EXPLANATION

UNCONSOLIDATED DEPOSITS

QUATERNARY

Recent

Road fill (Qr)

Alluvium
Qa, *silt, sand, and a small amount of gravel*
Qas, *sand and gravel*

Alluvial fan (Qf)
Pebbles, cobbles, boulders, and a small amount of sand

Talus (Qta)
Includes some soil or alluvium in scattered patches or thin layer on bedrock

Pleistocene

Gulch fill (Qg)
At Knowles damsite, subangular to subrounded gravel, 80 percent of which is 1 to 4 inches in diameter; thin film of silt on individual cobbles

Glacial-lake-beds
Interbedded very fine sand, silt, and clay. Undivided at Perma damsite, (Qlb). *At Knowles damsite divided into sand* (Qs), *silt* (Qsi), *and clay* (Qcl)

BEDROCK

PRECAMBRIAN

Belt Series

Diorite (pCd)
Fine- to medium-grained, massive. Sill at Perma Bridge contains considerable quartz and in a few places is quartz diorite

Prichard Formation (pCp)
Quartzite, impure quartzite, and argillite. Patterned where metamorphosed to biotite quartzite with gneissic texture in places. Northeast of Perma Bridge and east of the sill, metamorphosed zone grades from a quartz amphibolite to amphibolite quartz gneiss to recrystallized biotite quartzite

Contact, showing dip
Long dashed where approximately located; short-dashed where gradational; dotted where concealed

Fault
Dashed where approximately located; dotted where concealed

Concealed dike
Probably associated with shear zone or minor fault

Overturned anticline
Showing approximate trace of axial plane, direction of dip of limbs, and plunge

Strike and dip of beds
Apparent dip of beds shown in geologic sections by long-dashed lines

Strike and dip of overturned beds

Drill hole, Knowles damsite
Drilled by U.S. Army Corps of Engineers, 1944 and 1945. Samples taken with 2-inch drive sampler

Test hole, Perma damsite
Drilled with 1-inch soil sampler by U.S. Army Corps of Engineers, 1944

Adit

Prospect pit

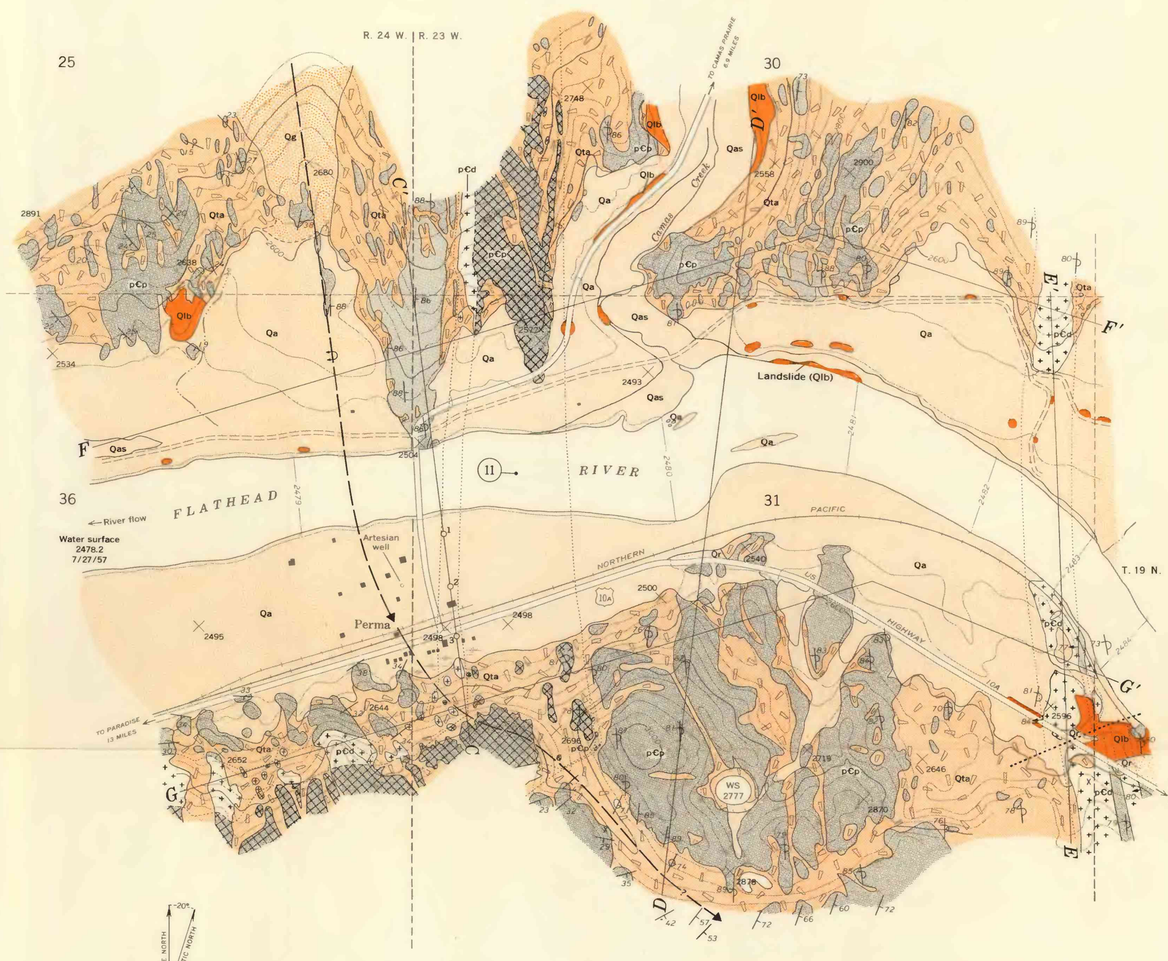
Bench mark
Marked with brass cap

Planetable bench mark

Found corner
Section lines dashed where approximately located

River mileage
Measured from mouth of river

Water surface
2471.4
8/8/57
Altitude of water surface
With date of measurement



SCALE 1:9 600
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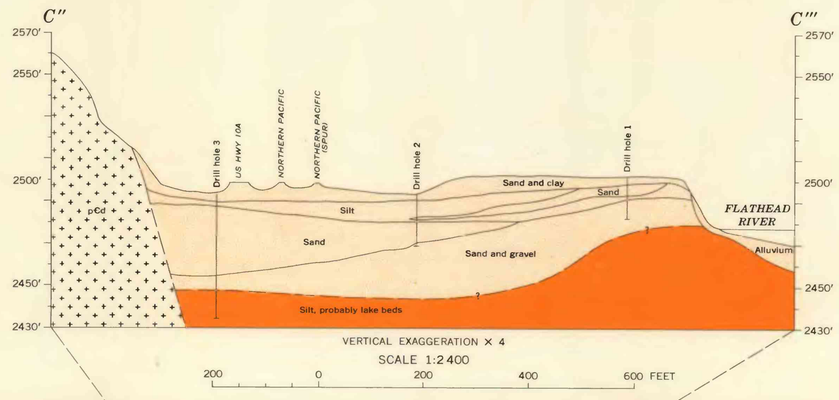
CONTOUR INTERVAL 40 FEET
SUPPLEMENTAL 1 FOOT CONTOURS ON WATER SURFACE
DATUM IS MEAN SEA LEVEL

PERMA DAMSITE



VERTICAL EXAGGERATION X 4
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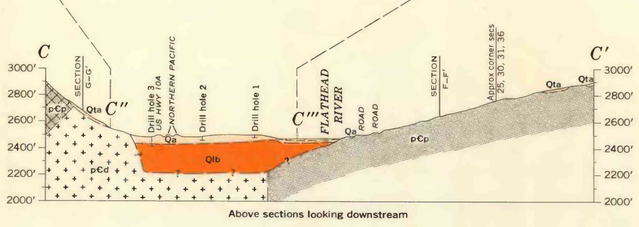
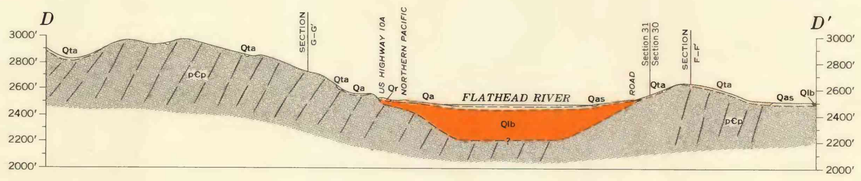
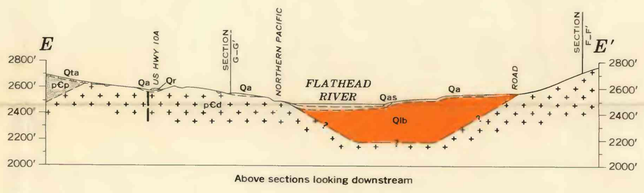
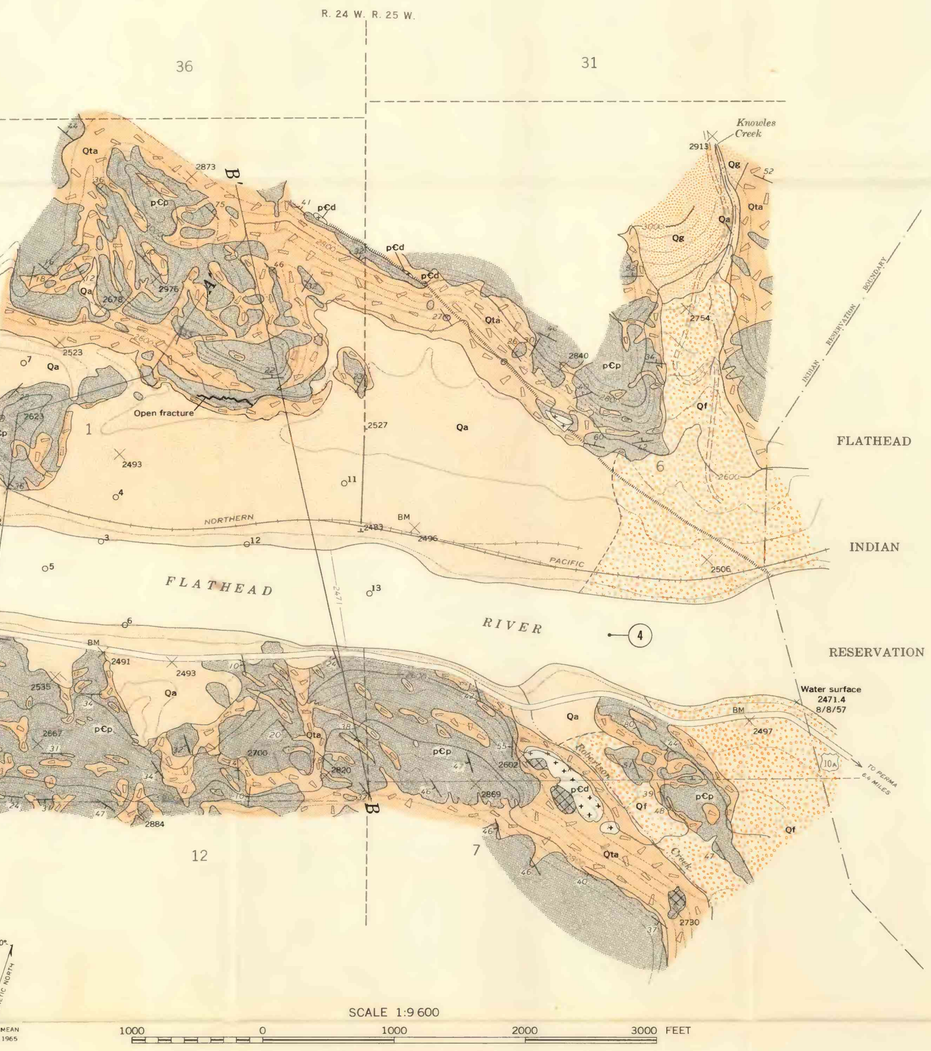


Above sections looking downstream





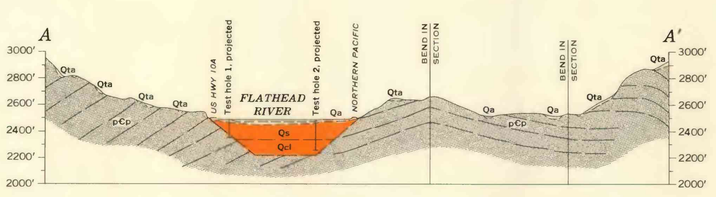
Above sections looking downstream

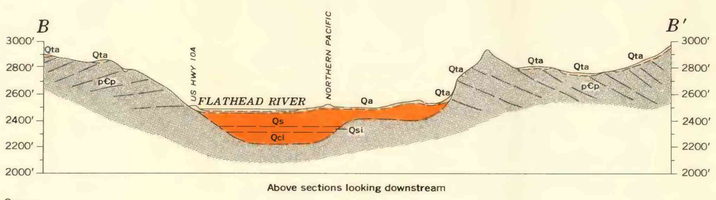


SCALE 1:9 600
1000 0 1000 2000 3000 FEET

CONTOUR INTERVAL 40 FEET
SUPPLEMENTAL 1 FOOT CONTOURS ON WATER SURFACE
DATUM IS MEAN SEA LEVEL

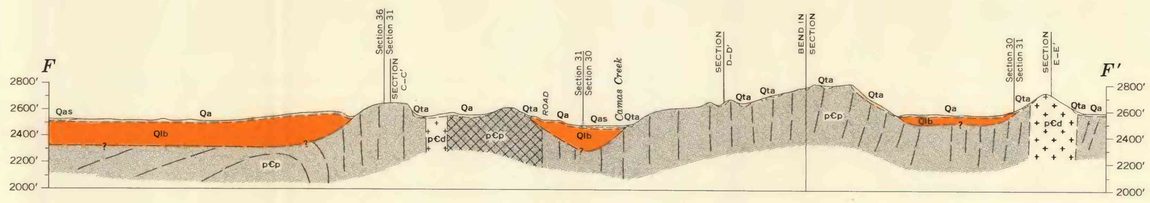
KNOWLES DAMSITE

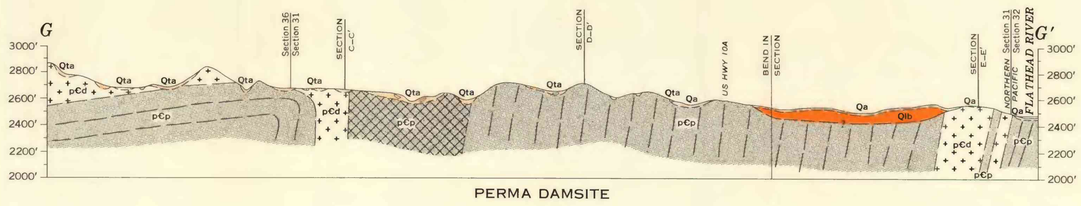




Above sections looking downstream

KNOWLES DAMSITE





PERMA DAMSITE

Base from U.S. Geological Survey River Survey, Knowles and Perma damsites, Montana, 1957, supplementary sheet to Flathead River, 1947

Geology by Kenneth S. Soward, 1957, 1958, and 1959

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1965—C63351

GEOLOGIC MAP AND SECTIONS OF KNOWLES AND PERMA DAMSITES, FLATHEAD RIVER, SANDERS COUNTY, MONTANA