



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	Debris flow	Removal of support by wave cutting	30
4	Qsr/Kjss	Earthflow, debris flow	do	20
5	Qsr	Earthflow, debris flow	Water, removal of support by wave cutting	25
6	Qsr	Debris slide	do	20
7	Qsr	Debris slide	Water	30
8	Kjss	Debris flow	Water, removal of support by wave cutting	30
9	Kjss	do	do	30
10	Kjss	do	do	30
11	Kjss	do	do	15
12	Kjss	do	do	20
13	Kjss	Earthflow	Removal of support by wave cutting	10
14	KJg	Debris slide	do	20
15	KJg	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	do	Removal of support by wave cutting	40
20	Qsr/Kjss	Debris flow	Removal of support by wave cutting	30
21	Kjss	Debris slide	do	30
22	Qsr/KJg	Debris flow, earthflow	Removal of support by road cut	25
23	KJm	Debris slide	Prolonged heavy rains	25
24	KJss	Earthflow	Water, removal of support by wave cutting	35
Tiburon Peninsula and Belvedere Island				
25	Ks	Rotational slump, debris flow	Removal of support by manmade cut other than roadcut	30
26	Osr/Kjss	Debris slide	Removal of support by wave cutting	40
27	Osr/Kjss	do	do	20
28	Qsr/Kjss	do	do	30
29	Qsr/Kjss	do	do	45
30	Qsr/Kjss	do	do	40
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	15
36	Qsr/KJg	do	do	20
37	Qsr/KJg	Earthflow, debris slide	Removal of support by manmade cut other than roadcut	35
38	KJg	Block glide, debris slide	Water, removal of support by manmade cut other than roadcut	40
39	Qsr/KJg	Earthflow, debris slide	Prolonged heavy rain	35
40	Qsr/KJss	do	Water, removal of support by manmade cut other than roadcut	35
41	KJg	Rotational slump, earthflow	Removal of support by loading of slope with Qaf and wave cutting	25
42	KJg	Earthflow	Prolonged heavy rain	25
43	Qsr(KJg)/KJg	Earthflow, debris flow	do	25
44	Qsr(KJg)/KJg	do	Removal of support by wave cutting	45
45	Qsr/KJg	do	Removal of support by roadcut	30
46	Qsr/KJg	do	Removal of support by roadcut and wave cutting	30
47	Qsr/KJg	do	Removal of support by wave cutting	30
48	Olo(Qsr)/Qlo	do	Water, removal of support by roadcut	**40-50
49	Qsr(KJg)/KJg	do	Prolonged heavy rain	35
50	KJss	Earthflow	Water	30
51	KJg	Rotational slump, debris flow	Fault surface, removal of support by roadcut	**21
52	Olo(Qsr)/KJss	do	Water, removal of support by roadcut	**45
53	Olo	Earthflow, debris flow	do	**32
54	Qsr(KJc)/KJss	do	do	**40-50
55	Qsr(KJc)/KJss	do	do	25
56	Qsr(KJc)/KJg	do	Removal of support by roadcut	30
57	Qsr(KJc)/KJg	do	Water, removal of support by roadcut	35
58	Qsr(KJc)/KJg	do	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	Qsr/Kjss	do	do	70
66	Qsr/Kjss	Rockfall, mudflow	do	30
67	Qsr/Kjss	Debris slide	do	30
68	KJss	do	do	50
69	Qsr	do	do	30
70	Qsr/KJsh	Debris slide, earthflow	Water, removal of support by manmade cut other than roadcut	30
71	Qsr/sp	Rotational slump	do	30
72	Qd/Qc/KJg	Earthflow	Removal of support by roadcut, vibration	20
73	Qsr	do	Removal of support by roadcut	20
74	Qsr	do	Water, removal of support by manmade cut other than roadcut	10
75	Qsr/KJss	Rotational slump, earthflow	Water	15
76	Qsr	Debris flow	do	33
77	KJss	Debris slide	Weakening of underlying KJg, now altered to clay	45
78	KJc/KJg	do	Water, removal of support by manmade cut other than roadcut	20
79	Qsr	Rotational slump	Water, removal of support by manmade cut other than roadcut, loading of slope with Qaf	30
80	Qsr/KJss or KJc	Earthflow	Water	35
81	Qd	Sandflow	do	35
82	Qd/KJc	Rotational slump, sandflow, debris slide	Desiccation and loss of cohesion	50
83	Qd	do	Removal of support by manmade cut other than roadcut	45
84	Qd	Debris slide	Water, earthquake	25
85	Qsr	do	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	Removal of support by wave cutting and by manmade cut other than roadcut	20
89	KJss	Rockfall	Water	50
90	sp/KJss	Rotational slump	Removal of support by wave cutting and by water	30
91	sp/KJss	do	Removal of support by wave cutting and by water	30
92	KJss	Rotational slump, debris slide	Removal of support by wave cutting, loading slope with Qaf	40
93	Qaf, Qd, KJss, sp	Debris flow, debris slide, mudflow	do	45
94	KJg/KJss	Rotational slump	Removal of support by wave cutting	25
95	KJg/KJss	Debris slide	Water	25
96	KJss, KJg	Rotational slump	Removal of support by wave cutting and by water	30
97	KJg	Rotational slump	Water, removal of support by wave cutting	40
98	KJss	Earthflow	Removal of support by wave cutting	45
99	KJss	do	Water, removal of support by wave cutting	40
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
Qd, debris and landslide deposits
Qo, older landslide deposits
Qd, dune sand
Qsr, slope debris and ravine fill

Francis Formation:
KJss, sandstone
KJsh, shale and thin-bedded sandstone
KJg, greenstone
KJc, radiolarian chert and shale
KJm, mudrock
KJg, sheared rocks

sp, serpentine

Qaf (sp) 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

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