 28 days.

Organohalogen Pesticides and Aroclors (EPA Method 505)

Collect sample in 40 mL vials containing 3 mg sodium thiosulfate. Cap bottle with Teflon®-lined cap. Samples must be refrigerated at 4°C from the time of collection and analyzed within 14 days. See Method.

*Other Pesticides (EPA Methods 507, 508, *508A, 515.1, 531.1)*

The sampling, preservation, and storage conditions for agricultural chemicals and pesticides shall be: to collect samples in one (1) liter amber bottles; fill bottle so that the headspace is no greater than the threaded portion of the neck; cap bottle with Teflon®-lined cap and refrigerate at 4°C from time of collection. The EPA specifies an exception for carbamates like Aldicarb. Acceptable holding time maxima for extraction and analytical stages vary for analytes and methods.

Carbamates: The EPA considers this class of compound very labile, subject to rapid degradation. To protect the sample, they specify pH adjustment, buffering, and freezing the sample. Before sampling for carbamates, call the laboratory for specific instructions.

(GC/MS) Base/Neutrals, Acids and Pesticides (EPA Method 525)

Keep samples iced or refrigerated at 4°C from the time of collection until extraction. Protect sample from light. All samples must be extracted within seven days and completely analyzed within 30 days of extraction.

Organics - General (Grease, Petrochemicals, Petroleum, etc.)

For water where there is little or no visible pollution, collect two one liter samples in a solvent-washed amber glass bottle with a solvent washed, Teflon® lined cap. Plastic gloves, rubber or plastic materials, oils, waxes or other products can contaminate water samples and give misleading test results.

Samples taken for organic analysis should not contact anything but the clean sample bottle. Keep samples cool and deliver to the laboratory as soon as possible. When appropriate, collect small samples of reference materials in 1 or 2 oz solvent-washed jars to facilitate the analytical work but be very careful to avoid contaminating the sample.

The following table contains information excerpted from EPA documents, and details sampling guidelines for organics analysis.

Test Method		Sample Container	Volume Needed	Preservative/ Comment
502.2 524.2 503 624	Volatile organics Volatile organics Volatile aromatics Volatiles (Wastewater)	40 mL VOA	40 mL	a, b, c, n
504	EDB/DBCP	40 mL VOA	40 mL	a, b, c, n
505	Chlorinated Pesticides/PCBs	40 mL VOA	40 mL	a, b, d
551	Chlorinated DBP	40 mL VOA	40 mL	l, b
m-8015	TPH-Gasoline (& BTEX)	40 mL VOA	40 mL	
507 508	N- & P-Pesticides Chlorinated Pesticides	1 L glass	1 L	b, e, f, g, h
509	ETU	60 mL glass	50 mL	b, d
515.2	Chlorinated Acid	1 L glass	50 mL	b, e, h, i, j
525.1 625	Semivolatiles Semivolatiles (Wastewater)	1 L glass	1 L	b, e, i, j, h
531.1	Carbamate Pesticides	60 mL glass	1 L	b, j
547	Glyphosate	60 mL glass	60 mL	b, h, k
548.1	Endothall	1 L glass	1 L	b, e, h, i, j
549.1	Diquat/paraquat	1 L amber PVC or silanized glass	1 L	b, h ,i, k
552.1	Haloacetic acids	1 L glass	1 L	b, d, h, m
555	Chlorinated acids	1 L glass	1 L	b, h, i, j, p
418.1 or m-8015	TPH-Diesel & Motor oil	1 L glass	1 L	

Table IV

Keys to the preservatives and comments column in Table IV:

a Remove residual chlorine with sodium thiosulfate or ascorbic acid.
b Store and transport at 4°C.
c Adjust to pH<2 by adding 1 drop of 1:1 HCl.
d VOA vial should be dried in a 400°C oven.
e If residual chlorine is present, add 80 mg of sodium thiosulfate.
f 1.0 mL of 10 mg/mL HgCl has been added as a bactericide, but SRLB does not recommend use of this preservative. Some of the method analytes (507, 508) are unstable regardless of the preservation technique and therefore samples should be analyzed immediately.
g Prerinse bottle with sample.
h Avoid light during storage.
i Add 1:1 HCl at the time of sampling to obtain pH<2.
j Do not prerinse bottle with sample.
k Add 100 mg/L sodium thiosulfate (6 mg/60 mL).
l Method 551 analyzes for THMs, halogenated solvents, and additional organic DBP. Appropriate preservation varies depending on the analytes of interest: THMs follow generic sampling procedure except dechlorinate by adding 4 mg of sodium thiosulfate, sodium thiosulfite, or ammonium chloride, or 25 mg of ascorbic acid; to determine all DBP use ammonium chloride. Ammonium chloride preservation, however, requires sample acidification—before sampling you must determine the amount of 0.2N HCl required to adjust the sample pH to 4.5-5 by dropwise addition to 40 mL of the water (with the ammonium chloride) in a 100 mL beaker. If recoveries of chloral hydrate are low in the water studied, preserve with 100 mg/L sodium sulfite or 625 mg/L ascorbic acid.
m Add 100 mg/L ammonium chloride.
n Generic VOC sampling procedure and general precautions: Collect all samples in duplicate in 40 mL VOA vials, a travel blank is required for each sampling site, if the water contains residual chlorine destroy it by adding 25 mg of ascorbic acid or 3 mg of sodium thiosulfate before filling. Don't use thiosulfate where fixed gases are being determined as it can interfere. Fill the bottles slowly to just overflowing, but take care not to flush out the reducing agent. Adjust the pH to <2 by adding 1 drop of 1:1 HCl, seal the vial with PTFE side down, mix vigorously for 1 min. Store at 4°C prior to analysis. Alway store samples with their respective travel blank, never store near solvents, motor fuel or highly contaminated samples. The VOA vials (and septum caps) should be washed with detergent and rinsed with tap and distilled water, air dried and then place in an oven for 1 hr. Cool vial in an area free of organic solvents.
o Add 1.8 mL monochloroacetic acid buffer. To remove residual chlorine add 5 mg of sodium thiosulfate.
p To remove residual chlorine add 5 mg of sodium sulfite/100 mL.

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ADDENDUM B

GROUNDWATER MANAGEMENT PLAN IMPLEMENTATION SCHEDULE