Community Well Protection and Land Use

Burkhard Bohm, Hydrogeologist

March 2016

POINT SOURCES OF GROUNDWATER POLLUTION - examples

- underground septic tanks and leachfields
- leaking underground storage tanks (fuel and possibly non-fuel?)
- leaking above-ground storage tanks
- leaking transformers
- graveyards
- improperly constructed wells (abandoned and used)
- accidental spills

NON-POINT SOURCES OF GROUNDWATER POLLUTION - examples

- leaking wastewater disposal lines
- livestock waste
- storm water runoff
- winter road salt
- fertilizers
- drainage ditches

GW Protection

- More difficult to contaminate Groundwater than Surface Water
- But GW clean-up much more expensive than SW clean-up

Keys to Groundwater Protection:

- Rules and Regulations
- Education and “Groundwater Awareness”

The DRASTIC Index

A MEASURE OF GW VULNERABILITY TO CONTAMINATION

	Parameter:	Ratings: minimum	Ratings: maximum	Weight factor
D	**depth to water**	1	10	5
R	**recharge**	1	9	4
A	**aquifer media**	2	10	3
S	**soil media**	1	10	2
T	**topography**	1	10	1
I	**impact of vadose zone**	1	10	5
C	**conductivity, hydraulic**	1	10	3

Ratings range from 1 to 10. Weights range from 1 to 5.

GW Pollution potential = sum of (Ratings x Weights)

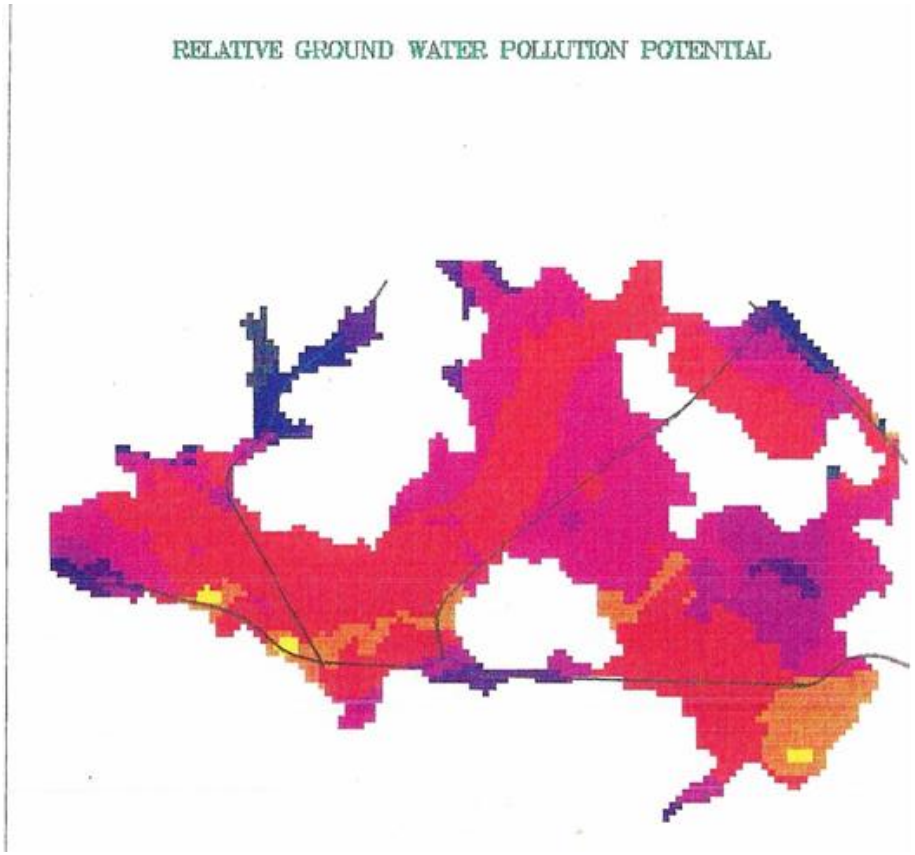
Lowest possible DRASTIC rating: 26 **least pollution potential**

Highest possible DRASTIC rating: 226 **most pollution potential**

for example - DRASTIC ratings in American Valley:

Valley floor	**100 - 200**
Bedrock highlands	**74 - 103**

DRASTIC ratings are plotted on a map.



American Valley

Relative groundwater pollution potential

yellow = 10 (highest)

blue = 1 (lowest)

source: American Valley Wellhead Protection Demonstration Program. Quincy CSD, February 1998.

WELL CAPTURE ZONES

groundwater velocity = K x I/n_e

K - hydraulic conductivity

I - groundwater table gradient (slope)

n_e - effective porosity

roughly: groundwater velocities are about 1 ft per day.

sand - 0.3 to 1 meter per day

clay - 0.00002 meters per day

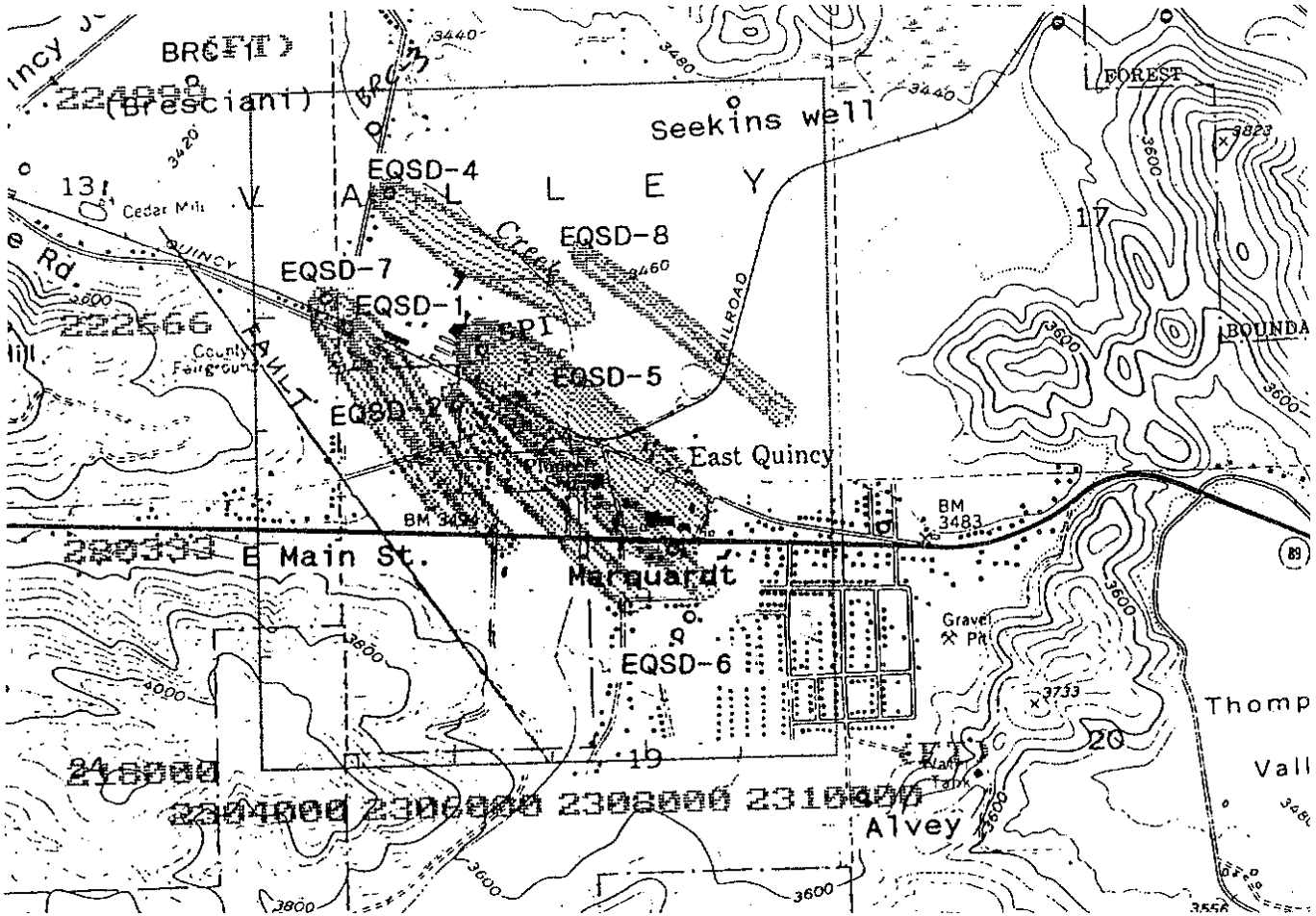
What is a Well Capture Zone?

elongated area of water level depression around pumping wells

- **any water particle (pollutant) within this area will end up in well.**

- **shape is affected by ground water table slope**
- **size increases with aquifer transmissivity**

EXAMPLE - East Quincy:



DWR State Median 2009-2013						
$61,094	80% of MHI	48,875	DAC status	(Disadvantaged Community)		
	85% of MHI	51,930	EDA	(Economically Distressed Area)		
Note: Data for CDPs marked with an "x" are from Realtor.com				**Status**		
County	**Community**	**ACS Data (2013)**	**% of MHI**	**Severe DAC (<60%)**	**DAC (<80%)**	**EDA qualifier (<85%)**
Plumas						
x	Almanor CDP	106,249	173.9%	No	No	No
	Beckwourth CDP	52,794	86.4%	No	No	No
x	Belden CDP	23,703	38.8%	Yes	Yes	Yes
x	Blairsden CDP	70,034	114.6%	No	No	No
x	Bucks Lake CDP	45,312	74.2%	No	Yes	Yes
	C Road CDP	75,208	123.1%	No	No	No
x	Canyondam CDP	106,249	173.9%	No	No	No
	Chester CDP	40,331	66.0%	No	Yes	Yes
	Chilcoot-Vinton CDP	47,607	77.9%	No	Yes	Yes
	Clio CDP	25,250	41.3%	Yes	Yes	Yes
	Crescent Mills CDP	31,413	51.4%	Yes	Yes	Yes
	Cromberg CDP	31,111	50.9%	Yes	Yes	Yes
	Delleker CDP	33,750	55.2%	Yes	Yes	Yes
	East Quincy CDP	45,417	74.3%	No	Yes	Yes
	East Shore CDP	149,643	244.9%	No	No	No
x	Gold Mountain CDP	61,303	100.3%	No	No	No
	Graeagle CDP	42,688	69.9%	No	Yes	Yes
	Greenhorn CDP	55,184	90.3%	No	No	No
	Greenville CDP	30,129	49.3%	Yes	Yes	Yes

	Hamilton Branch CDP	62,422	102.2%	No	No	No
x	Indian Falls CDP	23,703	38.8%	Yes	Yes	Yes
	Iron Horse CDP	61,031	99.9%	No	No	No
x	Johnsville CDP	70,034	114.6%	No	No	No
	Keddie CDP	82,333	134.8%	No	No	No
	Lake Alamanor Country Club CDP	85,068	139.2%	No	No	No
	Lake Almanor Peninsula CDP	46,667	76.4%	No	Yes	Yes
	Lake Almanor West CDP	113,750	186.2%	No	No	No
x	Lake Davis CDP	45,245	74.1%	No	Yes	Yes
x	La Porte CDP	45,312	74.2%	No	Yes	Yes
x	Little Grass Valley CDP	45,312	74.2%	No	Yes	Yes
	Meadow Valley CDP	63,698	104.3%	No	No	No
	Mohawk Vista CDP	57,721	94.5%	No	No	No
x	Paxton CDP	23,703	38.8%	Yes	Yes	Yes
	Portola City	34,942	57.2%	Yes	Yes	Yes
x	Prattville CDP	106,249	173.9%	No	No	No
	Quincy CDP	44,447	72.8%	No	Yes	Yes
x	Spring Garden CDP	52,950	86.7%	No	No	No
x	Storrie CDP	23,703	38.8%	Yes	Yes	Yes
	Taylorsville CDP	52,417	85.8%	No	No	No
x	Tobin CDP	23,703	38.8%	Yes	Yes	Yes
x	Twain CDP	23,703	38.8%	Yes	Yes	Yes
Sierra						
	Calpine CDP	17,083	28.0%	Yes	Yes	Yes
	Sattley CDP	147,955	242.2%	No	No	No
	Sierraville CDP	12,031	19.7%	Yes	Yes	Yes
	Sierra Brooks CDP	29,292	47.9%	Yes	Yes	Yes
	Loyalton City CDP	50,904	83.3%	No	No	Yes

DAC Well Vulnerability St Feb. 2016

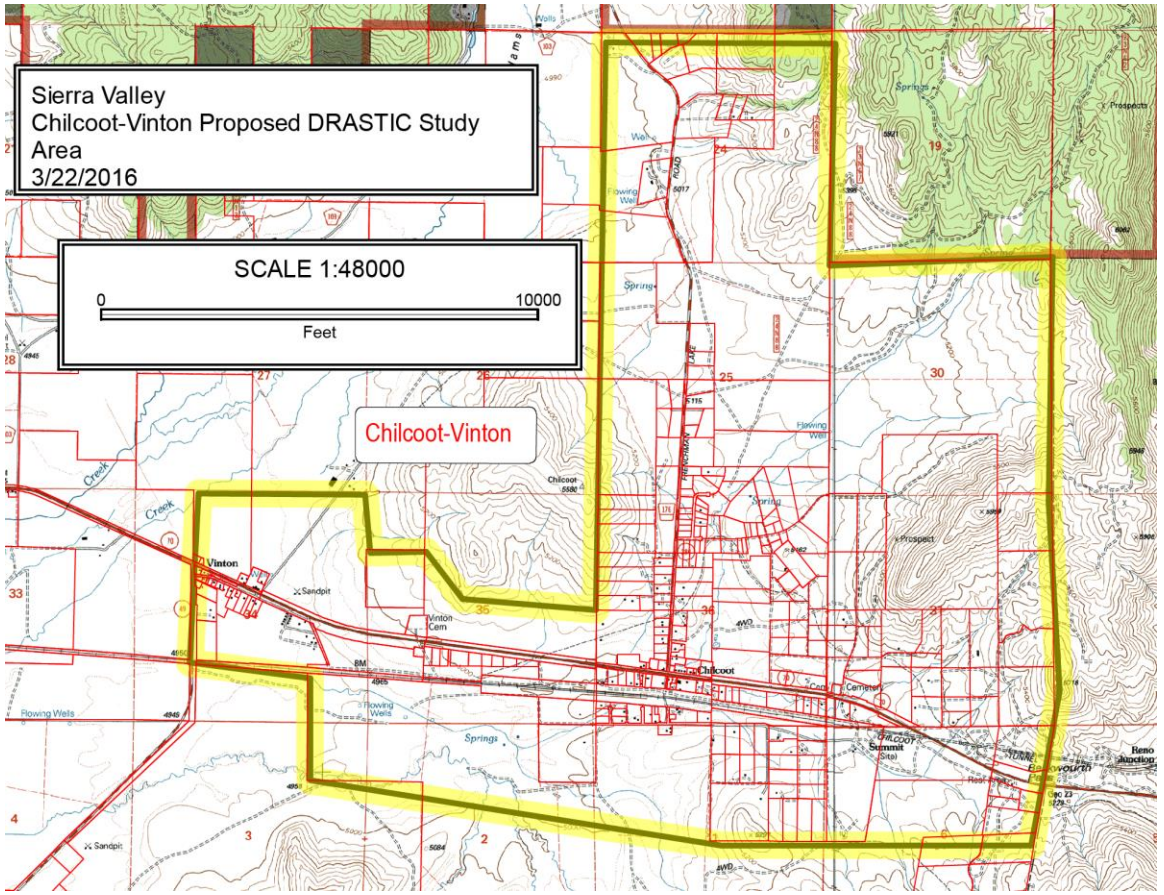
Selection of Communities

PRELIMINARY DRASTIC RATINGS:

	D	R	A	S	T	I	C	D	R	A	S	T	I	C	Cumula-tive
	depth to WL	GW recharge	aquifer mater.	soiltype	topogra-phy	vadose zone	conduc-tivity	Weighted ratings - R x W							DRASTIC rating
WEIGHT FACTORS:	5	4	3	2	1	5	3								prelimi-nary
Clio	9	9	6	9	10	8	6	45	36	18	18	10	40	18	185
Cromberg	9	9	6	10	9	8	6	45	36	18	20	9	40	18	186
Delleker	8	7	4	5	5	3	6	40	28	12	10	5	15	18	128
Sierra Brooks	9	4	6	6	9	7	6	45	16	18	12	9	35	18	153
Calpine	9	7	7	9	9	1	6	45	28	21	18	9	5	18	144
Sierraville	10	5	8	6	9	8	6	50	20	24	12	9	40	18	173
Loyalton	9	4	8	3	9	8	6	45	16	24	6	9	40	18	158
Chilcoot, alluvium	9	4	5	6	9	8	6	45	16	15	12	9	40	18	155
Chilcoot, bedrock	5	4	9	10	9	4	6	25	16	27	20	9	20	18	135
Vinton	9	4	8	6	9	8	6	45	16	24	12	9	40	18	164

COMMUNITIES RATED BY SEVERITY:

	rank		Preliminary DRASTIC index	DRASTIC scaling
Cromberg	1		**186**	**80%**
Clio	2		**185**	**80%**
Sierraville	3		**173**	**74%**
Vinton	4		**164**	**69%**
Loyalton	5		**158**	**66%**
Chilcoot, alluvium	6		**155**	**65%**
Sierra Brooks	7		**153**	**64%**
Calpine	8		**144**	**59%**
Chilcoot, bedrock	9		**135**	**55%**
Delleker	10		**128**	**51%**


Sierra Valley
Chilcoot-Vinton Proposed DRASTIC Study Area
3/22/2016
SCALE 1:48000
0
10000
Feet
Chilcoot-Vinton
Vinton
Chilcoot
Springs
Flowing Wells
Sandpit
Creek