

2000  
313  
no. 782



LANDSLIDES IN THE SAN FRANCISCO NORTH QUADRANGLE

Map No.	Map unit before sliding	Type of movement	Probable main cause	Approximate slope before sliding (degrees)
Angel Island				
1	Qaf/KJss	Rockfall, debris flow	Removal of support by wave cutting	65
2	KJss	Debris slide	Water, removal of support by wave cutting	35
3	KJss	do.	Removal of support by wave cutting	40
4	Qsr/KJss	Debris flow	do.	20
5	Qsr	Earthflow, debris flow	Water, removal of support by wave cutting	25
6	Qsr	Debris slide	do.	20
7	KJss	Debris flow	Water, removal of support by wave cutting	30
8	KJss	do.	do.	30
9	KJss	do.	do.	30
10	KJss	do.	do.	30
11	KJss	do.	do.	15
12	KJss	do.	do.	25
13	KJss	Earthflow	Removal of support by wave cutting	10
14	KJg	Debris slide	do.	15
15	KJss	do.	Water	31
16	KJss	do.	Removal of support by wave cutting	45
17	KJss	do.	do.	30
18	KJss	do.	Removal of support	30
19	KJg	Debris flow	Removal of support by wave cutting	35
20	Qsr/KJss	Debris slide	Debris flow, earthflow	40
21	KJss	Debris flow, earthflow	Removal of support by road cut	30
22	Qsr/KJg	Debris slide	Prolonged heavy rains	25
23	KJm	Debris slide	Water, removal of support by wave cutting	35
24	KJss	Earthflow	do.	35
Tiburon Peninsula and Belvedere Island				
25	Ks	Rotational slump, debris flow	Removal of support by manmade cut other than roadcut	30
26	Qsr/KJss	Debris slide	Removal of support by wave cutting	40
27	Qsr/KJss	do.	do.	20
28	Qsr/KJss	do.	do.	25
29	Qsr/KJss	do.	do.	30
30	Qsr/KJss	do.	do.	45
31	Qsr/KJss	do.	do.	40
Marin Peninsula				
32	Qsr/KJss	Earthflow, debris flow	Water	15
33	Qsr/KJss	do.	do.	15
34	Qsr/KJss	do.	do.	20
35	Qsr/KJss	do.	do.	20
36	Qsr/KJss	do.	do.	15
37	Qsr/KJg	Earthflow	do.	20
38	KJg	Block glide, debris slide	Removal of support by manmade cut other than roadcut	35
39	Qsr/KJg	Earthflow, debris flow	Water, removal of support by manmade cut other than roadcut	40
40	Qsr/KJss	Debris avalanche	Prolonged heavy rain	35
41	Qsr/KJg	Rotational slump, earthflow	Water removal of support by manmade cut other than roadcut	35
42	Qsr/KJg	Earthflow	Removal of support by loading of slope with Qaf and wave cutting	25
43	Qsr/KJg/KJg	Qsr (KJg)/KJg	Prolonged heavy rain	25
44	Qsr (KJg)/KJg	do.	do.	25
45	Qsr/KJg	do.	Removal of support by wave cutting	45
46	Qsr/KJg	Earthflow	Removal of support by roadcut and wave cutting	30
47	Qsr/KJg	do.	Removal of support by wave cutting	30
48	Qlo (Qsr)/KJss	Debris flow, rotational slump	Water, removal of support by roadcut	**40-50
49	Qsr (KJg)/KJg	Earthflow	Prolonged heavy rain	35
50	KJss	Debris slide, debris flow	Water	30
51	KJsh/KJc	Rotational slump, debris flow	Fault surface, removal of support by roadcut	*21
52	Qlo (Qsr)/KJss	do.	do.	*22
53	Qsr (KJc)/KJss	Earthflow, debris flow	Water, removal of support by roadcut	**40-50
54	Qsr (KJc)/KJss	do.	do.	25
55	Qsr (KJc)/KJss	do.	do.	20
56	Qsr/KJg	Debris slide, earthflow	Removal of support by roadcut	45
57	Qsr (KJc)/KJg	Debris flow	Water, removal of support by roadcut	35
58	Qsr/KJg	Earthflow	Water, removal of support by loading of slope with Qaf	35
59	KJg	Block glide, debris slide	Removal of support by manmade cut other than roadcut	35
Alcatraz Island				
60	KJss	Rockfall	Removal of support by wave cutting	85
61	Qaf	Debris slide	Water, removal of support by wave cutting	55
62	Qsr/KJss	Soil fall	Water	70
San Francisco				
63	KJss, KJsh	Debris slide	Removal of support by manmade cut other than roadcut	45
64	KJss	Rockfall	Water, removal of support by manmade cut other than roadcut	90-95
65	KJss	do.	do.	70
66	Qsr/KJss	Rockfall, mudflow	do.	70
67	KJss	Debris slide	Prolonged heavy rains	30
68	KJss	do.	do.	30
69	Qsr	do.	Removal of support by manmade cut other than roadcut	30
70	Qsr/KJsh	do.	Water, removal of support by manmade cut other than roadcut	50
71	Qsr/sp	Debris flow, earthflow	do.	30
72	Qd/Qc/KJg	Rotational slump	Removal of support by roadcut, vibration	30
73	Qsr	Earthflow	Removal of support by roadcut	20
74	Qsr	do.	do.	20
75	Qsr/KJss	Rotational slump, earthflow	Water, removal of support by manmade cut other than roadcut	10
76	Qsr	Debris flow	Water	15
77	KJss	Debris slide	do.	33
78	KJc/KJg	Rotational slump	Weakening of underlying KJg, now altered to clay	45
79	Qsr	Earthflow	Water, removal of support by manmade cut other than roadcut	20
80	Qsr/KJss or KJc	do.	Water, removal of support by manmade cut other than roadcut, loading of slope with Qaf	30
81	Qd	Sandflow	Water	35
82	Qd/KJc	do.	Desiccation and loss of cohesion	50
83	Qd	Rotational slump, sandflow, debris slide	Removal of support by manmade cut other than roadcut	45
84	Qd	Sandflow	Water, earthquake	25
85	Qsr	Debris slide	Removal of support by roadcut	30
86	sp	Rotational slump, debris slide	Water, removal of support by wave cutting	35
87	sp	Rotational slump, debris slide, earthflow	do.	35
88	sp	do.	do.	20
89	KJss	Rockfall	Removal of support by wave cutting and by manmade cut other than roadcut	50
90	sp/KJss	Rotational slump	Removal of support by wave cutting and by water	30
91	sp/KJss	do.	do.	30
92	KJss	Rotational slump, debris slide	Removal of support by wave cutting, loading slope with Qaf	10 (Upper) 45 (Lower) 17 (Upper) 60 (Lower)
93	Qaf, Qd, KJss, sp	Debris flow, debris slide, mudflow	do.	do.
94	KJg/KJss	Rotational slump	Removal of support by wave cutting	25
95	KJg/KJss	Debris slide	Water, removal of support	25
96	KJss, KJg	Rotational slump	Removal of support by wave cutting and by water	30
97	Ks	Rotational slump, earthflow, debris flow	Water, removal of support by wave cutting	30
98	KJss	Earthflow	Removal of support by wave cutting	40
99	KJsh	do.	Water, removal of support by wave cutting	45
100	KJss	Rotational slump	Removal of support by roadcut	40
101	KJss, sp	Not known, probably rotational slump	Removal of support for roadcut	45

Letter symbols indicate map units on plate 1, as follows:

Surficial deposits:  
Qaf, artificial fill  
Qly, younger landslide deposits  
Qlo, older landslide deposits  
Qd, dune sand  
Qsr, slope debris and ravine fill

Franciscan Formation:  
KJss, sandstone  
KJsh, shale and thin-bedded sandstone  
KJg, gneiss  
KJc, radiolarian chert and shale  
KJm, metamorphic rocks  
Ks, sheared rocks

sp, serpentinite

Qaf (KJc)/KJg indicates slope debris and ravine fill composed predominantly of debris of radiolarian chert and shale of the Franciscan Formation overlying greenstone of the Franciscan Formation

\* Natural slope

\* Roadcut

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MAP SHOWING AREAS OF EXPOSED BEDROCK, CONTOURS ON BEDROCK SURFACE, AND LANDSLIDES IN THE  
SAN FRANCISCO NORTH QUADRANGLE, SAN FRANCISCO AND MARIN COUNTIES, CALIFORNIA