TO: BOARD OF DIRECTORS

FROM: BRUCE BUEL BSB

DATE: May 4, 2007

AGENDA ITEM F

MAY 9, 2007

MANAGER'S REPORT

ITEM

Standing report to your Honorable Board --*Period covered by this report April 19, 2007 through May 2, 2007*

DISTRICT BUSINESS

Administrative

Staff interviewed two District Engineer candidates on April 23, 2007 and rejected both. Based on the first two rounds of interviews staff has requested that the Finance Audit and Personnel Committee review the salary range and/or job duties of this position (See Minutes from 5/2/07 FAP Committee Meeting attached as part of Agenda Item G).

Staff presented a rough draft budget to the Finance, Audit and Personnel Committee at its Committee's April 18th Meeting and received edit recommendations from the Committee. Staff will circulate a proposed budget prior to the Board's May 30, 2007 Budget Workshop.

Our Administrative Intern, Laura Pennebaker, reported for work on April 16, 2007. Our Water Conservation/Outreach Specialist is scheduled to report to work on May 14, 2007.

Staff has held meetings with representatives of the Craig Family regarding the proposed Outside User Agreement. Staff expects that a draft OUA will be presented to the Board at the Board's May 23, 2007 Board Meeting.

Staff attended SCAC's April 23rd meeting and the Committee recommended that the County certify a Level of Severity III for water supply on the Nipomo Mesa. Staff expects to participate in the Planning Commission's May 24, 2007 Meeting on this issue.

The General Manager attended the Spring Cal/Nevada AWWA Section conference from April 18 to April 20. Attached are excerpt of some of the materials discussed at the conference.

Safety Program

No injury reports during the period.

Project Activity

Staff will provide a verbal projects update to the Board at the Board Meeting.

Conservation Program Activities

Staff has been working with the Conservation Committee on the Emergency Shortage Ordinance.

RECOMMENDATION

Staff seeks direction and input from your Honorable Board.

ATTACHMENTS –

- AWWA Conference Materials

Halfway Through: Long Term 2 Enhanced Surface Water Treatment & Stage 2 Disinfectant Byproduct Rules

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Long Term 2 Enhanced Surface Water Treatment Rule (Briefly)

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LT2 ESWTR

- **Final Rule published Jan 5, 2006**
  - **Federal Register 71, #3, pp 654-786**
- **CA, AZ, NV agree to implement LT2**
- **EPA has enforcement authority until the State adopts the rule**

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New Data on Cryptosporidium

- Occurrence
  - Source water occurrence overall is lower than previously thought
  - Relatively high levels for some filtered systems
  - Finished water occurrence relatively higher in systems avoiding filtration
- New treatment technology available (UV)

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Source Water Monitoring Requirements - *Filtered Systems*

- **Filtered systems serving 10,000 or more people monitor for Cryptosporidium, E. coli and turbidity**
  - **At least monthly for 24 months**
- **Filtered systems serving <10,000 monitor initially only for E. coli**
  - **Biweekly for 12 months**
  - **If above triggers, then must do Cryptosporidium twice a month for 12 months**
- **No monitoring for filtereds, if 5.5-log treatment**

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Source Water Monitoring Requirements – *Systems Avoiding Filtration*

- Systems avoiding filtration monitor for *Cryptosporidium*
  - **10,000 or more: monthly for 24 months**
  - **<10,000: twice a month for 12 months**
  - **No monitoring if 3.0-log Crypto inactivation in place**

40 CFR 141.701

Initial Source Water Monitoring - Dates

System must begin initial round by the dates shown below, unless avoidance criteria are met

Schedule	Population served	Begin first round no later than...
1	≥ 100,000	October 2006
2	50,000 – 99,999	April 2007
3	10,000 – 49,999	April 2008
4	< 10,000 & monitor for *E. coli*	October 2008
4	<10,000 & monitor for *Crypto*	April 2010

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Initial Source Water Monitoring Plans – Due Dates

- **System must submit monitoring plan 3 months before monitoring is scheduled to begin, at latest.**

Schedule	Population served	Submit monitoring plan no later than...
1	≥ 100,000	June 30, 2006
2	50,000 – 99,999	Dec. 31, 2006
3	10,000 – 49,999	Dec. 31, 2007
4	< 10,000 & monitor for *E. coli*	July 1, 2008
4	<10,000 & monitor for *Crypto*	Dec. 31, 2009

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Grandfathered Data – Due Dates

- Report intent on same schedule as you would submit a source water monitoring plan
- Report applicable data to State within 2 months after source water monitoring is scheduled to start

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Considering the Source Water Monitoring Results: Bin Classification

- Filtered Systems are assigned a "bin" classification based on source water quality (i.e. crypto concentration)
- Any additional surface water treatment requirements for *Cryptosporidium* treatment are based upon this bin classification
- Special requirements for PWSs avoiding filtration

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Filtered System Bin Classification & Additional Treatment

Bin Number	*Cryptosporidium* concentration (in oocysts/L)	Additional Treatment Beyond Current Requirements
1	*Crypto* < 0.075	No additional treatment
2	0.075 ≤ *Crypto* < 1.0	1.0 log
3	1.0 ≤ *Crypto* < 3.0	2.0 log
4	*Crypto* ≥ 3.0	2.5 log

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Compliance Schedule - *Systems Required to Install Additional Treatment*

Systems that serve…	Compliance Date
≥10,000 people	April 1, 2012
50,000 to 99,999 people	October 1, 2012
10,000 to 49,999 people	October 1, 2013
<10,000 people	October 1, 2014
States may allow up to 2 more years to comply if capital improvements are needed.	

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Compliance Help (1)

- **EPA Website:**
  http://www.epa.gov/OGWDW/disinfection/lt2/compliance.html
  - LT2 Quick Reference Guides
  - Source Water Monitoring Guidance Manual
  - Point of Contact List by State
  - On-line LT2 Training Module & List of Upcoming Webcast Trainings

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Compliance Help (2)

- **EPA Website:**
  http://www.epa.gov/OGWDW/disinfection/lt2/compliance.html
  - Information about the EPA laboratory certification program for Cryptosporidium Analysis
  - Microbial Laboratory Guidance Manual for LT2
  - List of Laboratories Certified for Crypto Analysis

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Compliance Help (3)

- **EPA Website:**
  http://www.epa.gov/OGWDW/disinfection/lt2/compliance.html
- Toolbox Options Guidance Manuals
  - Membrane Filtration & Low Pressure Membrane Filtration Guidance Manuals
- *Upcoming* Toolbox Guidance Manuals
  - Microbial Toolbox Guidance Manual
  - UV Disinfection Guidance Manual
  - UV Disinfection Guidance Manual Workbook

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Stage 2 DBPR
Purpose

- To provide additional protection from disinfection byproducts of concern
  - Recognizes that current compliance based on averaging across entire distribution system may miss spots that may have higher DBP levels, risks
  - Supplements existing DBP Rule by focusing on parts of distribution system with higher risks

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DBP Public Health Concerns

- Chlorine + microorganisms = dead bugs
- But, chlorine + organic carbon = DBPs (chlorinated disinfection byproducts)
- Ingestion of these DBPs associated with adverse health effects
  - Cancer (bladder, colon, and rectal); Suspected reproductive and developmental damage
- Known impacts low, but much unknown

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Stage 2 DBPR
Main Components

- Initial Distribution System Evaluation (IDSE)
- New compliance monitoring locations
  - High TTHM and HAA sites chosen from IDSE and/or Stage 1 DBPR sites
- Compliance based on Locational Running Annual Average (not systemwide average)
- Population based monitoring frequency

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Initial Distribution System Evaluation (IDSE)

- Studies conducted by water systems to identify distribution system locations that represent high TTHM and HAA5 levels
- Results of the IDSE are used to select Stage 2 compliance monitoring sites
- Not required for NTNCWSs serving fewer than 10,000 people
- In addition to current Stage 1 monitoring

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IDSE Schedule

	Systems Serving:	Submit 40/30 Cert. or Monitoring Plan By:	Complete IDSE Study By:	Submit IDSE Report By:
1	≥ 100,000	Oct 1, 2006	Sept 30, 2008	Jan 1, 2009
2	50,000–99,999	Apr 1, 2007	Mar 31, 2009	Jul 1, 2009
3	10,000–49,999	Oct 1, 2007	Sep 30, 2009	Jan 1, 2010
4	< 10,000	Apr 1, 2008	Mar 31, 2010	Jul 1, 2010

Schedule for systems in a combined distribution system is based on that of the largest system in the combined distribution system

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Factors Affecting DBP Formation & Concentration

- Precursor concentration
- Disinfectant - type and dose
- Water chemistry
- Water temperature
- Water age
- Biodegradation of HAAs

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Standard Monitoring Program - Steps

- Select monitoring locations
- Prepare and submit Standard Monitoring Plan
  - Primacy Agency must approve the plan
- Conduct monitoring according to plan
  - 12 months of monitoring for TTHM and HAA5
- Select Stage 2 DBPR compliance monitoring locations based on IDSE and Stage 1 data
- Prepare and submit IDSE report

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Standard Monitoring Plan- *Required Components*

- Population served
- Source water type
- Distribution system schematic
  - **Entry points and sources**
- Locations and dates of proposed IDSE monitoring
- Locations and dates of Stage 1 DBPR monitoring
- Justification for IDSE monitoring sites
  - **Must include data used to justify selection**

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Standard Monitoring Program *Sampling Requirements*

- Dual sample set (both TTHM and HAA5) collected at all locations
- Sample site locations based on system type, size – as specified in regulation
- Sample frequency based on population served and source type – as in regulation

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Standard Monitoring Plan - Selecting "High HAA5" Sites

- **HAA5 formation**
  - Water age, but also consider biodegradation
- **Avoid**
  - Areas with known biofilm growth
  - Areas with difficulty maintaining a residual
- **Good HAA5 sites**
  - Downstream of booster chlorination
  - Sites with low but detectable residual
  - Areas of high historic levels
  - Downstream of tanks
  - Hydraulic dead ends and mixing zones
  - Areas with low water use

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IDSE Options (3) *System Specific Studies*

- If you have at least as much valid TTHM and HAA5 data in hand as would be required for the Standard Monitoring Program, you may use them, or
- If you have a validated hydraulic model for your system that can predict water age and DBPs, you can use that

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System Specific Study *Existing Monitoring Data*

Minimum requirements:

- Must include at least as many samples as SMP
- Samples collected no earlier than 5 years prior to study plan submission date
- Samples collected and analyzed according to analytical requirements
- Each location must have been sampled once during month of highest TTHM/ HAA5 or highest water temperature
- Must include all Stage 1 DBPR compliance monitoring results

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Selecting Stage 2 Monitoring Sites

- Calculate a locational running annual average (LRAA) for each IDSE site and Stage 1 site
- Select sites with highest LRAA values according to Stage 2 requirements
- May select sites with slightly lower LRAA values, but must provide rationale in report
  - (i.e. to provide better geographic coverage, maintain historic data collection, site used to sample for other water quality parameters)
- Finally, sample for Stage 2 Compliance

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Compliance Help (1)

- **EPA Website:**
  http://www.epa.gov/OGWDW/disinfection/stage2/compliance.html
  - Stage 2 Fact Sheets (40/30, VSS, SMP, SSS)
  - IDSE Tool and Guidance Manual
  - Point of Contact List by State
  - On-line Stage 2 Training Module & List of Upcoming Webcast Trainings

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Compliance Help (2)

- **EPA Website:**
  http://www.epa.gov/OGWDW/disinfection/stage2/compliance.html
- **Guidance Manuals**
  - Draft Simultaneous Compliance Manual
- **Upcoming Guidance Manuals**
  - Consecutive Systems Guidance Manual
  - Small Systems Guidance Manual
  - Operations Evaluation Manual

UNREGULATED CONTAMINANT MONITORING REGULATION
(the Second Cycle)
UCMR 2

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Final UCMR 2

- Published in the Federal Register January 4, 2007
- Website for Federal Register Notice:

http://www.epa.gov/fedrgstr/EPA-WATER/2007/January/Day-04/w22123.pdf

UCMR 2
Overview of Talk:

- Purpose & Organization of UCMR 2
- Applicability- Who must comply
- Monitoring Requirements
- Monitoring Costs
- Reporting Requirements
- Roles, Responsibilities, and Contact Info.

Purpose and Organization

Brief History of the UCMR Program

- First established under the 1986 SDWA
- Updated per 1996 SDWA amendments
  - ➢ Monitoring occurs in 5-year cycle
  - ➢ No more than 30 contaminants per cycle
- UCMR 1 from 2001-2005 *(64 FR 50556)*
- UCMR 2 from 2007-2011 *(72 FR 368)*

~30 UCs

Purpose of the UCMR

- Determine occurrence of unregulated contaminants in finished DW
- Use data in regulatory decision-making

Resampling Procedures

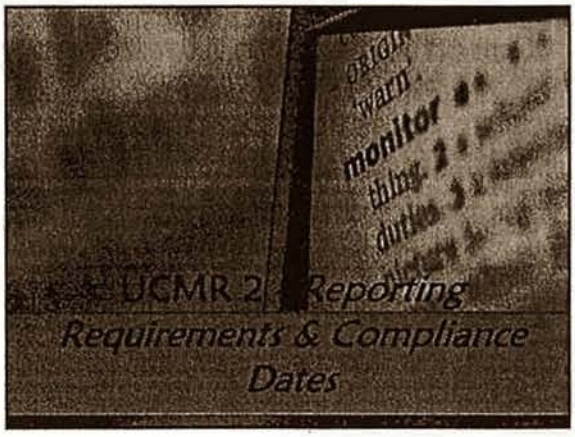
- Required if sample:
  - ➢ Does not meet collection or QC requirements
  - ➢ Is lost or damaged during shipping
  - ➢ Is subject to lab error
- 30-day deadline
- Recollection *must* include original Sample Event Code (SE#) to correctly associate with original sample set

Monitoring Requirements
Use of EPA-Approved Labs

- Systems must use UCMR 2 EPA-approved labs
- Lab approved by method
- Current list available at: *http://www.epa.gov/safewater/ucmr/ucmr2/labs.html*

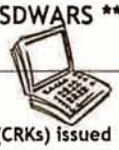
UCMR 2
Estimated Monitoring Costs per Sample

List 1- Assessment Monitoring	$435
List 2- Screening Survey	$870



Where to Report

** Most information is reported to SDWARS **
PWSs serving >10K only



- CDX account for SDWARS required
  - ➢ August 2006 - Customer retrieval keys (CRKs) issued to PWS and States
  - ➢ Users can nominate others within organization
  - ➢ Still need a CDX account for SDWARS? *Contact the UCMR Message Center (800-949-1581)*
  - ➢ 2007 - EPA-approved labs will get accounts

Where to Report

UCMR Sampling Coordinator

- Non-electronic reporting limited to:
  - ➢ PWS applicability issues
  - ➢ Groundwater representative sampling plan proposals submitted by May 4, 2007
  - ➢ PWS schedule or inventory changes after August 2, 2007

Mail:	UCMR Sampling Coordinator, USEPA, Technical Support Center, 26 West Martin Luther King Dr (MS 140) Cincinnati, OH 45268
E-mail:	UCMR_Sampling_Coordinator@epa.gov
Fax:	(513) 569-7191

Reporting Monitoring Results
Overview

15 Data Elements

- ➢ 5 from PWSs, prior to monitoring (also posted with results by labs)
- ➢ 10 posted by lab, with results

Data Elements 1-5
Reported Prior to and with Sample Results

- 1. PWSID
- 2. PWS Facility ID
- 3. Water Source Type
- 4. Sampling Point ID
- 5. Sampling Point Type

Data Elements 6-15
Reported with Sample Results

- 6. Disinfectant Residual Type *(Screening Survey only)*
- 7. Sample Collection Date
- 8. Sample ID
- 9. Contaminant
- 10. Analytical Method
- 11. Sample Analysis Type
- 12. Analytical Results - Sign
- 13. Analytical Result - Value
- 14. Lab ID
- 15. Sample Event

Reporting with Monitoring

Key Dates

Requirement	Due
Lab posts results & associated data	120 days from sample collection
PWSs review & approve data	60 days from lab posting of data*

** After this date, data considered approved by PWS, available for EPA & State review, prior to public release.*

Reporting to your Public Consumer Confidence Reports

- Applies to CWSs only
- CWSs must report average & range of detected contaminants
- CWSs may briefly explain reason for UCMR monitoring

Consumer Confidence Report
Suggested Language

The explanation may read as follows:

Unregulated contaminants are those that don't yet have a drinking water standard set by USEPA. The purpose of monitoring for these contaminants is to help EPA decide whether the contaminants should have a standard.

More information about CCR at:
www.epa.gov/safewater/ccr

Other Resources

- UCMR2 implementation question?
- Database registration question?
  - Call the UCMR Message Center: 800-949-1581

- General UCMR 2 question?
  - Call the Safe Drinking Water Hotline: 800-426-4791

- UCMR 2 Website: http://www.epa.gov/safewater/ucmr/ucmr2/

States

Roles and Responsibilities
By Agreement with EPA

- CA, NV provided list of applicable PWSs and sample site locations (to SDWARS)
- NV agreed to notify PWSs and provide compliance assistance
- CA has no substantial involvement in UCMR 2 implementation.

PWSs

Roles and Responsibilities

- Immediate reporting responsibility (SDWARS)
  - Register/establish CDX account for SDWARS
  - Enter PWS contact information by April 4, 2007
  - Review sample location inventory, monitoring schedule by August 2, 2007
- Prior to monitoring
  - Establish contract with EPA-approved UCMR 2 lab
- During scheduled monitoring
  - Ensure proper sample collection/shipment
  - Review/approve lab posted data in SDWARS

Laboratories

Roles and Responsibilities

- UCMR 2 approval, by method from USEPA
- Labs conducting analyses post data to SDWARS
  - Subcontract labs post data to SDWARS
- EPA approval is contingent upon labs:
  - Posting data to SDWARS
  - Adhering to quality control
- EPA-approved labs subject to audit

Laboratories

Proficiency Testing (PT) Schedule

Two of 5 PTs Remaining

- PT Study #4 - June 19, 2007
  - Application deadline: May 21, 2007
- PT Study #5 - September 25, 2007
  - Final PT study of Laboratory Approval Program
  - Application deadline: August 27, 2007

Laboratory Approval Program Registration Deadline: April 4, 2007

UCMR 2 Compliance Update– CA and Nevada Systems

- Compliance with the April 4th Milestone
  - CA 236/357 = 66% compliance
  - NV 8/10 = 80%
  - AZ 38/55 = 69%

(as of Monday, 4/16/07)

UCMR2 Groundwater Representative Sampling Locations
Instructions for Preparing a Groundwater Representative Monitoring Plans

Documentation Included in the Groundwater Representative Monitoring Plan (GWRMP)

Overview

The proposed GWRMP shall be submitted by the water system in either of two formats. Either one plan for the entire water system, which includes all proposed groundwater representative sampling locations (GWRSLs), or one plan for each proposed GWRSL. The proposal will contain four sections. The first three sections contain the basic information used to develop the proposal and the fourth section is a summary of this information where the water system provides a justification why they should be permitted to use the proposed GWRSL(s).

Water System Responsibilities

For each proposed representative sampling location, you must submit the following information: PWSID Code, PWS facility identification code, and sampling point identification code (as defined in Table 1, paragraph (e) of the proposed rule). The following defines the four sections required in the proposal, but it will be the responsibility of the water system to provide detailed information related to these broad areas that they consider relevant to their proposed request. It is also the water system's responsibility to use this information to justify their request. It is not the responsibility of the State or EPA to interpret the information provided, but to verify the information and logic the water system used in their proposal. References to any documents used in the development of the GWRMP should be included at the end of the proposal. EPA reserves the right to request these documents.

Section 1 - Site Map

The purpose of this section is to show an overview map of the locations of the wells that will be represented by the proposed GWRSL and visually show the various important geographical information, e.g., roads, rivers, etc, which they considered in developing the proposed GWRMP.

The proposal should include a map of the area which the GWRSL(s) will represent. The map should show the location of all wells and their entry points to the distribution system as well as the location of the proposed GWRSL(s). This map should also include all roads and locations of major potential sources of contamination (e.g., industries, landfills, wastewater discharges, underground storage tanks, agricultural irrigation, animal farms, mining septic tanks, deep injection wells, etc.). The map should also provide information on the distances of each well from the proposed GWRSL. Figure 1 presents an example of a site map.

This section of the plan can present basic information about the water system, including the number of wells, well location, screen intervals or water bearing intervals for open boreholes, identification of the areal extent and thickness of the area confining units and aquifer(s) utilized by the water system, the regional groundwater flow rate and direction. This information could be summarized from source water assessment plans or wellhead protection plans.

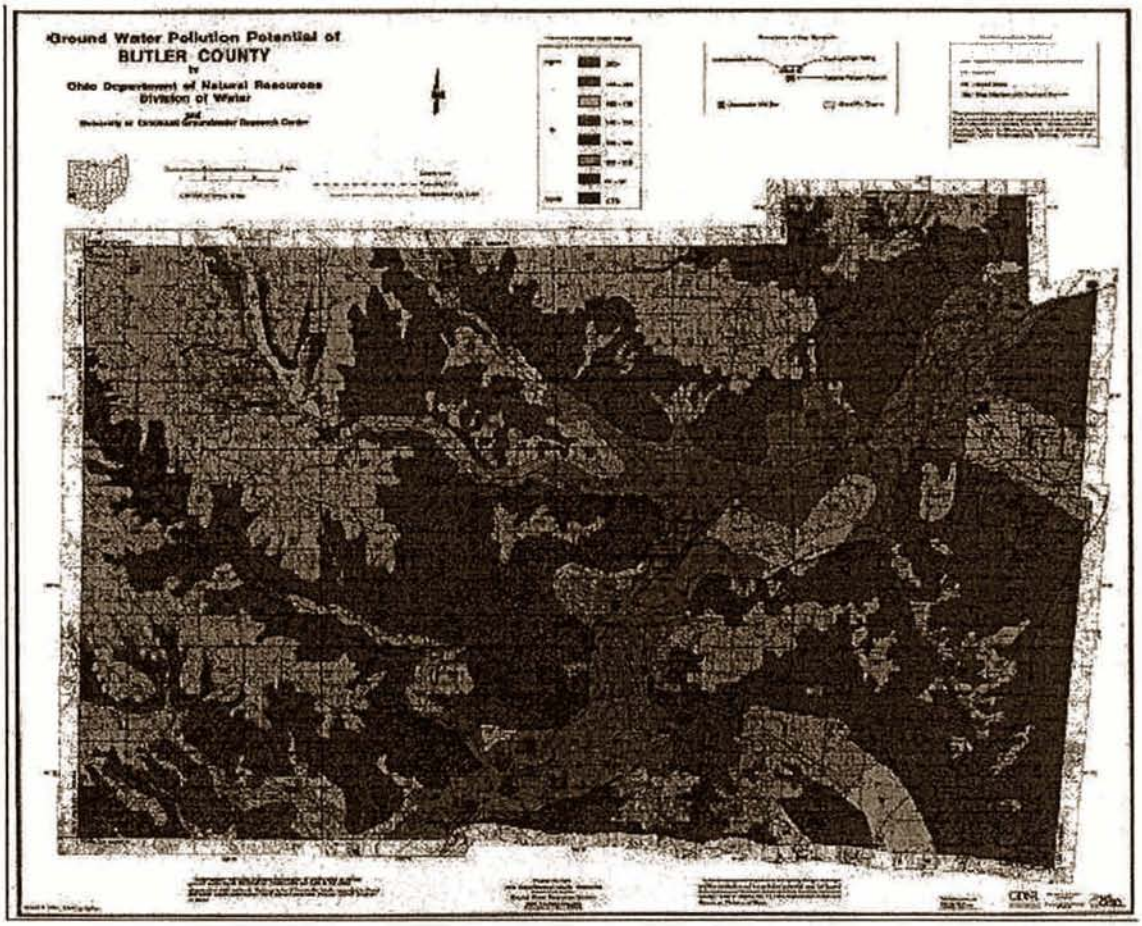


Figure 2. State Groundwater Contamination Information

Section 3 - Similarities of Groundwater Quality for Proposed Area

The purpose of this section is to provide data that shows how the groundwater at all the wells within the proposed area are similar and how the proposed GWRSL is truly representative of the all the wells within the area.

This section should contain a summary of the well log information for all the wells and how this information is similar to the proposed GWRSL. The information that should be included is information on the well depth, well construction, and strata found during construction of the wells.

This section should also contain a summary and analysis of the water quality data to indicate that all of the wells produce water of a similar quality. The water system should identify the water quality parameters they consider relevant given their situation and provide an explanation of why they chose the particular parameter(s). For the selected water quality parameters, the water system should report historical and representative water quality data for each of the wells within the proposed area and the GWRSL over the period of a year.

EPA United States Environmental Protection Agency

UCMR 2: Fact Sheet for Assessment Monitoring of List 1 Contaminants

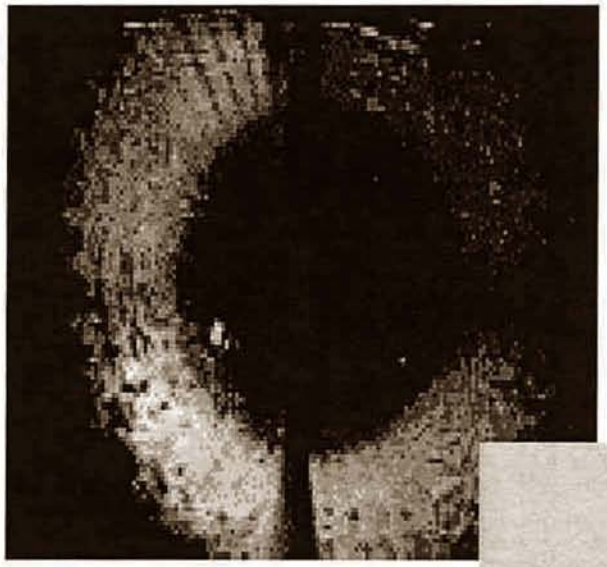
Overview of the Rule	
Title	Unregulated Contaminant Monitoring Regulation (UCMR) for Public Water Systems (PWSs) Revisions
Purpose	To collect occurrence data for contaminants suspected to be present in drinking water, but that do not have health-based standards set under the Safe Drinking Water Act. Assessment Monitoring targets contaminants that are analyzed with methods that utilize existing and widely used technology. The UCMR monitoring program is the primary source of drinking water contaminant occurrence data used by EPA in regulatory determinations.
General Description	The second cycle of the revised UCMR (UCMR 2) includes Assessment Monitoring (List 1) for 10 contaminants using 2 analytical methods. PWSs subject to Assessment Monitoring will sample within a twelve month period during 2008 - 2010. Monitoring results for PWSs serving over 10,000 people are reported to EPA's UCMR electronic data reporting system (i.e., the Safe Drinking Water Accession and Review System [SDWARS].)
Utilities Covered	Community water systems (CWSs) and non-transient non-community water systems (NTNCWSs) that serve a total population of more than 10,000 people and a representative sample of 800 systems serving 10,000 or fewer people are required to conduct Assessment Monitoring.

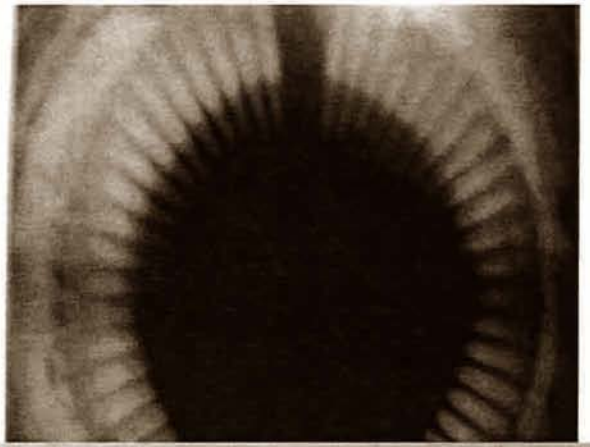
UCMR 2 List 1 Contaminants

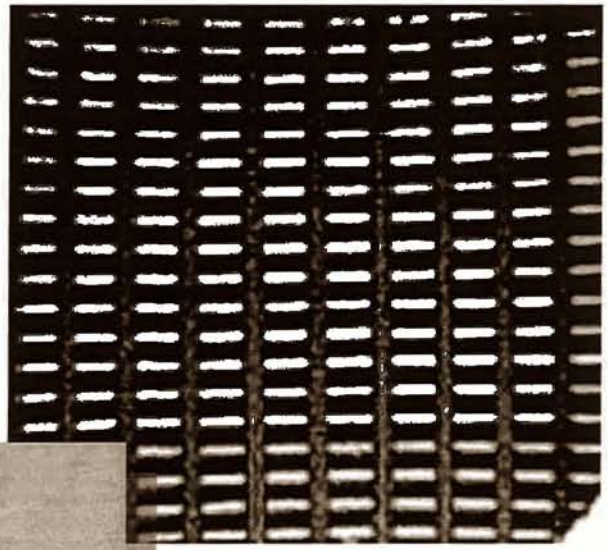
Contaminant and CAS[1] Registry Number	MRL[2] (µg/L)	Use or Environmental Source	Health Effects[3]
2 Priority Compounds (1 insecticide and 1 insecticide degradate), by EPA Method 527			
Dimethoate 60-51-5	0.7	Insecticide used on cotton and other field crops, orchard crops, vegetable crops, in forestry, and for residential uses	EPA classified as a "possible human carcinogen," with a reference does (RfD) of 0.0002 milligrams per kilogram per day (mg/kg/day)
Terbufos sulfone 56070-16-7	0.4	Degradate of the parent compound, terbufos; terbufos used for systemic control of soil-borne insects and nematodes in fields of corn, grain sorghum, and sugar beets	EPA derived chronic RfD of 0.00005 mg/kg/day for the parent compound, based on no observed adverse effect level for plasma cholinesterase inhibition
5 Flame Retardants, by EPA Method 527			
2,2',4,4'-tetrabromodiphenyl ether (BDE-47) 5436-43-1	0.3	Flame retardants added to plastics (for products such as computer monitors, televisions, textiles, and plastic foams)	Animal studies suggest thyroid and liver effects, as well as possible reduced immune system function and neurobehavioral alteration
2,2',4,4',5-pentabromodiphenyl ether (BDE-99) 60348-60-9	0.9		
2,2',4,4',5,5'-hexabromodiphenyl ether (BDE-153) 68631-49-2	0.8		
2,2',4,4',6-pentabromodiphenyl ether (BDE-100) 189084-64-8	0.5		
2,2',4,4',5,5'-hexabromobiphenyl (HBB) 59080-40-9	0.7	Flame retardant additive; production of polybrominated biphenyls ended in 1976 in U.S. after an incident of significant accidental agricultural contamination in 1973	
3 Explosives, by EPA Method 529			
2,4,6-trinitrotoluene (TNT) 118-96-7	0.8	Used as an explosive in bombs and grenades, also used as a propellant; small amounts used for industrial explosive applications, such as deep well and underwater blasting; chemical intermediate in manufacture of dyestuffs and photographic chemicals	EPA classified as possible human carcinogen (Group C) based on urinary bladder papilloma and carcinoma in female rats and activity in Salmonella, with and without metabolic activation
1,3-dinitrobenzene 99-65-0	0.8	Used in explosives; also formed as a by-product during the manufacture of the explosive TNT; used in the manufacture of aramid fibers, spandex, and dyes	EPA derived chronic oral RfD of 0.0001 mg/kg/day, based on increased spleen weight
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) 121-82-4	1.0	Used in detonators, primers, mines, rocket boosters, and plastic explosives; used in fireworks and demolition blocks, and as a rodenticide	EPA derived chronic oral RfD of 0.0003 mg/kg/day, based on prostate inflammation observed in rats in a 2-year feeding study, and has classified RDX as a possible human carcinogen (Group C), based on adenomas and carcinomas in female mice

[1] Chemical Abstracts Service
[2] Minimum reporting level
[3] Unregulated Contaminant Monitoring Regulation (UCMR) for Public Water Systems Revisions; Proposed Rule. Fed. Reg. Vol. 70, No. 161. p. 49093, August 22, 2005.

Water Well Rehabilitation: the Good, the Bad, and the Ugly







Tony Morgan, PG, CHG
Senior Hydrogeologist
Layne GeoSciences Group
Layne Christensen Company
Fontana, CA

Identify Problems

- Lost Capacity
- Turbidity
- Corrosion
- Red Water
- Taste / Odor
- Pump Wear
- Water Quality Fluctuations

Rehabilitation Goals

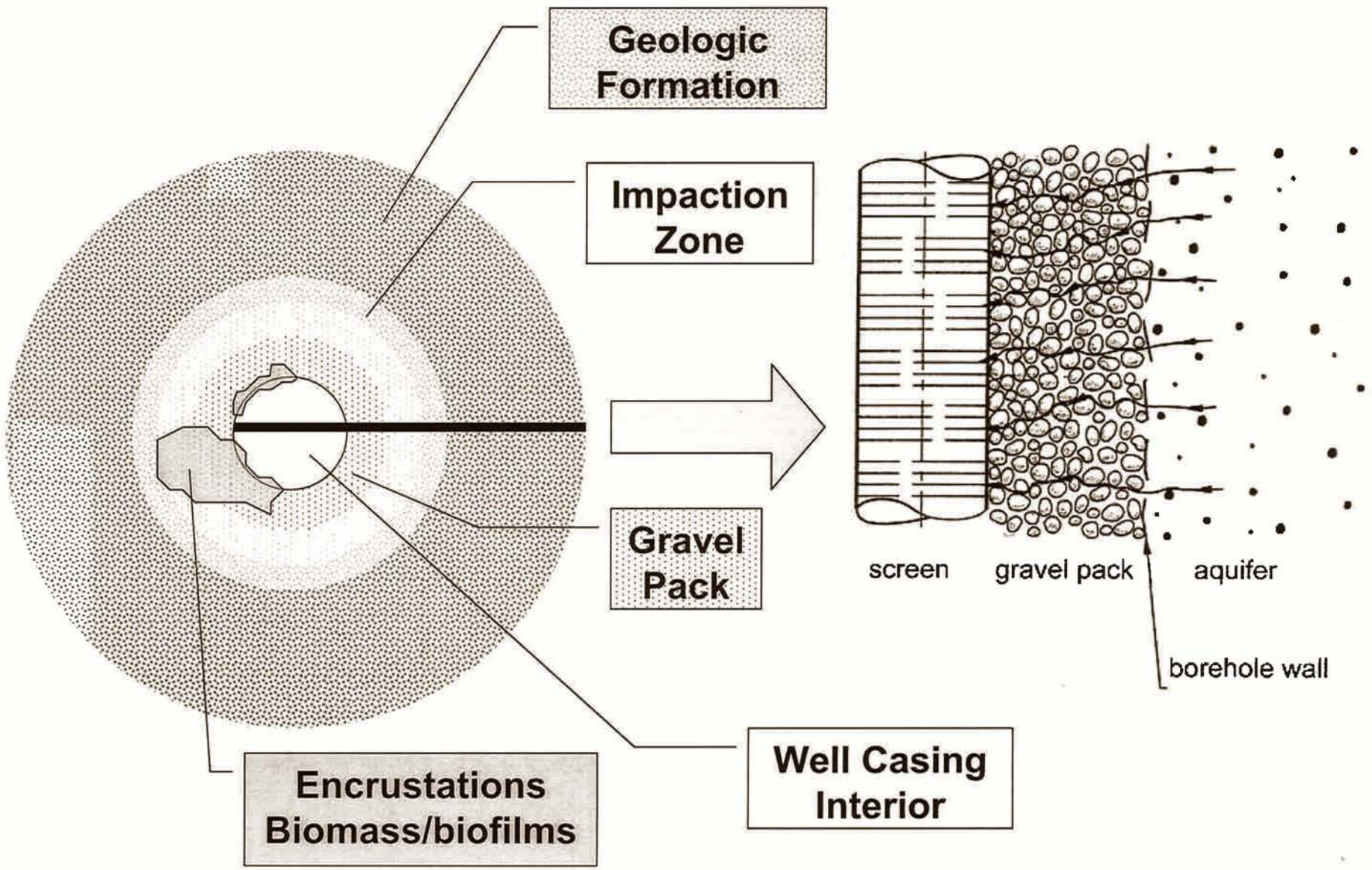
Restore lost capacity by:

- Remove clay, silt, sand from gravel pack
- Remove mineral encrustations
- Remove biofouling and its by-products

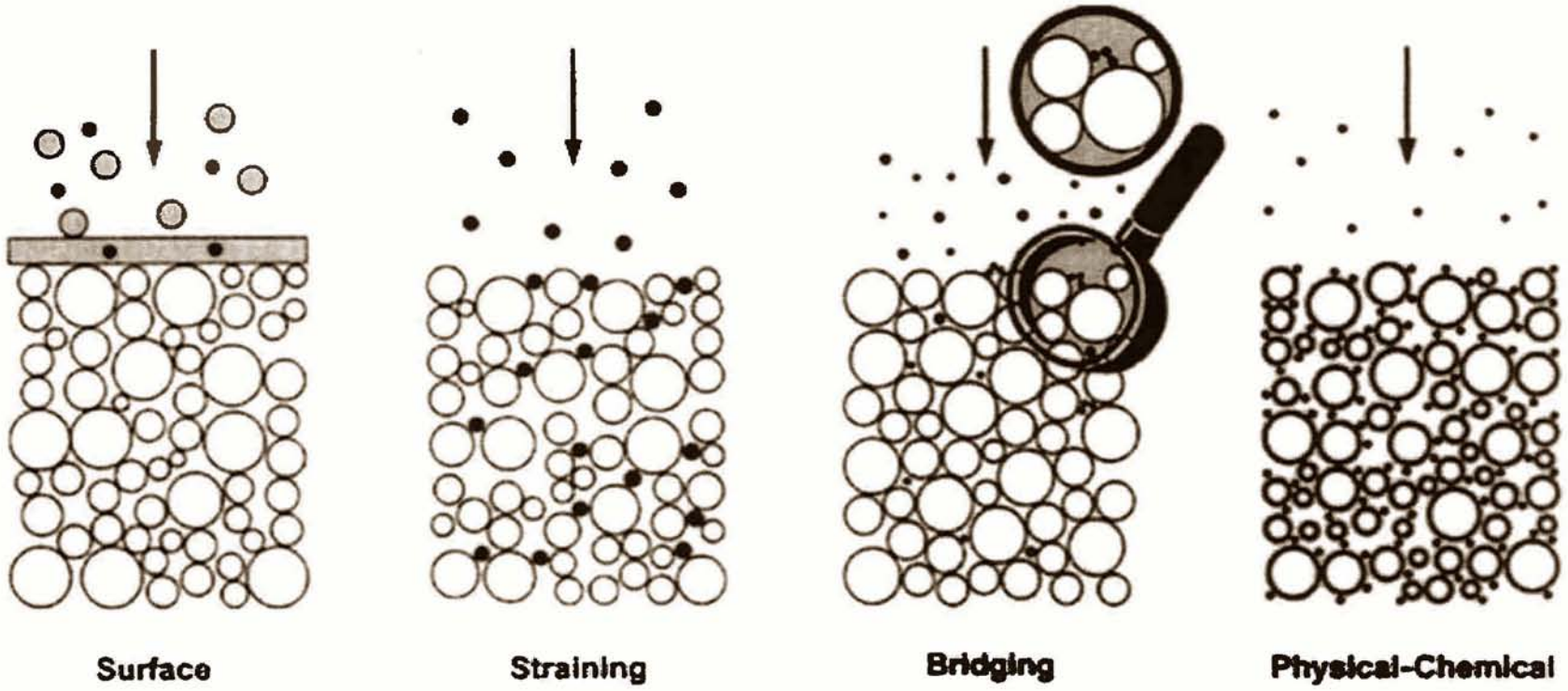
Rehabilitation Zones

- Inside the well casing
- Exterior of well casing and surrounding gravel pack
- Near-well geologic formation

Rehabilitation Zones



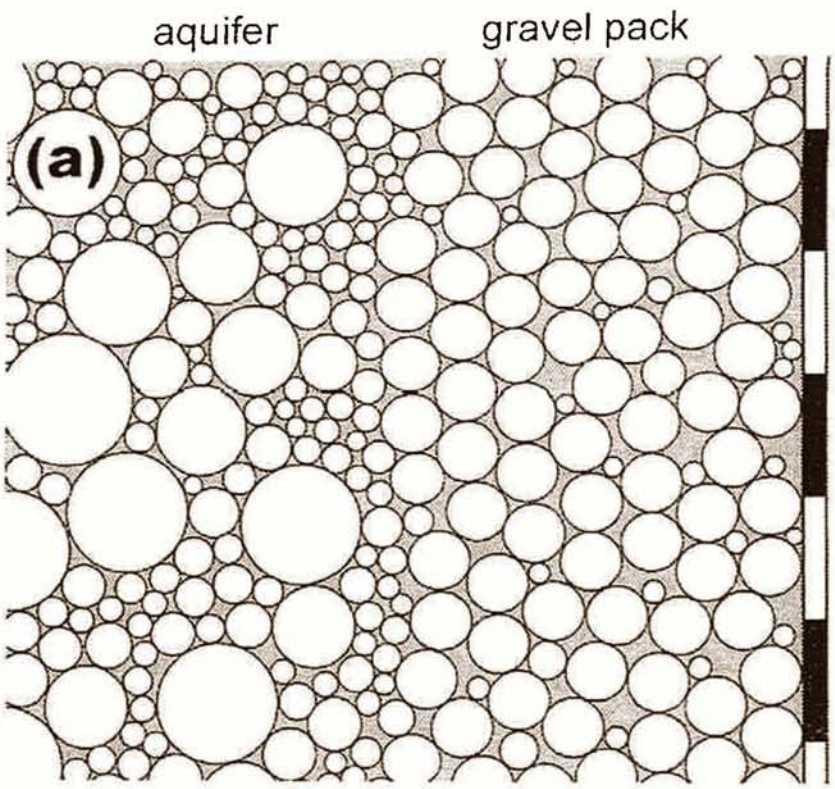
Impaction Zone

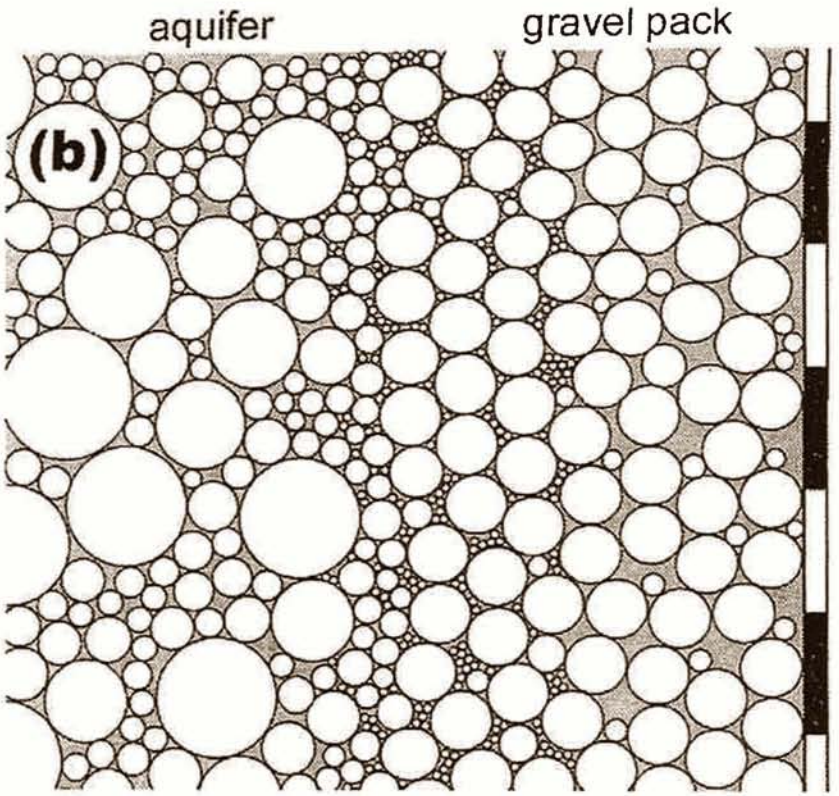


Filtration Mechanisms

- **Surface** – surface cake forms when particle size > pore size
- **Straining** – average particle size < average pore size. Particle eventually trapped
- **Bridging** – Multiple particles arrive at pore at same time and bridge; often caused by high velocity flow
- **Physical / Chemical** – attracting electrostatic forces bond particle to gravel pack; gravitational settling

Impaction Zone

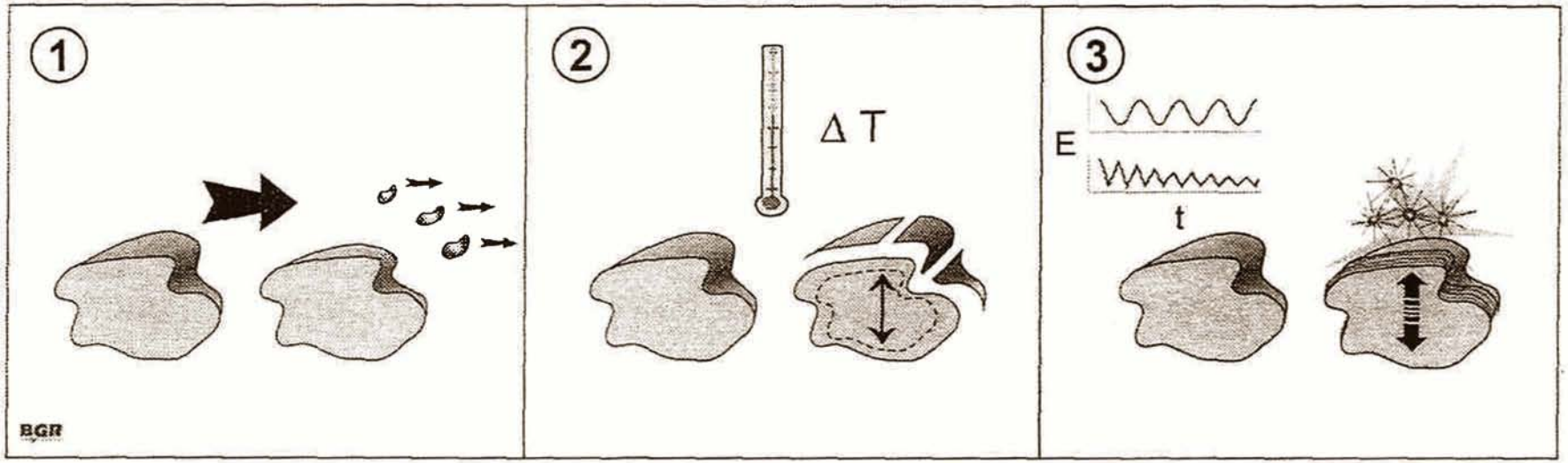




Rehabilitation Technology Categories

- Major rehabilitation method categories:
  - Mechanical
  - Chemical

Mechanical Methods



Separation methods for mechanical rehabilitation

- Hydraulic erosion
- Thermal expansion / contraction
- Impulses

Mechanical Methods

- Brushing (also called "well cleaning")
- Swabbing/Development
- Jetting
- RotoScrub
- Bore Blast
- Aqua Freed
- Sonar Jet

Chemical Methods

- Chlorination
- Acidization
- Formulated Chemistries

Site-Specific Factors

Volume

Concentration

Sequence

Combinations

Pre-mixing