

APPENDIX A:

SANDSTONE PETROLOGIC DATA

Sample numbers correspond to numbers
on plates (in pocket)

Wilson Grove Formation Sandstone Petrography

Raw Data

Sample #	Quartz Non- undulatory	Quartz Undulatory	Quartz Polycrystalline few	Quartz Polycrystalline many	Feldspar	Volcanic Lithic	Sedimentary Lithic	Metamorphic Lithic	Matrix- Cement	Total
1	87	27	18	24	30	9	3	24	78	300
2	53	35	21	33	37	10	5	31	75	300
3	83	39	35	19	42	3	1	14	64	300
4	96	66	27	30	30	3	0	12	36	300

Normalized without cement or matrix

Sample #	Q	F	L	Total
1	156	30	36	222
2	142	37	46	225
3	176	42	18	236
4	219	30	15	264

Percent Q,F,L

Sample #	Q	F	L	Q	F	L	Total
1	0.7027027	0.13513514	0.162162162	70%	14%	16%	100%
2	0.631111111	0.164444444	0.204444444	63%	16%	21%	100%
3	0.74576271	0.1779661	0.076271186	74%	18%	8%	100%
4	0.82954545	0.11363636	0.056818182	83%	11%	6%	100%

No tests on Wilson Grove sandstone:

Non-undulatory and polycrystalline quartz, minor prismatic grains of basaltic hornblende with a large 2V negative angle, fresh and slightly altered plagioclase, augite, volcanic glass, potasium feldspar, glaucophane with a 2V at about 35°(-), garnet, abundant amphiboles which are actinolite-tremolite, epidote, lawsonite as inclusions in feldspars, reddish brown biotite, muscovite, ilmenite, magnetite, and accessory glaucophane. Lithic fragments are minor and represent volcanic, siltstone, chert, metagraywacke, and schist sources. The plagioclase is predominantly oligoclase. In the plagioclase population, albite ranges from 15 to 50% with small amounts of andesine (Travis, 1950). The values given for orthoclase include small amounts (less than 1/2%) of sanidine and microcline (Johnson, 1934). Most of the plagioclase and alkali feldspars are fresh. Some of the feldspars are slightly altered where albite twinning is sometimes vague and appears as "ghosts" upon rotation of the stage. Most quartz grains are monocrystalline and lack undulatory extinction. Polycrystalline and undulatory quartz grains are present, but not common.

Sandstone Petrography of the Middle and Upper Petaluma Formation

Raw Data

Sample #	Quartz Non- undulatory	Quartz Undulatory	Quartz Polycrystalline few	Quartz Polycrystalline many	Feldspar Lithic	Volcanic Lithic	Sedimentary Lithic	Metamorphic Lithic	Matrix- Cement	Total
5	33	31	10	46	27	14	30	52	57	300
6	19	26	10	38	24	15	18	105	45	300
7	12	24	22	42	31	12	9	110	38	300
8	17	41	12	16	22	12	6	102	72	300
9	45	0	3	15	24	42	3	54	114	300
10	57	3	6	39	33	63	0	66	33	300
11	35	12	15	29	25	57	6	48	73	300
12	51	6	2	18	18	40	2	58	105	300

Normalized without cement or matrix

Sample #	Q	F	L	Total
5	120	27	96	243
6	93	24	138	255
7	100	31	131	262
8	86	22	120	228
9	63	24	99	186
10	105	33	129	267
11	91	25	111	227
12	77	18	100	195

Precent Q,F,L

Sample #	Q	F	L	Q	F	L	Total
5	0.49382716	0.11111111	0.395061728	49%	11%	40%	100%
6	0.36470588	0.0941176	0.541176471	37%	9%	54%	100%
7	0.38167939	0.1183206	0.5	38%	12%	50%	100%
8	0.37719298	0.0964912	0.526315789	37%	10%	53%	100%
9	0.33870968	0.1290323	0.532258065	21%	15%	64%	100%
10	0.39325843	0.1235955	0.483146067	39%	13%	48%	100%
11	0.40088106	0.1101322	0.488986784	40%	11%	49%	100%
12	0.39487179	0.0923077	0.512820513	40%	9%	51%	100%

NOTES: Samples 5 and 6 are from the upper Petaluma Formation sandstone collected at the Marcucci Ranch in the axis of an anticline mapped on Plate 3. The hinge of the anticline contains pencil structures. Sample 7 is from the upper Petaluma Formation in Bennett Valley in Mantanzas Creek (See Map). Sample 8 is from the upper Petaluma Formation in southwestern Sonoma Valley on the Chateau St. Jean vineyard property. Samples 9,10,11, and 12 are from the middle Petaluma Formation exposed between Stage Gulch Road and the Tola and Rodgers Creek faults.

Notes on Petaluma sandstone:

Sandstone samples 9-12 were collected from areas mapped as middle Petaluma Formation in this study. Sandstone samples 5-8 were collected in the upper Petaluma Formation sandstone which is an informal unit closely associated with Monterey Group derived conglomerate and the Roblar Tuff.

The samples from the middle Petaluma Formation are calcite cemented, but most of the cement or matrix in the Petaluma Formation sandstones are argillaceous and hematite. The samples from the upper Petaluma Formation were poorly cemented, so these had to be impregnated with epoxy.

Glauconite occurs in the Petaluma Formation.

Petrographic work classifies Petaluma Formation medium-grained sandstone as litharenite (Folk, 1984). The thin sections were stained for potassium feldspar. Average composition of the middle Petaluma Formation medium- to coarse-grained sandstone samples are: Q: 35%, F: 12%, L: 53%. Average composition of sandstone from the upper Petaluma Formation is: Q: 40%, F: 11%, L: 49.

Quartz is usually non-undulatory and to a lesser extent is polycrystalline. Feldspar is albite with minor sanidine and some feldspars are zoned with melt inclusions. From mineral separation studies, Davies (1986) reports that calcium feldspar is 87.2% and potassium feldspar is 12.9% of the total feldspars. K-spar was not reported in the point counts presented herein, but a few grains that were not counted are K-spar.

The lithic fragments are volcanic and metamorphic in the middle Petaluma. Dominant Franciscan Complex metamorphic lithics, rare Tertiary volcanic, Tertiary chert and sandstone lithics are found in the upper Petaluma. Over 50% of the lithic fragments are volcanic at times in the middle Petaluma. Amphiboles counted and also present in un-counted portions of the slides are basaltic hornblende, which occurs as prismatic, isolated grains that have been plucked from unstable volcanic lithic fragments and are included as volcanic lithics. Other amphiboles present are common hornblende and glaucophane. Epidote, garnet, lawsonite, biotite, muscovite, augite and hypersthene are also present in thin sections.

The lithologic differences between the middle and upper Petaluma Formation sandstones appears to lie within the lithic grains. The middle Petaluma Formation appears to contain an abundance of Tertiary volcanic lithics along with Franciscan Complex-derived lithics. The upper Petaluma Formation appears to contain abundant metamorphic lithics.

Garrity Member of the Contra Costa Group Sandstone Petrography

Raw Data

Sample #	Quartz Non-undulatory	Quartz Undulatory	Quartz Polycrystalline few	Quartz Polycrystalline many	Feldspar	Volcanic Lithic	Sedimentary Lithic	Metamorphic Lithic	Matrix-Cement	Total
13	69	24	6	24	9	39	0	63	66	300
14	93	42	21	30	27	24	0	33	30	300
15	58	25	52	24	17	28	2	47	47	300

Normalized without cement or matrix

Sample #	Q	F	L	Total
13	123	9	102	234
14	186	27	57	270
15	159	17	77	253

Precent Q,F,L

Sample #	Q	F	L	Q	F	L	Total
13	0.525641026	0.0384615	0.435897436	52%	4%	44%	100%
14	0.688888889	0.1	0.211111111	69%	10%	21%	100%
15	0.628458498	0.0671937	0.304347826	63%	7%	30%	100%

Samples numbers correspond to petrographic data and labels on maps.

Notes of Garrity sandstone:

Sandstone samples were collected along the shore of San Pablo Bay at Point Pinole (Samples 13 and 15; Appendix 6) where Franciscan Complex-derived conglomerate dominate. Sandstone petrography is presented in Appendix 6. Petrographic work on potassium feldspar stained sandstone from the fine-to medium grained sandstone of the "Garrity Member" classify the rock as predominantly litharenite with one sample classified as feldspathic litharenite. Average QFL composition of sandstone from the "Garrity Member" of the Contra Costa Group is: Q: 61%, F: 7%, L: 31% (Appendix 6).

Quartz is usually non-undulatory and to a lesser extent is polycrystalline. Feldspar is albite with minor sanidine and some feldspars are zoned with melt inclusions. K-spar was not reported in the point counts presented herein, but a few grains that were not counted are K-spar.

The lithic fragments are volcanic and metamorphic with rare Tertiary chert and sandstone. Over 50% of the lithic fragments are volcanic at times. Amphiboles counted and also present in un-counted portions of the slides are basaltic hornblende, which occurs as prismatic, isolated grains that have been plucked from unstable volcanic lithic fragments and are included as volcanic lithics. Other amphiboles present are common hornblende and glaucophane. Epidote, garnet, lawsonite, biotite, muscovite, augite and hypersthene are also present in thin sections.