DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF -1401

SHEET 21 OF 21

Table 1.--Radiocarbon dates from the Sacramento-San Joaquin Delta and vicinity

Age in ^{14}C years before A.D. 1950	Laboratory number	Latitude north	Longitude west	7.5-minute quadrangle (sheet) 1/	Depth in feet	Elev. in feet 2/	Thickness of underlying soft deposits in feet: Peat	Thickness of underlying soft deposits in feet: Mud	Material dated	Map unit	Remarks	References 3/
540±120	UM-2078	38°02'55"	121°51'49"	*Antioch North (9)	0.7	+2.3	30	nd	Rhizomes of Distichlis spicata.	Qpm	Gives minimum age at Browns Island for transition from freshwater marsh dominated by Scirpus acutus and Phragmites australis to seasonally brackish-water marsh dominated by D. spicata.	TR
860±170	GX-2932	38°05'30"	121°29'30"	Terminous (12)	2?	-3?	10+	nd	Peat	Qpm	--	S&B; hole 13(?) of J
890±80	UM-2079	38°02'55"	121°51'49"	*Antioch North (9)	0.7	+2.3	30	nd	Peat with rhizomes of D. spicata and Scirpus robustus.	Qpm	Together with UM-2078 (540±120), suggests relative sea-level rise at Browns Island less than 30 cm during past 900 years.	TR
1430±95	USGS-750	38°14'55"	121°42'30"	*Rio Vista (6)	7.7	-4.4	25.7	0	Peaty mud with common plant detritus.	Qpm	--	TR
1910±95	USGS-749	38°18'30"	121°34'00"	*Courtland (4)	8	-6	0	3	Firm peat	Qpm?	Suggest that overlying crevasse-splay deposits formed in prehistoric time.	TR
2110±80	USGS-751	38°14'55"	121°42'30"	*Rio Vista (6)	11.1	-7.8	22.3	0	Peaty mud with common plant detritus.	Qpm	--	TR
2240±250	W-436	38°33'07"	121°31'05"	Sacramento West	60	-40?	0	0	Wood	Qfp	Dates channel deposits well beneath top of natural-levee deposits; great depth of sample reflects lateral rather than vertical accretion (cf. Allen, 1970, p. 311).	R&A
2420±140	GX-2933	38°05'30"	121°29'30"	Terminous (12)	7?	-8?	5+	nd	Peat	Qpm	--	S&B; hole 13(?) of J
2940±140	BETA-2344	38°36'40"	121°30'50"	Sacramento West	11	+2	0	nd	Wood fragments, probably detrital	Qb	Collected 8 ft below historic flood-basin surface, which is marked by sharp contact between Columbia and Sacramento soils.	TR
2950±150	GX-4221	37°51'15"	121°34'15"	*Clifton Court Forebay (18)	4.1	-5.7	1.0	6	Peat	Qpm	--	W
3090±190	GX-2583	38°07'	121°41'	Jersey Is. (10)	10	-20	20?	8?	Peat	Qpm	--	S&B; hole 5 of J, at Standard Oil Co. Souza #5
3315±150	GX-2581	38°07'	121°29'	Terminous (12)	11	-20?	0?	0?	Peat	Qpm	--	S&B; hole 15 of J., near former Western Pacific R.R. tracks
3490±140	GX-4222	37°51'15"	121°34'15"	*Clifton Court Forebay (18)	9.6	-11.2	0.6	nd	Peat	Qpm?	Separated from overlying GX-4221 (2950±150) by 5 ft of soft gray silty clay; map unit queried because of possibility that sample accumulated in a supratidal environment (see remarks for GX-4223 (4340±150)).	W
3575±260	GX-2934	38°05'30"	121°30'	Terminous (12)	12?	-13?	3?	nd	Peat	Qpm	--	S&B; hole 13(?) of J
3900±180	GX-2582	38°03'30"	121°47'	Jersey Is. (10)	12	-20	7	10+	Peat	Qpm	--	S&B; hole 2 of J
4330±65	USGS-752	38°14'55"	121°42'30"	*Rio Vista (6)	27.8	-24.5	5.6	0	Peaty mud with rhizomes of Phragmites australis.	Qpm	--	TR
4340±150	GX-4223	37°51'15"	121°34'15"	*Clifton Court Forebay (18)	10.5	-12.1	0	nd	Peat	Qpm?	Minimum age for pollen of native walnut (Juglans hindsii) in underlying deposit (West, 1981); possibly deposited in a supratidal interdistributary basin rather than a tidal wetland because elevation is 5-10 ft higher than coeval relative sea level in San Francisco Bay; else uplifted relative to parts of San Francisco Bay (see Atwater and others, 1977, p. 11)	W
4340±195	GX-2575	38°04'	121°43'	Jersey Is. (10)	13	-30	24	3+	Peat	Qpm	--	S&B; hole 3B of J
4675±200	GX-2579	38°06'30"	121°35'15"	Bouldin Is. (11)	13	-30?	0	7	Peat	Qpm	--	S&B; hole 10 of J
6100±100	USGS-753	38°14'55"	121°42'30"	*Rio Vista (6)	33.4	-31.1	0	0	Peat with rhizomes of Scirpus acutus.	Qpm	Indicates relative sea-level rise of about 10 m during past 6,000 ^{14}C years near Lindsey Slough.	TR
6600±250	W-794	38°01'48"	121°44'46"	*Jersey Is. (10)	33	-43	1	27	Peat	Qpm	Ground-surface elevation -10.0 ft., not 0.0 ft. as assumed by Shlemon and Begg (1975, p. 262).	R&A; P&W
6635±320	GX-2576	38°04'	121°43'	Jersey Is. (10)	23	-40	14	3	Peat	Qpm	--	S&B; hole 3B of J
6805±350	GX-2577	38°04'	121°43'	Jersey Is. (10)	33	-50	4	3	Peat	Qpm	--	S&B; hole 3B of J
10,975±590	GX-2578	38°04'	121°43'	Jersey Is. (10)	39	-56	0	0	"Peaty silty sandy loam" (ref. J)	Qfp?	Not demonstrably of tidal origin; possibly deposited on a point bar, in an oxbow lake, or in a flood basin. -- Same remark as for W-794	S&B; hole 3B of J
10,690±300	W-744	38°01'48"	121°44'46"	*Jersey Is. (10)	58	-68	0	3	"Organic silt" (ref. J), grayish brown, bulk density 1.97 g/cm^3.	Qfp?		R&A; P&W
20,465±675	UM-2059	37°53'30"	121°43'30"	*Brentwood (14)	20 (below top of stream bank)	+140	0	0	Detrital charcoal from younger alluvium of Marsh Creek or from unidentified older unit; 1mm of sandy mud in channel gravels; charcoal pretreated with HCl but not NaOH; 0.37 g of carbon counted.		Minimum age if contaminated with humic acids; overlain by 10 ft gravel (channel facies) capped by 10 ft clayey sandy silt (overbank facies).	TR
32,700±700	USGS-573	38°01'45"	121°40'30"	*Jersey Is. (10)	137	-139	0	0	Layer of plant detritus in micaceous sandy silt 10.7 ft beneath eolian sand of the upper member of the Modesto Formation.		Sample contaminated: overlying deposits dated 43,000 and 46,000 B.P. (USGS-571, -572).	TR
38,100±950	USGS-574	37°59'45"	121°30'00"	*Brentwood (14)	70	-75	0	0	Detrital wood in micaceous sandy silt 20 ft beneath eolian sand of the upper member of the Modesto Formation.		Maximum age for eolian sand of the upper member of the Modesto Formation and a buried fan deposit of Marsh Creek at Hotchkiss Tract.	TR
42,200±1600	USGS-570	38°04'30"	121°39'00"	*Jersey Is. (10)	40	-45	0	0	Layers of plant detritus, largely decomposed, in soft mud approx. at disconformable contact with overlying contact of eolian sand of the upper member of the Modesto Formation.		Maximum age for eolian sand of the upper member of the Modesto Formation at Bradford Island.	TR
43,000±1700	USGS-571	38°01'45"	121°40'30"	*Jersey Is. (10)	65	-67	0	0	Layers of plant detritus in micaceous sand and mud overlain by alluvium of Marsh Creek at -52 ft and eolian sand of the upper member of the Modesto Formation at -32 ft.		Imply correlation with roughly coeval deposits at Hotchkiss Tract and Bradford Is.; give maximum age range for eolian sand of the upper member of the Modesto Formation and for a buried channel deposit of Marsh Creek Qym at Jersey Is.; date episode of aggradation by San Joaquin River.	TR; TR
46,300±2400	USGS-572	38°01'45"	121°40'30"	*Jersey Is. (10)	80	-82	0	0				TR

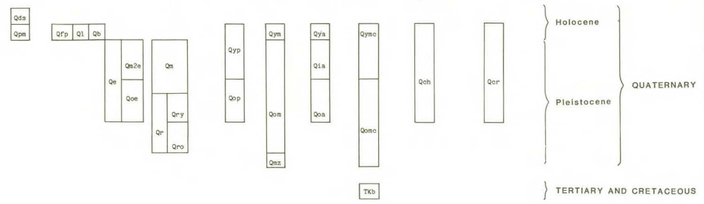
1/ Asterisk denotes samples identified on sheets 1-20; precise locations of Shlemon and Begg's (1975) boreholes not known (W. S. Johnson, oral commun., 1981).

2/ Datum is National Geodetic Vertical Datum of 1929, formerly called Sea Level Datum of 1929. Elevations of Shlemon and Begg (1975) queried where elevation at top of borehole not documented in field logs (ref. J).

3/ J: W. S. Johnson, unpublished borehole logs on file in Project Geology Office, California Dept. of Water Resources (DWR), 1416 9th Street, Sacramento.
P&W: J. F. Poland, USGS, written communication, 1981, citing elevation of -10.0 ft for DWR borehole SHIX4, drilled 1957; this elevation reported to Poland in 1961 by J. Welsh of DWR.
R&A: Rubin and Alexander (1958; W-436) and (1960; W-794; samples from borehole SHIX 4).
S&B: Shlemon and Begg (1975).
TR: This report.
W: West (1977).

CORRELATION OF MAP UNITS

Note: relative ages generally well established within individual columns but generally speculative between columns



DESCRIPTION OF MAP UNITS

(see attached text for fuller description and discussion)

Qds HYDRAULIC-DREDGE SOILS (Holocene; post-1900)

Qpm PEAT AND MUD OF TIDAL WETLANDS AND WATERWAYS (Holocene)

ALLUVIUM OF SUPRATIDAL FLOOD PLAINS (Holocene) -- Consists of:
- Qfp Alluvial-floodplain deposits, undivided
- Ql Natural-levee deposits (Holocene)
- Qb Flood-basin deposits (Holocene)

EOLIAN DEPOSITS (Pleistocene) -- Consist of:
- Qe Eolian deposits, undivided (upper Pleistocene)
- Qm2e Eolian deposits of upper member of the Modesto Formation (upper Pleistocene
- Qoe Older eolian deposits (upper Pleistocene)

ALLUVIAL-FAN DEPOSITS DERIVED FROM GLACIATED DRAINAGE BASINS (Pleistocene) -- Consist of:

Qm MODESTO FORMATION (Pleistocene) -- Dense stipple - loose sand, probably eolian; light stipple - loose sand and silt, chiefly fluvial; no stipple - compact silt and very fine sand

RIVERBANK FORMATION (Pleistocene) -- As mapped, divided into:
- Qr Riverbank Formation, undivided (upper Pleistocene)
- Qry Younger unit of the Riverbank Formation (upper Pleistocene)
- Qro Older unit of the Riverbank Formation (upper Pleistocene)

ALLUVIAL-FAN AND ALLUVIAL-TERRACE DEPOSITS DERIVED FROM UNGLACIATED DRAINAGE BASINS (Holocene and Pleistocene) -- Consist of:

ALLUVIUM OF PUTAH CREEK (Holocene and Pleistocene) -- Divided into:
- Qyp Younger alluvium of Putah Creek (Holocene and(or) upper Pleistocene)
- Qop Older alluvium of Putah Creek (upper Pleistocene)

ALLUVIUM OF MONTEZUMA HILLS AND VICINITY (Holocene and Pleistocene) -- Divided into:
- Qym Younger alluvium of Montezuma Hills and vicinity (Holocene)
- Qom Older alluvium of Montezuma Hills and vicinity (Pleistocene)

ALLUVIUM OF ANTIOCH AND VICINITY (Holocene and Pleistocene) -- Divided into:
- Qya Youngest alluvium of Antioch and vicinity (Holocene)
- Qia Intermediate alluvium of Antioch and vicinity (upper Pleistocene)
- Qoa Oldest alluvium of Antioch and vicinity (upper Pleistocene)

ALLUVIUM OF MARSH CREEK AND VICINITY (Holocene and Pleistocene)
- Qymc Younger alluvium of Marsh Creek and vicinity (Holocene and upper Pleistocene)
- Qomc Older alluvium of Marsh Creek and vicinity (Pleistocene)

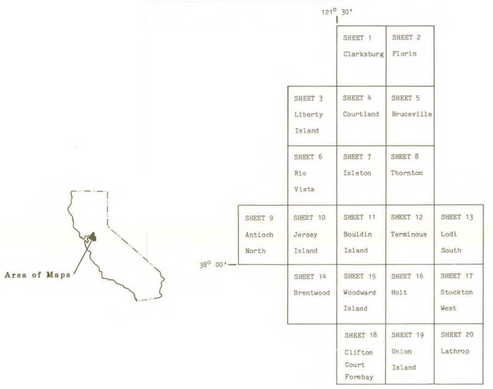
Qch ALLUVIUM OF CREEKS FROM THE CORRAL HOLLOW DRAINAGE TO BRUSHY CREEK (Holocene and(or) upper Pleistocene)

Qcr ALLUVIUM OF CALAVERAS RIVER AND VICINITY (Holocene and(or) upper Pleistocene)

Qmz MONTEZUMA FORMATION (Pleistocene)

TKb BEDROCK (Tertiary and upper Cretaceous)

INDEX TO SHEETS AND USGS 7.5-MINUTE QUADRANGLES



MISCELLANEOUS SYMBOLS

Contacts between map units
- Location generally accurate within 500 ft
- Location may err by more than 500 ft
- Concealed by flooding of Franks Tract (sheets 10 and 11)

Faults
- Fault zone with demonstrated Quaternary movement

Former wetlands and waterways
- Landward margin of tidal wetland at low river stages circa 1850. Queried where location may err by more than 1000 ft
- Centerline or edge of late Holocene waterway subject to tidal flow at low river stages. Hachured where probably abandoned before 1850. Dashed where location may err by more than 1500 ft
- Centerline or edge of waterway subject chiefly or wholly to non-tidal flow. Arrow gives probable direction of flow. Dashed where location may err by more than 1500 ft. Circled numbers on sheet 14 denote relative ages of waterways. (1) older and (2) younger.
- Shoreline of perennial lake at low river stage circa 1910. Queried where location may err by more than 1500 ft

Subsurface stratigraphy
- Boreholes and outcrops: Borehole or outcrop from fieldwork by author; Borehole from other sources (see table 2)
- Elevations at base of soft deposits: Peat or peaty mud deposited chiefly in tidal wetlands (number above line) overlying mud deposited chiefly in channels (number below line)
- -15 · Basal deposits peat or peaty mud
- -18 · Basal deposits mud
- >-20 · Lowest known soft deposits peat or peaty mud, but basal soft deposits not reached
- (+) · Soft deposits missing; firm or stiff deposits at ground surface at indicated elevation

Materials described in log of borehole or outcrop
G, gravel; g, gravelly
S, sand; s, sandy (VF, very fine; F, fine; M, medium; C, coarse; VC, very coarse)
Z, silt; z silty
C, clay; c, clayey
F, peat (at least 50 percent organic matter by dry weight); p, peaty (approx. 10-50 percent organic matter by dry weight)

10YR 5/4 Color, Munsell system

PP 1-2 Unconfined shear strength in kg/cm^2, measured with pocket penetrometer

Contacts between subsurface deposits
- Abrupt
- Gradational
- Buried soil

Examples of borehole logs
- -18 / -22 Deepest peat or peaty mud is located at -18 ft. Soft mud extends from -18 to -22 ft.
- Ql, Qpm, Qb: 6 ft of natural-levee silt overlie 11 ft of peaty clay of tidal origin, which in turn overlie firm, calcareous silty clay deposited in a supratidal flood basin. The basal peaty clay lies at -12 ft.

Other
- Generalized contours circa 1910 (sheet 5 only)
- 1927 → Sites and dates of levee breaks (sheets 6, 10-12, and 15)
- Boundary of map area
- Probable crests of eolian dunes, marked by light photographic tone (sheets 10, 11, 14, and 15)

Table 2.--Principal sources of subsurface data for historically intertidal areas and contiguous natural levees

Investigation and date	Location	Approx. number of holes plotted on sheets 1-20	Sponsor
Salinity-control barrier, chiefly 1955-1958	Crowns and land-side toes of manmade levees throughout the Delta; also a few holes in interiors of Bouldin, Grand, Medford, Sherman, and Staten Islands, Rindge and Terminous Tracts, and Pierson District (SE of Courtland, sheet 9).	950	Calif. Dept. Water Resources (on file in Project Geology Office, 1416 9th Street, Sacramento).
Delta geology, 1978-1980	Interiors of scattered islands and tracts throughout the Delta.	150	U.S. Geological Survey (this report).
Sewage collection system, Sanitation District #15, Contra Costa County, 1977	Toe of levee on Hotchkiss Tract (SE of Jersey Island, sheet 10) and roads in SE part of Bethel Island.	80	County Dept. Public Works; report prepared by Harding-Lawson Assoc., Concord (HLA Job no. 4035,041.05).
Mokelumne Aqueduct, 1946-1947	Interiors of Orwood Tract, Woodward Island, Upper Jones Tract, and Lower Roberts Island.	60	East Bay Municipal Utilities District.
Highway 12, 1938-1958	Interiors of Brannan and Andrus Islands.	27	Calif. Div. Highways (on file in Stockton Office of Calif. Dept. of Transportation).
Peripheral Canal, alternate routes, ca. 1975	Interiors of Staten, Tyler, Andrus, and Grand Islands.	15	Calif. Dept. Water Resources (on file in Project Geology Office, 1416 9th Street, Sacramento).
Subsidence of organic soils, 1976	Interiors of Jersey, Mandeville, Victoria, and Woodward Islands and Lower Jones, Lower Roberts, Orwood, and Webb Tracts.	15	Calif. Dept. Water Resources (on file in Central District Office, 3251 S Street, Sacramento; see also Neumarch, 1980).

GEOLOGIC MAPS OF THE SACRAMENTO-SAN JOAQUIN DELTA, CALIFORNIA

By
Brian F. Atwater

1982

Interior--Geological Survey, Reston, Va.--1982

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