

Community Well Protection and Land Use

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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

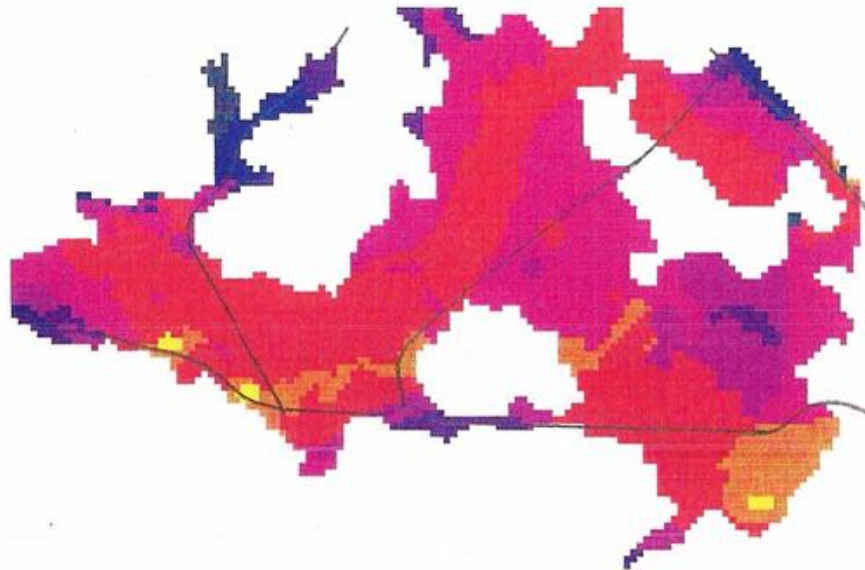
100 - 200

Bedrock highlands

74 - 103

DRASTIC ratings are plotted on a map.

RELATIVE GROUND WATER POLLUTION POTENTIAL



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

$$\text{groundwater velocity} = K \times I / n_e$$

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

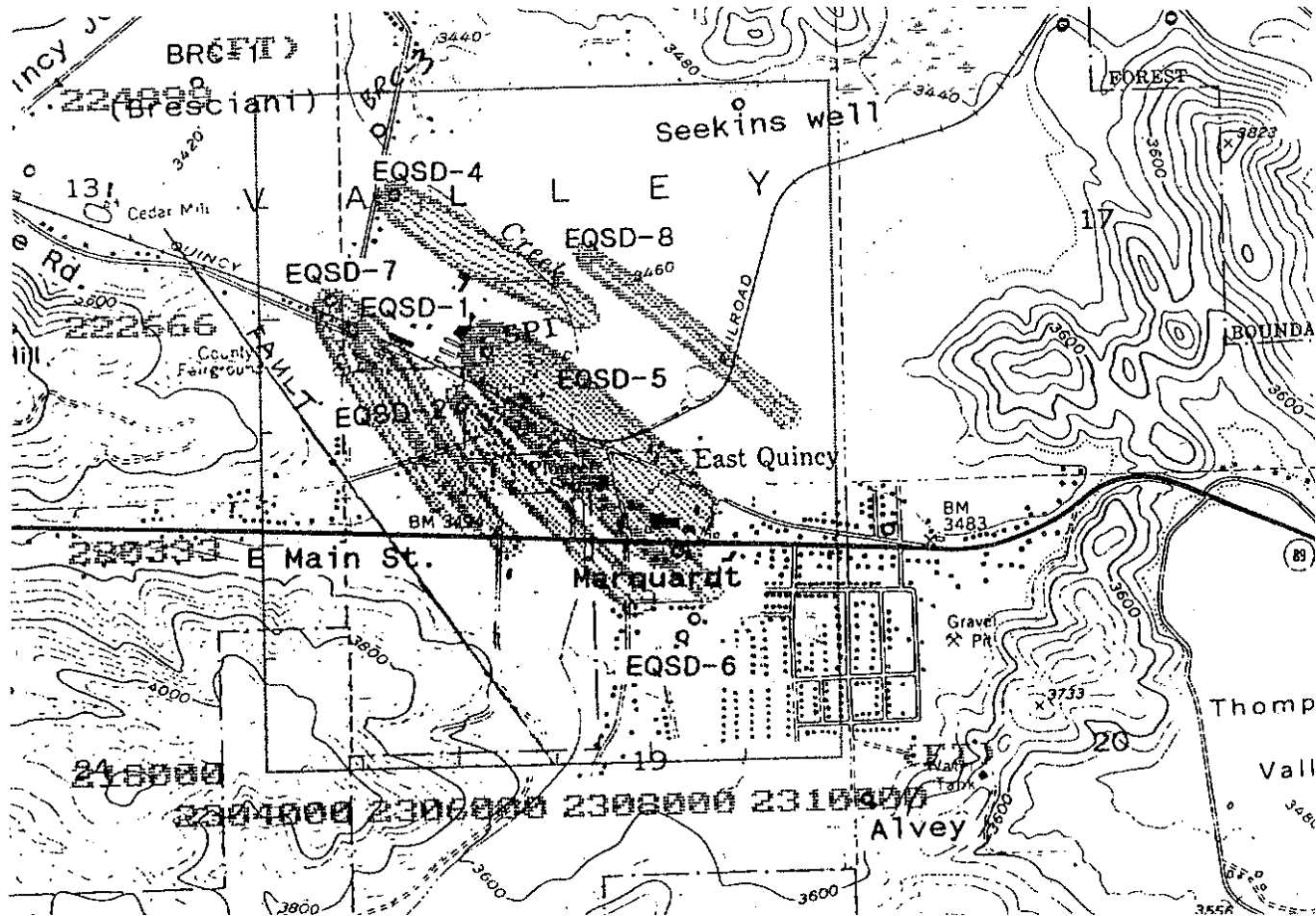
What is a Well Capture Zone?

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)		
<i>Note: Data for CDPs marked with an "x" are from Realtor.com</i>				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	Blairsdon 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
	Keddle 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

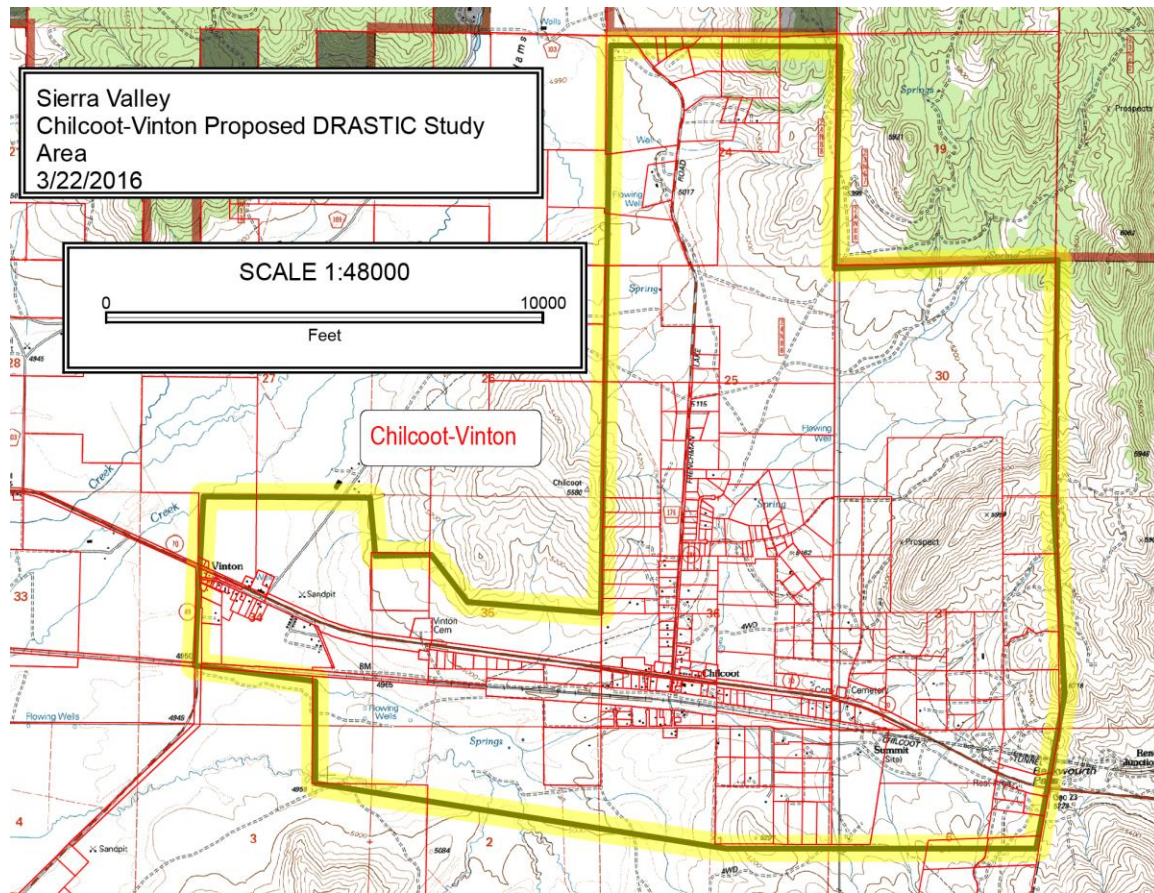
Selection of Communities

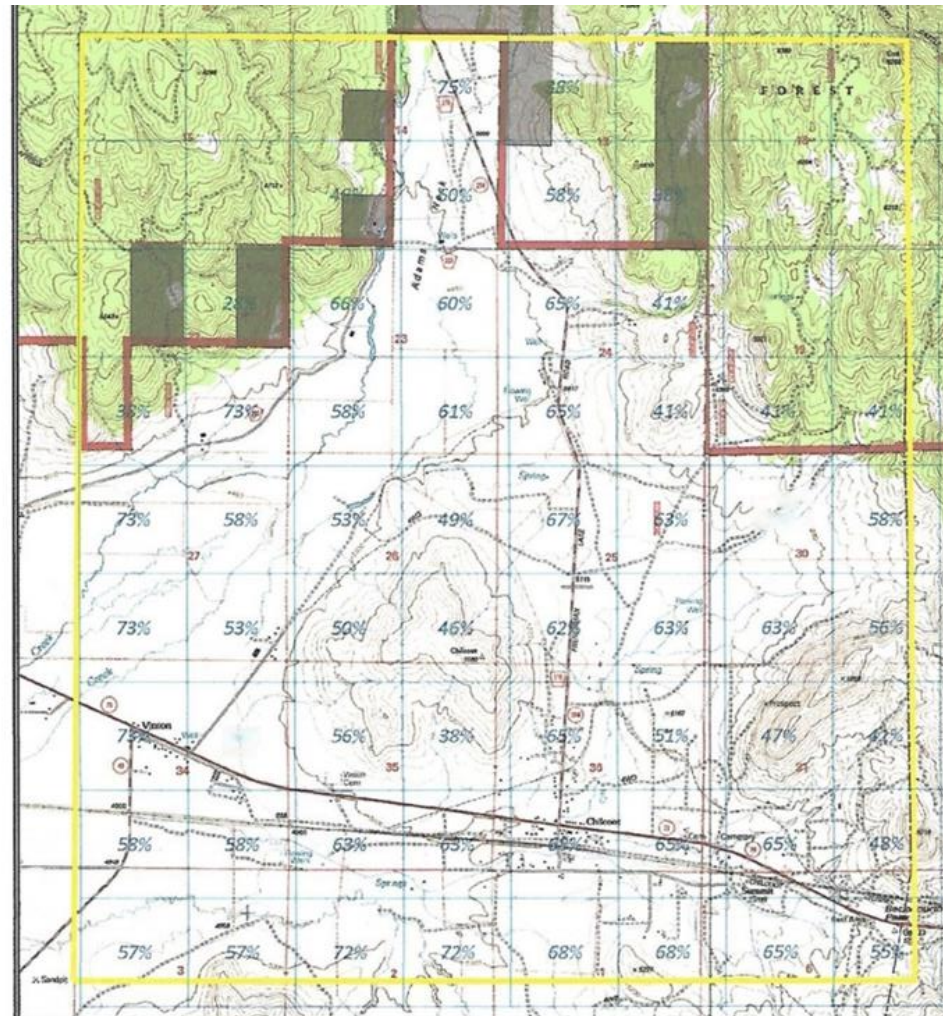
PRELIMINARY DRASTIC RATINGS:

	D	R	A	S	T	I	C		D	R	A	S	T	I	C	Cumulative
	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									preliminary
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%





DRASTIC ratings, Chilcoot-Vinton

2	2	3	4	2	2	2	2
2	2	3	3	3	2	3	3
2	2	4	3	4	3	3	3
2	4	3	4	4	3	3	3
4	3	3	3	4	4	3	3
4	3	3	3	4	4	4	3
4	2	3	2	4	3	3	3
3	3	4	4	4	4	4	3
3	3	4	4	4	4	4	3
Chilcoot-Vinton							
Well Vulnerability Index:		1	2	3	4	5	
			low		medium		high

Well Vulnerability – Chilcoot-Vinton

Nitrate in Quincy Wells - before 1998

