

FIELD GEOLOGY MAPS

GEARY COUNTY, KANSAS

Preliminary Field Geology Maps for

**FORT RILEY NE
JUNCTION CITY
KANSAS FALLS
MILFORD
MILFORD DAM
WOODBINE**

1:24,000-Scale Quadrangles

Ronald R. West and Robert S. Sawin

**Kansas Geological Survey
Open-File Report 2007-10**

GEARY COUNTY, KANSAS

Copies of the field maps are open-filed at the Kansas Geological Survey, Lawrence, Kansas.

LEGEND

THESE MAPS INDICATE LITHOSTRATIGRAPHIC UNITS ONLY. NO TEMPORAL, GENETIC, OR RELATED DEPOSITIONAL ASPECTS ARE MEANT OR IMPLIED.

The stratigraphic sequence in this report is restricted to the interval from the Speiser Shale at the base to the Nolans Limestone at the top. Overlying these Permian rocks are Quaternary alluvium and terrace deposits and Holocene sand dunes.

Terminology of the left side of the Composite (Generalized) Lithologic Sequence is that of Zeller (1968), which agrees with Jewett (1941).

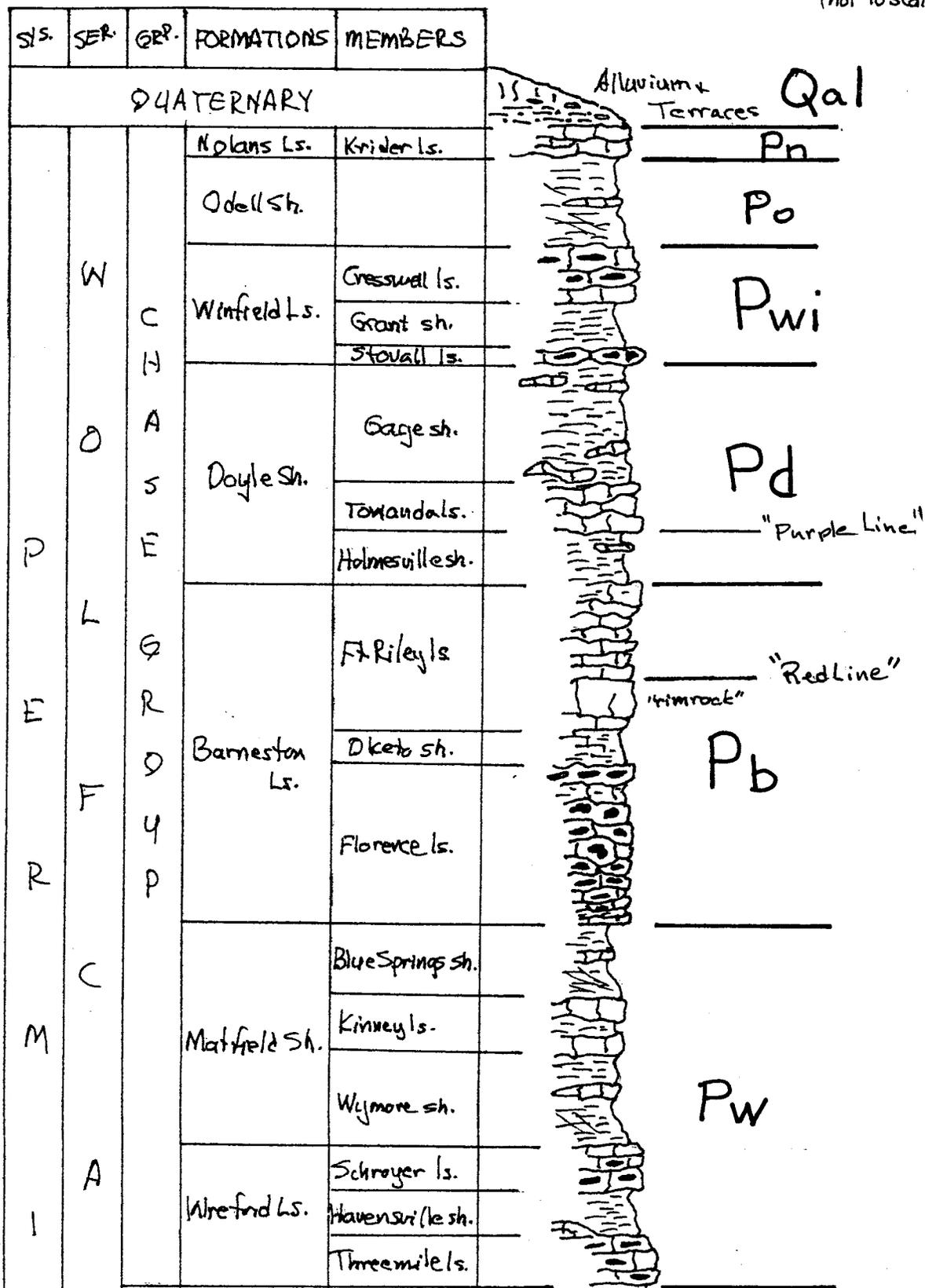
The following lithostratigraphic contacts were mapped in the Geary County quadrangles of this report:

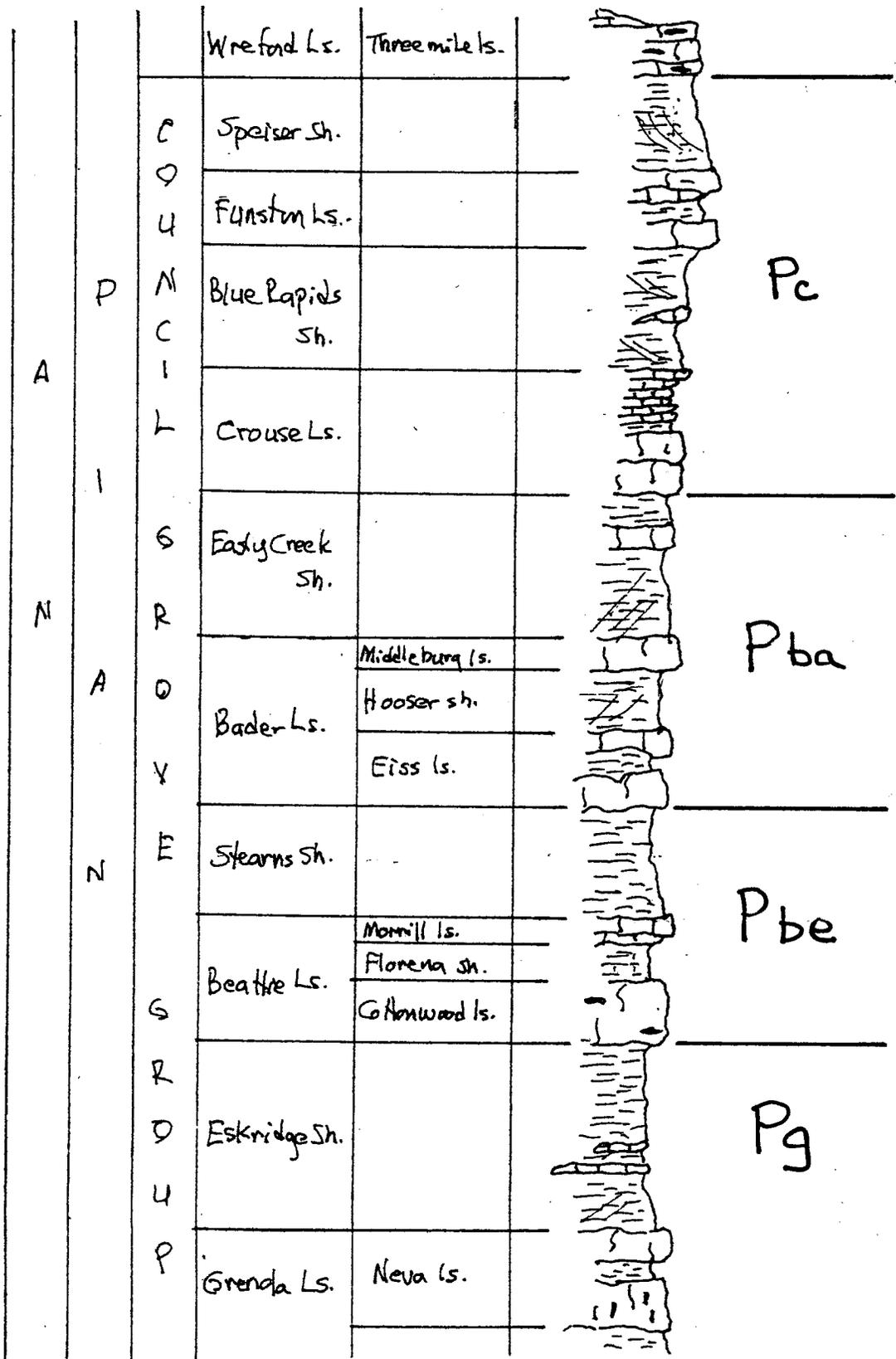
- Sand Dunes (shown as tan dune pattern)
- Quaternary alluvium and terrace deposits
- Base of the Nolans Limestone (Kridler Limestone member)
- Top of the Winfield Limestone (Cresswell Limestone member)
- Base of the Winfield Limestone (Stovall Limestone Member)
- Base of the Towanda Limestone Member of the Doyle Shale (Marker Bed shown as purple line)
- Top of the Barneston Limestone (Fort Riley Ls. member)
- Fort Riley Ls. "rimrock" (Marker Bed shown as red line)
- Base of Barneston Limestone (Florence Ls. member)
- Base of the Wreford Limestone (Threemile Ls. member)

Solid Line = Observed Contact

Dashed Line = Concealed Contact

COMPOSITE (GENERALIZED) LITHOLOGIC SEQUENCE
(not to scale)





FORT RILEY NE QUADRANGLE – GEARY CO.

EXPLANATION - CONTROL POINTS FOR THE GEARY COUNTY MAP ARE IDENTIFIED AS FOLLOWS:

(1) NUMBERS PRECEDED BY THE LETTER **G** REFER TO MEASURED SECTIONS IN THE GEARY COUNTY, KANSAS BOOKS IN THE FILES OF THE KANSAS GEOLOGICAL SURVEY, NUMBERING BEGAN AT FIRST SECTION IN THE BOOK AND PRECEDED SEQUENTIALLY TO THE LAST SECTION;

(2) NUMBERS PRECEDED BY THE LETTER **J** REFER TO MEASURED SECTIONS CONTAINED IN KGS BULL. 39 (JEWETT, 1941);

(3) NUMBERS PRECEDED BY THE LETTERS **GE** ARE SITES EXAMINED AND EVALUATED SPECIFICALLY FOR THIS MAPPING PROJECT; AND

(4) THERE ARE ALSO SITES INDICATED THAT ARE CONTAINED IN: a) A KSU MASTER'S THESIS BY VORAN (1977), b) A SOUTH-CENTRAL GSA GUIDEBOOK ON THE CROUSE LIMESTONE (1972), c) A KGS TECHNICAL SERIES 6 BY MAZZULLO, ET AL. (1997), AND d) A KSU MASTER'S THESIS BY GRIFFIN, 1974.

OBVIOUSLY, ANY GIVEN SITE MAY BE IDENTIFIED BY ANY ONE, TWO, THREE OR ALL FOUR OF THESE DESIGNATIONS.

NOTE: There are no data points in the Geary County, Kansas part of the Fort Riley NE quadrangle (Fort Riley Military Reservation) .

JUNCTION CITY QUADRANGLE – GEARY CO.

EXPLANATION - CONTROL POINTS FOR THE GEARY COUNTY MAP ARE IDENTIFIED AS FOLLOWS:

(1) NUMBERS PRECEDED BY THE LETTER **G** REFER TO MEASURED SECTIONS IN THE GEARY COUNTY, KANSAS BOOKS IN THE FILES OF THE KANSAS GEOLOGICAL SURVEY, NUMBERING BEGAN AT FIRST SECTION IN THE BOOK AND PRECEDED SEQUENTIALLY TO THE LAST SECTION; THESE MEASURED SECTIONS ARE ALSO AVAILABLE ONLINE AT THE KGS WEBSITE AT

<http://www.kgs.ku.edu/General/Geology/Measured/index.html>;

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G-5 = Sequence from the Schroyer limestone to the Holmesville Formation (present understanding would identify the sequence as measured and described as being from mudrocks in the Speiser Shale to the Towanda limestone) one mile East of Junction City, Kansas; near Center of NW1/4, SE1/4, Sec. 7, T.12S., R.6E., Geary Co., Kansas; measured and described by Elias in 1932; same as J-66.

G-6 = same as G-5 = J-66.

G-7 = Sequence from the Crouse Limestone just above water level in the Smoky Hill River to the Towanda limestone; near Center, Sec. 7, T.12S., R.6E., Geary Co., Kansas; measured by Jewett based on the graphics, undated.

G-8 = Sequence from the Fort Riley limestone to the Towanda limestone 2 miles West of Junction City, Kansas on U. S Highway 40; SE cor. Sec. 15, T.12S., R.5E., Geary Co., Kansas; measured and described by Elias in 1932; same as J-65.

G-9 = Sequence from the Florence limestone into the Fort Riley limestone at the Walker Cut Stone Co.; just SW of the enter of NW1/4, Sec. 10, T.12S., R.5E., Geary Co., Kansas; measured and described by Ives in 1953.

G-14 = Sequence from the Havensville shale into the Fort Riley limestone; Sec. 9, T.12S., R.6E., Geary Co., Kansas; measured by Jewett, 1930; same as J-67.

G-16 = Sequence from the Wymore shale into the Blue Springs shale (Matfield Shale) in spur of upland southeast (this locality is southwest of Junction City, Kansas) of Junction

City, Kansas; Sec. 15, T.12S., R.5E., Geary Co., Kansas; measured and described by Condra & Upp, (Section 15, p. 39), 1931.

G-18 = Wreford Limestone sequence from the Fourmile limestone (now Threemile limestone) into the Schroyer limestone in spur of upland southeast of Junction City, Kansas; Sec.12, T. 12S., R.5E., Geary Co., Kansas; measured, described, and published by Condra & Upp, (Section 12, p. 35), 1931.

G-19 = Sequence and descriptions of lithologies suggest the interval from the upper Wymore shale into the Fort Riley limestone; section at Mill by the bridge over the Smoky Hill River a little South and East of Junction City, Kansas; Sec. 7, T.12S., R.6E., Geary Co., Kansas; measured, described, and published by Sellards & Beede, 1905 (pp.93-94).

J-56 = Sequence from upper Wymore shale to the Towanda limestone exposed in Sec. 22, T.11S., R.5E., Geary Co., Kansas.

J-65 = Same as G-8.

J-66 = Same as G-5 and G-6.

J-67 = Same as G-14.

GE-82 = Road cut exposure of lower Barneston (Florence) Limestone in road cut on the North side of Junction Road with base of Florence limestone at 378m (1240'); 1 digital photo; near Center of South line of Sec. 10, T.12S., R.6E., Geary Co., Kansas.

GE-217 = Road cut exposure of upper Barneston (Fort Riley) Limestone, Oketo shale, and upper Florence limestone) Limestone on the South side of Junction Road, base of Fort Riley "Rim Rock" at 390m (1280'), Oketo shale is very thin here; 1 digital photo; approx. 150' West of Center of North line NE1/4, NW1/4, Sec. 15, T.12S., R.6E., Geary Co., Kansas.

GE-218 = Road cut exposure of upper Barneston (Fort Riley) Limestone on the Southwest side of Kansas Highway 57 with the base of the "Rim Rock" at 390m (1280'); 1 digital photo "on the run"; Northwest of Center of SE1/4, NE1/4, NW1/4, Sec. 15, T.12S., R.6E., Geary Co., Kansas.

GE-219 = Road cut exposure of upper Barneston (Fort Riley) Limestone on the North side of Kansas Highway 57 at Franks Hill with the base of the "Rim Rock" at 384m (1260'); 1 digital photo without a scale; near Center of west line SW1/4, NE1/4, NW1/4, Sec. 9, T.12S., R.6E., Geary C., Kansas; location of the Fort Riley limestone recorded in G-14 and J-67. Measured section 13 in Griffith (1974) measured and described 4.34m (14') of Oketo shale in SE1/4, NW1/4, Sec. 9, T.12S., R.6E., Geary Co., Kansas in a road cut on the North side of Kansas Highway 57, 0.5 miles Southeast of Kansas Highway 57 and Interstate Highway 70 intersection.

GE-220 = Road cut exposure of lower Barneston (Florence) Limestone on the North side of Kansas Highway 57 at Franks Hill with the base of the Florence limestone at 372m

(1220'); 1 digital photo without scale; near Center of NW1/4, NW1/4, Sec. 9, T.12S., R.6E., Geary Co., Kansas; location of Florence limestone recorded in G-14 and J-67.

GE-221 = Good exposure of Matfield (Kinney limestone and upper Wymore shale) Shale at a small parking area on the Northeast side of Kansas Highway 57 at Franks Hill with the base of the Kinney limestone at 357m (1171'); 1 digital photo with scale in dm; just West of the Center of the South line of NE1/4, NE1/4, NE1/4, Sec. 8, T.12S., R6E., Geary Co., Kansas; location of Kinney limestone recorded in G-14 and J-67.

GE-222 = Road cut exposures of upper Wreford (Schroyer) Limestone on both sides of Kansas Highway 57 just South and East of a Roadside Park, with the top of the Schroyer at 350m (1148'); 1 digital photo with scale in dm taken of exposure on the Northeast side of highway; just South and West of Center of North line of NE1/4, NE1/4, Sec. 8, T.12S., R.6E., Geary Co., Kansas; location of Schroyer limestone recorded in G-14 and J-67.
NOTE: Measured section 112 of Mazzullo, et al. (1997) measured and described the Schroyer limestone and Wymore shale at "Roadcut on Frank's (sic) Hill, N/2, sec. 9, T. 12S., R.6E., Geary County, Texas (sic)". Their location is incorrect as the Schroyer limestone and Wymore shale are exposed in Section 8 as given above for this site and GE-221.

GE-223 = Hillside exposure of upper Barneston (Fort Riley) Limestone at Freedom Park with the base of the "Rim Rock" at 386m (1266') and lower down the slope the approx. top of the Wreford (Schroyer) Limestone is at 350m (1148'); 2 digital photos without scales, one close-up and one wide angle; near Center of SE1/4, SE1/4, NE1/4, Sec. 4, T.12S., R.6E., Geary Co., Kansas.

GE-224 = Road cut exposure of lower Wreford (Threemile) Limestone and upper Speiser Shale on both sides of Kansas Highway 57 and Alternate U. S. Highway 40 on the East side of the bridge over the Smoky Hill River, base of Threemile limestone is best exposed on the North side of the highway at 335m (1099'); 2 digital photos, one on South side of highway with scale in dm and one on North side without scale; just North and West of East line of NW1/4, NE1/4, Sec. 7, T.12S., R.6E., Geary Co., Kansas.

GE-225 = Road cut exposure on the South side on Interstate Highway 70 of sequence from the lower Barneston (Florence) Limestone down to the Matfield (Wymore) Shale with the base of the Florence limestone at 370m (1214'); 1 digital photo taken from the North side of I-70 without scale; approx. 150' South and 300' West of the Center of East line of NW1/4, NW1/4, Sec. 8, T.12S., R.6E., Geary Co., Kansas.

GE-226 = Road cut exposures of upper Barneston (Fort Riley) Limestone on both sides of Old Stage Road with the base of the "Rim Rock" at 378m (1240'); 1 digital photo with scale in dm; near Center of South 1/2, NW1/4, Sec. 17, T.12S., R.6E., Geary Co., Kansas.

GE-227 = Road cut exposure of lower Barneston (Florence) Limestone on the Northeast side of Old Stage Road with base of Florence limestone at 367m (1204'); 1 digital photo with scale in dm; near Center of West line of NE1/4, NE1/4, NE1/4, Sec. 18, T.12S., R.6E., Geary Co., Kansas.

GE-228 = Road cut exposures of upper Barneston (Fort Riley) Limestone on the Southeast side of J Hill Road with the base of the “Rim Rock” at 377m (1237’); 1 digital photo with scale in dm; approx. 200’ East and 300’ North of Center of South line SW1/4, SE1/4, Sec. 7, T.12S., R.6E., Geary Co., Kansas; this is the general area of sections G-5, G-6, G-7, and J-66.

GE-229 = Road cut exposure of lower Barneston (Florence) Limestone on the Northeast side of Old Stage Road with base of Florence limestone at 365m (1197’); 1 digital photo with scale in dm; near Center of SW1/4, SE1/4, NE1/4, Sec. 7, T.12S., R.6E., Geary Co., Kansas; about 0.2 miles Southeast of the probable location of G-19.

GE-230 = New home construction exposure of upper Barneston (Fort Riley) Limestone on the West side of Webster Avenue in Junction City, Kansas with base of the “Rim Rock” at 370m (1214’); 1 digital photo with scale in dm; just South of Center of North1/2, NE1/4, Sec 14, T.12S., R.5E., Geary Co., Kansas.

GE-231 = Road cut exposure of lower Barneston (Florence) Limestone on the West side of Webster Avenue in Junction City, Kansas with the base of the Florence limestone at 358m (1174’); 1 digital photo with scale in dm; approx. 100’ East of Center of NE1/4, Sec. 14, T.12S., R.5E., Geary Co., Kansas. NOTE: According to Chaplin (1988) the type locality of the Fort Riley limestone is 0.25 miles Southeast of GE-231.

GE-232 = Exposure of upper Barneston (Fort Riley) Limestone on the South side of visitors parking lot of the Geary Co. Unified Schools – Mary E. Devin Center for Education Support at 123 N. Eisenhower Street in Junction City, Kansas with the base of the “Rim Rock” at 370m (1214’); 1 digital photo with scale in dm; approx. 200’ North and 100’ East of center of West1/2, sec. 11, T.12S., R.5E., Geary Co., Kansas.

GE-233 = Excellent road cut exposure of Barneston (Florence limestone, Oketo shale and lower Fort Riley limestone) Limestone on the North side of new reroute of old U. S. Highway 40 on the South side of The Bluffs development South of Junction City, Kansas with the base of the “Rim Rock” at 365m (1197’); 1 digital photo without scale; approx. 100’ West of Center of SW1/4, SE1/4, Sec. 15, T.12S., R.5E., Geary Co., Kansas.

GE-234 = Excellent road cut exposure of upper Matfield (Blue Springs) Shale and lower Barneston (Florence) Limestone on the East side of new reroute of old U. S. Highway 40, South and East of GE-233 with the base of the Florence limestone at 352m (1155’); 1 digital photo with scale in dm; near Center of South line of SE1/4, Sec. 15, T.12S., R.5E., Geary Co., Kansas. NOTE: G-8 (J-65) is 0.25 miles due East of this GE-234 and reported the sequence from the Fort Riley limestone to the Towanda limestone.

NOTE: Sections G-16 of the Matfield Shale, Measured section 3 of Griffith (1974) of the Oketo shale, and Section 13 of Miller (1992) of the Barneston Limestone are located within Section 15, T.12S., R.5E., Geary Co., Kansas.

GE-235 = Exposure in old quarry (now being developed for housing) of the upper Barneston (Fort Riley) Limestone on the East side of Spring Valley Road in western Junction City, Kansas with the base of the “Rim Rock” at 360m (1181’); 1 digital photo

with scale in dm; near Center of South line of NW1/4, NW1/4, Sec. 10, T.12S., R.5E., Geary Co., Kansas; this is close to the location given for G-9 that reports an excellent exposure of the Barneston Limestone at the Walker Cut Stone Co. quarries.

GE-236 = Excellent road cut exposures of the upper (lower Fort Riley limestone and upper Oketo shale) Limestone on both sides of 6th Street in Junction City, Kansas just East of the entrance to the Country Club and Welcome to Junction City sign with the base of the “Rim Rock” at 363m (1191’); 1 digital photo with scale in dm; approx. 250’ West of the SE cor. Sec. 3, T.12S., R.5E., Geary Co., Kansas.

GE-237 = Road cut exposure of upper Barneston (Fort Riley) Limestone on the West side of Oakridge Drive in an area of old quarries with base of “Rim Rock” at 360m (1181’); 1 digital photo with scale in dm; near Center of NE1/4, Sec. 10, T.12S., R.5E., Geary Co., Kansas.

GE-238 = Excellent road cut exposures of upper Barneston (lower Fort Riley limestone and upper Oketo shale) Limestone on both sides of intersection between U. S. Highway 77 and Kansas Highway 18 (also Junction City, Kansas 6th Street), base of “Rim Rock” recorded on the Southwest side of the Southwest ramp of the intersection at 362m (1188’); 1 digital photo with scale in dm; just South of Center of NW1/4, NE1/4, NW1/4, Sec. 10, T.12S. R.5E., Geary Co., Kansas; this is also the location of Measured section 11 in Griffith (1974).

GE-239 = Road cut exposure of upper Barneston (Fort Riley) Limestone on the East side of Spring Valley Road in the western part of Junction City, Kansas with base of the “Rim Rock” at 360m (1181’); 1 digital photo with scale in dm; near Center of West line of SW1/4, SW1/4, Sec. 3, T.12S., R.5E., Geary Co., Kansas.

GE-240 = Excellent hillside exposure of upper Matfield (upper Blue Springs shale) Shale and lower Barneston (Florence) Limestone on the West side of Custer Road just North of the intersection of Custer Road and Marshall Drive in the Westwood area of Junction City, Kansas with the base of the Florence limestone at 348m (1142’); 1 digital photo without scale; 0.15 miles North of the SE cor. Sec. 34, T.11S. R.5E., Geary Co., Kansas.

GE-241 = Good road cut exposure of upper Barneston (Fort Riley) Limestone on the East side of Thompson Road with base of the “Rim Rock” at 361m (1184’); 1 digital photo with scale in dm; approx. 200’ East and 150’ South of Center Sec. 3, T.12S., R.5E., Geary Co., Kansas.

GE-242 = Road cut exposure of lower Barneston (Florence) Limestone on the East side of Thompson Road just North of the intersection with Westwood Blvd.; base of Florence limestone at 350m (1133’); 1 digital photo with scale in dm; approx. 1150’ Southeast of Center Sec. 3, T.12S., R.5E., Geary Co., Kansas.

GE-243 = Road cut exposure of upper Barneston (Fort Riley) Limestone on the East side of U. S. Highway 77 & Kansas Highway 18 with the base of the “Rim Rock” at 361m (1184’); 1 digital photo without scale; near Center of N1/2, SW1/4, sec. 3, T.12S., R.5E., Geary Co., Kansas.

GE-244 = Road cut exposure of upper Barneston (Fort Riley) Limestone on the Northwest side of Walla Walla Road with base of “Rim Rock” at 356m (1197’); 1 digital photo with scale in dm; approx. 250’ South of Center of North line of NE1/4, NE1/4, Sec. 33, T.11S., R.5E., Geary Co., Kansas.

GE-245 = Exposure of middle Doyle (Towanda limestone) Shale in road ditch on the East side of Walla Walla Road with base of Towanda limestone at 373m (1224’); 1 digital photo with scale in dm; near Center of West line of Sec. 34, T.11S., R.5E., Geary Co., Kansas. NOTE: sequence from the Barneston (Florence) Limestone to the Doyle (Towanda limestone) Shale was measured along the West side of U. S. Highway 77 approx. 200’ due East of GE-245 as follows: 5.6’ = Oketo, 35.2’ = Fort Riley, 12.4’ = Holmesville, and 6.0+’ = Towanda; 6 digital photos with scale in dm as follows: 1 of the Oketo-Fort Riley contact, 1 of the “Rim Rock”, 1 of the top of Fort Riley, 2 of the Holmesville, and 1 of the upper Holmesville and Towanda. Measured section 2 of Griffith (1974) measures and describes 2.52m (9.6’) of Oketo on the East side of U. S. Highway 77 at this site.

GE-246 = Road cut exposure of upper Barneston (Oketo shale and Fort Riley limestone) Limestone and lower Doyle Shale on the East side of U. S. Highway 77 with base of “Rim Rock” at 360m (1181’); 1 digital photo with scale in dm; approx. 100’ North of Center of NW1/4, Sec. 22, T.11S., R.5E., Geary Co., Kansas. NOTE: Measured section 1 of Griffith (1974) measures and describes 3.73m (12.2’) of Oketo on the East side of U. S. Highway 77 but located, erroneously, the sequence in the NW1/4, SE1/4, SE1/4 of Sec. 22.

GE-247 = Road cut exposure of upper Barneston (Oketo shale and Fort Riley limestone) Limestone and lower Doyle Shale on the West side of U. S. Highway 77 with the base of the Towanda limestone at 371m (1217’); 1 digital photo without scale; approx. 300’ Northwest of GE-246 near Center of SE1/4, NW1/4, NW1/4, Sec. 22, T.11S., R.5E., Geary Co., Kansas. NOTE: section J-56, sequence from the upper Wymore shale to the Towanda limestone is located in Sec. 22, T.11S., R.5E., Geary Co., Kansas.

GE-248 = Excellent road cut exposures of middle Doyle (Towanda limestone) Shale on both sides of U. S. Highway 77 with the base of the Towanda limestone at 370m (1214’); 1 digital photo with scale in dm; approx. 200’ North of the Center of the South1/2, SW1/4, Sec. 15, T.11S., R.5E., Geary Co., Kansas.

NOTE: Measured Section 110A of Mazzullo, et al., 1997 is a composite based on road cut exposures from the NW1/4, Sec. 22 and the SW1/4, Sec. 15, T.11S., R.5E., Geary Co., Kansas.

GE-249 = Road cut exposure of the upper Barneston (Fort Riley) Limestone on the Northwest side of old U. S. Highway 77 with base of “Rim Rock” at 355m (1165’); 1 digital photo with scale in dm; approx. 200’ East of the SW cor. of SW1/4, NW1/4, NE1/4, Sec. 15, T.11S., R.5E., Geary Co., Kansas.

GE-250 = Exposure in road ditch of Winfield [Stovall (lower cherty bed)] Limestone on East side of road with the base of the Stovall limestone at 389m (1276'); area of old quarries, probably the Towanda limestone; 1 digital photo without scale; near Center of west line of NW1/4, NW1/4, SW1/4, Sec. 2, T.11S., R.5E., Geary Co., Kansas.

GE-251 = Exposure in road ditch of Winfield [Stovall (lower cherty bed)] Limestone on East side of Old Quarry Road with the base of the Stovall limestone at 385m (1263'); 1 digital photo with scale in dm.; near Center of west line of SW1/4, SW1/4, SW1/4, Sec. 3, T.11S., R.5E., Geary Co., Kansas.

GE-272 = Hillside exposure on the North side of old U. S. Highway 40, now Golden Belt Blvd, at the site of an excavation for new construction and thus probably only temporarily available; sequence from the upper bed of the Wreford (Schroyer) Limestone through part of the Matfield Shale (Wymore shale, Kinney limestone and lower beds of the Blue Springs shale), top of the Wreford (Schroyer) Limestone at 338m (1109'); two digital photos; just North of Center of NE1/4, SE1/4, SW1/4, Sec. 14, T.12S., R.5E., Geary Co., Kansas.

KANSAS FALLS QUADRANGLE – GEARY CO.

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GE-183 = Top of Barneston (Fort Riley) Limestone at 1251' in Zimmerman Road with red mudrock above; 1 digital photo; approx 200' South of Center S1/2, Sec. 21, T.13S., R.5E., Geary Co., Kansas.

GE-184 = Base of Towanda Limestone Member, Doyle Shale, in Zimmerman Road at 1262'; 1 digital photo; approx. 100' South of Center N1/2, Sec. 21, T.13S., R.5E., Geary Co., Kansas.

GE-185 = Base of Fort Riley "Rim Rock" at 1201' in Zimmerman Road and in fields on both sides of road; 1 digital photo; approx. 250' South of Center of North line, Sec. 21, T.13S., R.5E., Geary Co., Kansas.

GE-192 = Base of Fort Riley "Rim Rock" at 1200' along West side of Beck Road; 1 digital photo; approx. 250' South of Center of N1/2, Sec. 4, T.13S., R.5E., Geary Co., Kansas.

GE-193 = Base of Fort Riley "Rim Rock" at 1185' along East side of Beck Road; 1 digital; photo; approx. 150' East and 300' north of Center of South line, Sec. 33, T.12S., R.5E., Geary Co., Kansas.

GE-194 = Base of Barneston (Florence) Limestone at 1154' along Southeast side of junction of Beck Road and River Road; 1 digital photo; approx. 300' East of Center of S1/2, Sec. 33, T.12S., R.5E., Geary Co., Kansas.

GE-197 = Base (covered) of Towanda Limestone Member, Doyle Shale, at 1245' in road cut on east side of Beck Road; 1 digital photo; approx. 350' South of Center, Sec. 4, T.13S., R.5E., Geary Co., Kansas.

GE-198 = Good base of Towanda Limestone Member, Doyle Shale, at 1222' in road cuts on both sides of Schuler Road; 1 digital photo; Center of West line, Sec. 7, T.13S. R.5E., Geary Co., Kansas.

GE-199 = Base of Towanda Limestone Member, Doyle Shale, at 1211' in road cuts on both sides of Latzke Road; 1 digital photo; near Center of South line of N1/2, SW1/4, Sec. 18, T.13S., R.5E., Geary Co., Kansas.

GE-200 = Base of Fort Riley "Rim Rock" at 1170' in road cut on South side of Latzke Road and in drainage on North side of road; 1 digital photo; approx. 800' West of Center of East line, Sec. 18, T.13S., R.5E., Geary Co., Kansas.

GE-201 = Base of Fort Riley "Rim Rock" at 1184' in N. Latzke Road, poor exposure, could be the "second" bench in the Fort Riley limestone; 1 digital photo; approx. 550' North of Center of south line, Sec. 8, T.13S., R.5E., Geary Co., Kansas.

GE-202 = Base of Fort Riley "Rim Rock" at 1175' along ridge on East side of Lyons Creek Road; 1 digital photo; Center of South line, NE1/4, NW1/4, Sec. 20, T.13S., R.5E., Geary Co., Kansas.

GE-203 = Base of Towanda limestone Member, Doyle Shale, at 1198' in road ditch (poorly exposed) on West side of Schuler Road; 1 digital photo; approx. 175' North of Center of West line, Sec. 19, T.13S., R.5E., Geary Co., Kansas.

GE-204 = Base of Fort Riley "Rim Rock" at 1195' in field on South side of Kickapoo School Road; 1 digital photo; approx. 600' South of Center of North line, Sec. 29, T.13S., R.5E., Geary Co., Kansas.

GE-205 = Base of Fort Riley "Rim Rock" at 1174' in pasture on both sides of road along the Geary - Dickinson county line with Oketo shale exposed below, excellent exposure; 1 digital photo; approx. 350' South of Center of West line, Sec. 36, T.13S., R.4E., Dickinson Co., Kansas and approx. 350' South of Center of East line, Sec. 31, T.13S., R.5E., Geary Co., Kansas.

GE-206 = Base of the Barneston (Florence) Limestone at 1145' in road cut on North side of Lyons Creek Road with Matfield (Blue Springs) Shale exposed below; 1 digital photo; Center S1/2, NE1/4, Sec. 31, T.13S., R.5E., Geary Co., Kansas.

GE-207 = Base of Fort Riley "Rim Rock" at 1200' in road cut on North side of Kansas Highway 157 with Oketo shale exposed below, excellent exposure; 1 digital photo; near Center of South line SE1/4, SW1/4, Sec.29, T.13S., R.5E., Geary Co., Kansas.

GE-208 = Possible base of Towanda Limestone Member, Doyle Shale, at 1260' in road cut on both sides of Kansas Highway 157; 1 digital photo; near Center of South line, SW1/4, SE1/4, Sec. 29, T.13S., R.5E., Geary Co., Kansas.

GE-210 = Sequence from Matfield (upper Wymore, Kinney, and Blue Springs) Shale to lower Barneston (Florence) limestone exposed in road cut on East side of Britt Road, base of Barneston (Florence) Limestone at 1135', 17' of Blue Springs shale with Kinney limestone at 1118', Kinney is a thin bedded, highly fossiliferous argillaceous carbonate overlain by a thin grayish mudrock with a thick bed of hard, dense limestone at the top; 2 digital photos; approx. 200' West and 200' North of Center of South line, NW1/4, Sec. 28, T.12S., R.5E. Geary Co., Kansas.

NOTE: this is the location of measured section 111 of Mazzullo, et al. (1977, pp. 185-186) who reported the following thicknesses; Florence = 8'5", Blue Springs = 12'3", Kinney = 19'6", and Wymore = 8'8".

GE-211 = Base of Fort Riley "Rim Rock" at 1178' in road ditch and in field East of Britt Road; 1 digital photo; approx. 100' West of Center of North line NW1/4, Sec. 28, T.12S., R.5E., Geary Co., Kansas.

GE-212 = Sand "borrow" pit South of Old U. S. Highway 40; 1 digital photo; approx. 175' South of North line, SE1/4, Sec. 20, T.12S., R.5E., Geary Co., Kansas.

GE-213 = Base of Fort Riley "Rim Rock" at 1135' in ditch on West side of Crider Road just North of West bound lane on I-70 (underpass); 1 digital photo; approx. 450' South of NE cor., Sec. 24, T.12S., R.4E., Geary Co., Kansas.

GE-214 = Base of Fort Riley "Rim Rock" at 1135' in West facing hillside North of Kansas Falls Road; 1 digital photo; approx. 250' East and 125' North of Center of South line, SW1/4, NE1/4, Sec.24, T.12S., R.4E., Geary Co., Kansas.

GR-215 = Near base of Towanda Limestone Member, Doyle Shale, at 1235' in a new quarry; 2 digital photos; approx. 150' East and 300' South of Center of West line, Sec. 5, T.13S., R.5E., Geary Co., Kansas.

GE-216 = Exposure of sequence from the lower Barneston (Florence) Limestone along the Smoky Hill River to the lower part of the Towanda Limestone Member, Doyle Shale (or limestone in the Holmesville?), in an old quarry face, see graphic section, base of Fort Riley "Rim Rock" at approx. 1142' and base of Towanda Limestone Member, Doyle Shale at approx. 1180'; 3 digital photos; just South of Center of West line, SE1/4, SW1/4, NE1/4, Sec. 36, T.12S., R.4E., Dickinson Co., Kansas.

NOTE: At the junction of Interstate 70 and Milford Lake Road either these are limestone beds of the upper Fort Riley Limestone Member (Barneston Limestone) or the limestone in the Holmesville Shale Member (Doyle Shale).

MILFORD QUADRANGLE – GEARY CO.

EXPLANATION - CONTROL POINTS FOR THE GEARY COUNTY MAP ARE IDENTIFIED AS FOLLOWS:

(1) NUMBERS PRECEDED BY THE LETTER **G** REFER TO MEASURED SECTIONS IN THE GEARY COUNTY, KANSAS BOOKS IN THE FILES OF THE KANSAS GEOLOGICAL SURVEY, NUMBERING BEGAN AT FIRST SECTION IN THE BOOK AND PRECEDED SEQUENTIALLY TO THE LAST SECTION; THESE MEASURED SECTIONS ARE ALSO AVAILABLE ONLINE AT THE KGS WEBSITE AT

<http://www.kgs.ku.edu/General/Geology/Measured/index.html>;

(2) NUMBERS PRECEDED BY THE LETTER **J** REFER TO MEASURED SECTIONS CONTAINED IN KGS BULL. 39 (JEWETT, 1941);

(3) NUMBERS PRECEDED BY THE LETTERS **GE** ARE SITES EXAMINED AND EVALUATED SPECIFICALLY FOR THIS MAPPING PROJECT; AND

(4) THERE ARE ALSO SITES INDICATED THAT ARE CONTAINED IN: a) A KSU MASTER'S THESIS BY VORAN (1977), b) A SOUTH-CENTRAL GSA GUIDEBOOK ON THE CROUSE LIMESTONE (1972), c) A KGS TECHNICAL SERIES 6 BY MAZZULLO, ET AL. (1997), AND d) A KSU MASTER'S THESIS BY GRIFFIN, 1974.

OBVIOUSLY, ANY GIVEN SITE MAY BE IDENTIFIED BY ANY ONE, TWO, THREE OR ALL FOUR OF THESE DESIGNATIONS.

GE-252 = Exposure of Doyle (Towanda limestone) Shale in Access Area on the North side of Milford Lake, top of Towanda limestone at 349m (1145'); two digital photos, one of upper beds and one of lower beds; near Center of NE1/4, NW1/4, NE1/4, Sec. 11, T.10S., R.4E., Geary Co., Kansas.

GE-253 = Exposure of Winfield Limestone along road on the North side of Milford Lake; Stovall limestone = +1.0', Grant shale = 11.5', Creswell limestone = 2.5 to 3.0' with the base of the Cresswell limestone at 363m (1191); two digital photos, one of Stovall and one of Cresswell; about 250' South and 150' east of North line, SW1/4, SW1/4, Sec. 2, T.10S., R.4E., Geary Co., Kansas.

GE-254 = Excellent exposure of Doyle (Towanda limestone) Shale overlain by Pleistocene units along North shore of Milford Lake with some red mudrocks of the Gage shale exposed between the Towanda limestone and Pleistocene units (measure and describe for County Report); top of Towanda limestone at 355m (1165') with upper bed massive (approx. 8dm thick), mudcracked, vuggy, and brecciated, possibly bored; three digital photos, one of Gage and Towanda, one of Towanda, and a close-up of the top of the Towanda; just North of Center of SE1/4, SW1/4, SW1/4, Sec. 2, T.10S., R.4E., Geary Co., Kansas.

Point A = Probable Cresswell limestone exposed on North side of Kansas Highway 82 at +365m (1197'); near Center of North line NW1/4, NE1/4, NE1/4, Sec. 2, T.10S., R.4E., Geary Co., Kansas.

Point B = Towanda limestone (no top, no base) along the West side of the Madison Creek arm of Milford Lake; one digital photo of surface of a limestone block with very well preserved mudcracks; near Center NW1/4, SW1/4, Sec.7, T.10S., R.5E., Geary Co., Kansas.

GE-255 = Exposure of Winfield (Cresswell) Limestone on the NE side of an old quarry (miss labeled as a gravel pit), base of Cresswell limestone at 371m (1217'); one digital photo; near Center of South line NW1/4, NW1/4, NW1/4, Sec. 7, T.10S., R.5E., Geary Co., Kansas.

GE-256 = Exposure of Winfield (Stovall) Limestone approx. 1.0' thick on South side of an old quarry (miss labeled as a gravel pit), top of Stovall at 367m (1204'); one digital photo; approx. 100' East of Center of West line, NW1/4, NW1/4, Sec. 7, T.10S., R5E., Geary Co., Kansas.

GE-257 = Exposure of Doyle (Towanda limestone) Shale on the East side of the Madison Creek arm of Milford Lake with approx. 8.0' of Towanda limestone and 10.0' (mostly covered) of underlying mudrock (Holmesville shale?) and 2.0' of what appears to be a mostly covered limestone bed (see graphic section), base of Towanda limestone at 355m (1165'); two digital photos; near Center of South1/2, sec. 7, T.10S., R.5E., Geary Co., Kansas.

GE-258 = Top of Towanda limestone at 358m (1174') on a grassy slope on the North side of access road to Milford Lake, approx. 0.25 mile due North of GE-257; one digital photo; near Center of Sec. 7, T.10S., R.5E., Geary Co., Kansas.

GE-259 = Road cut exposure of Winfield Limestone on the NE side of U. S. Highway 77 with the base of the Stovall limestone at 373m (1224'); three digital photos, one of exposure on NE side of highway, one of the Cresswell limestone on the SW side of highway, and one of the upper Grant shale and Cresswell limestone on the NE side of highway; approx. 100' South of Center of North line of SW1/4, SE1/4, NE1/4, Sec.7, T.10S., R.5E., Geary Co., Kansas. NOTE: This is the location of Sec. 117 (Mazxzullo, et al. (1997).

GE-260 = Limestone exposure, Towanda (see graphic section), West of Milford Cemetery along the East shore of Milford Lake, top of a massive, vuggy bed at 352m (1155'), above this bed is 5.5 feet of mudrock overlain by +4.0' of thin to platy bedded limestone; five digital photos; near Center of South line of SE1/4, SW1/4, NE1/4, Sec. 18, T.10S., R5E., Geary Co., Kansas.

GE-261 = Road cut exposure of Winfield (Stovall) Limestone and Doyle (Gage) Shale along NE side of U. S. Highway 77 with Stovall limestone at 380m (1247'), good exposure of Gage shale; three digital photos, one of Stovall and two of the Gage; approx. 200' East and 250' North of Center of SW1/4, NE1/4, Sec. 29, T.10S., R5E., Geary Co., Kansas. NOTE: This is the location of Sec. 116 of Mazzullo, et al. (1997).

GE-262 = Exposure of Doyle (Towanda limestone and lithologies 8 to 10' below [see graphic section]) along the North side of an access road to the Farnum Creek arm of

Milford Lake, base of Towanda at 357m (1173'); three, overlapping digital photos; near Center of SW1/4, SE1/4, NW1/4, Sec. 29, T.10S., R.5E., Geary Co., Kansas.

GE-263 = Exposure about 0.25 mile NW of GE-262 with the sequence overlapping (?) and below that at GE-262 (see graphic section); elevation of what is Towanda? is at 353m (1157'); five digital photos, one of all exposed beds, one of surface with molds of bivalves, one of the lower beds, one of the middle beds, and one of the upper beds; Center SW1/4, NW1/4, Sec. 29, T.10S., R.5E., Geary Co., Kansas. NOTE: This sequence is only exposed because the water level in the lake is very low.

GE-264 = Road cut exposure of Winfield (Stovall limestone, Grant shale, and Cresswell limestone) Limestone along the NE side of U. S. Highway 77 North of Rush Creek with the base of the Stovall at 378m (1240'); two digital photos, one of base of Stovall and the other of the sequence above Stovall; approx. 250' East of Center of NE1/4, NW1/4, SE1/4, Sec. 29, T.10S., R.5E., Geary Co., Kansas.

GE-265 = Road cut exposure of Winfield (Cresswell) Limestone on both sides of U. S. Highway 77, erosional top of the Cresswell at 384m (1260') with 2 to 3' of overlying soil on East side of Highway; two digital photos; near Center of West line of NW1/4, SE1/4, SE1/4, Sec. 29, T.10S., R.5E., Geary Co., Kansas.

GE-266 = Lake shore exposure of Doyle (upper Holmesville shale and lower Towanda limestone) Shale with base of Towanda limestone at 347m (1138'), see graphic section; four digital photos; near Center of SE1/4, Sec. 24, T.10S., R.4E., Geary Co., Kansas.

GE-267 = Exposure of Doyle (12.5' of Towanda limestone and 15 to 20 feet of Gage shale above) Shale in an old quarry, top of Towanda limestone at 354m (1161'); six digital photos; approx. 300' East of S1/2 of SW1/4, Sec. 24, T.10S., R.4E., Geary Co., Kansas.

GE-268 = Lake shore exposure of Doyle (15.5' of Towanda limestone and gray green mudrock of the Holmesville shale below) Shale, base of Towanda limestone at 345m (1132'); one digital photo; approx. 300' South of Center of NW1/4, SE1/4, Sec. 25, T.10S., R.4E., Geary Co., Kansas.

Point C = Towanda limestone, no top and no base, exposed in road and along lake shore; near Center of East line of SE1/4, NE1/4, Sec. 35, T.10S., R.4E., Geary Co., Kansas.

Point D = Winfield (Cresswell) Limestone at 375m (1230') exposed in road; SE cor. Sec. 26, T.10S., R.4E., Geary Co., Kansas.

Point E = Winfield (Cresswell) Limestone at 370m (1214') exposed on East side of road; Center of West line of SW1/4, NW1/4, Sec. 26, T.10S., R.4E., Geary Co., Kansas.

Point F = Road cut exposure of Winfield (Cresswell) Limestone on East side of Union Road, base of Cresswell limestone at 368m (1207'); just NE of Center of South line of NE1/4, SE1/4, Sec. 34, T.10S., R.4E., Clay Co., Kansas.

Point G = Lake shore exposure of Doyle (Towanda limestone) Shale with base of Towanda limestone at ± 350 m (1148'); approx. 300' East of Center of South line of NW1/4, Sec. 36, T.10S., R.4E., Geary Co., Kansas.

GE-269 = Lake shore exposure of Doyle (Towanda limestone and gray green of the upper mudrocks of the Holmesville shale below) Shale, base of Towanda limestone at 348m (1142'); basal bed of the Towanda limestone is a laterally discontinuous bed of microbial/algal stromatolites, some are vase-shaped masses that merge into microatolls that are several dm in diameter, others are elongated to a length of several dm; seven digital photos; approx. 200' West of Center of SW1/4, SE1/4, Sec. 36, T.10S., R.4E., Geary Co., Kansas.

GE-295 = Road cut exposures of the Doyle (lower Towanda limestone and uppermost Holmesville shale) Shale on both sides of U. S. Highway 77 with the base of the Towanda limestone at 363m (1190'); one digital photo on the northeast side of U. S. Highway 77; approx. 300' East of Center of NW1/4, sec. 4, T.11S., R.5E., Geary Co., Kansas.

MILFORD DAM QUADRANGLE – GEARY CO.

EXPLANATION - CONTROL POINTS FOR THE GEARY COUNTY MAP ARE IDENTIFIED AS FOLLOWS:

(1) NUMBERS PRECEDED BY THE LETTER **G** REFER TO MEASURED SECTIONS IN THE GEARY COUNTY, KANSAS BOOKS IN THE FILES OF THE KANSAS GEOLOGICAL SURVEY, NUMBERING BEGAN AT FIRST SECTION IN THE BOOK AND PRECEDED SEQUENTIALLY TO THE LAST SECTION; THESE MEASURED SECTIONS ARE ALSO AVAILABLE ONLINE AT THE KGS WEBSITE AT

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(2) NUMBERS PRECEDED BY THE LETTER **J** REFER TO MEASURED SECTIONS CONTAINED IN KGS BULL. 39 (JEWETT, 1941);

(3) NUMBERS PRECEDED BY THE LETTERS **GE** ARE SITES EXAMINED AND EVALUATED SPECIFICALLY FOR THIS MAPPING PROJECT; AND

(4) THERE ARE ALSO SITES INDICATED THAT ARE CONTAINED IN: a) A KSU MASTER'S THESIS BY VORAN (1977), b) A SOUTH-CENTRAL GSA GUIDEBOOK ON THE CROUSE LIMESTONE (1972), c) A KGS TECHNICAL SERIES 6 BY MAZZULLO, ET AL. (1997), AND d) A KSU MASTER'S THESIS BY GRIFFIN, 1974.

OBVIOUSLY, ANY GIVEN SITE MAY BE IDENTIFIED BY ANY ONE, TWO, THREE OR ALL FOUR OF THESE DESIGNATIONS.

G-12 = Winfield Limestone (Stovall limestone, Grant shale and Cresswell limestone); Sec. 14, T.11S., R.4E., Geary Co., Kansas; measured and described by J. M. Jewett, undated; same as J-55.

J-55 = Same as G-12.

GE-270 = Lake Shore exposure of Doyle (lower beds of Towanda limestone and upper mudrocks of the Holmesville shale) Shale with the base of the Towanda limestone at 350m (1148'); basal bed like that at GE-269 with laterally discontinuous microbial/algal stromatolites; three digital photos, one of base where stromatolites are absent and two of the base where stromatolites are present just SE of the first photo; approx. 400' East and 200' South of NW cor. Sec. 12, T.11S., R.4E., Geary Co., Kansas.

GE-271 = Roadcut exposure of Winfield (Stovall) Limestone on North side of Rebecca Road, base of 2.1' thick Stovall limestone is at 364m (1194'); three digital photos; approx. 500' East of Center of South line of Sec. 2, T.11S., R.4E., Geary Co., Kansas.

GE-273 = Lake shore exposure of Doyle (Towanda limestone) Shale, only lower part of Towanda limestone exposed with the base at 350m (1148'); one digital photo; approx. 100' East of Center of S1/2, SW1/4, Sec. 14, T.11S., R.4E., Geary Co., Kansas.

GE-274 = Road cut exposure of Winfield (Stovall limestone, Grant shale and lower Cresswell limestone) on East side of Union Road (Dickinson-Geary Co. line), base of

Stovall limestone at 363m (1191'), see graphic section; five digital photos; Center of West line SW1/4, Sec. 2, T.121S., R.4E., Geary Co., Kansas.

GE-275 = Road cut exposures on both sides of Union Road (Dickinson-Geary Co. line) of Winfield (upper mudrocks of Grant shale and lower beds of Cresswell limestone) Limestone, Cresswell limestone is 3.6' thick with the base at 370m (1214'); two digital photos; Center West line NW1/4, NW1/4, Sec. 11, T.11S., R.4E., Geary Co., Kansas.

GE-276 = Road cut exposures on both sides of Union Road (Dickinson-Geary Co. line) of Winfield (upper mudrocks of Grant shale and lower beds of Cresswell limestone) Limestone, base of Cresswell limestone at 370m (1214'); one digital photo; approx. 400' South of NW cor. SW1/4, Sec. 11, T.11S., R.4E., Geary Co., Kansas.

GE-277 = Road cut exposures on both sides of Union Road (Dickinson-Geary Co. line) of Nolans (Krider) Limestone at 385m (1263'), base and top covered; two digital photos, one on each side of road; approx. 100' North of SW cor. NW1/4, SW1/4, Sec.11, T.11S., R.4E., Geary Co., Kansas.

GE-278 = Road cut exposure on East side of Union Road (Dickinson-Geary Co. line) of Winfield (Stovall limestone, covered Grant shale, and lower beds of Cresswell limestone) Limestone, top of Stovall limestone at 365m (1197'); one digital photo; Center of West line of SW1/4, Sec. 23, T.11S., R.4E., Geary Co., Kansas.

GE-279 = Lake shore exposure of Doyle (+8.2' of Towanda limestone and 7.5' of yellowish brown, grayish green, and maroon mudrocks of upper Holmesville shale) Shale, base of Towanda limestone at 349m (1145'); stromatolitic bed at base of Towanda limestone poorly developed, thin bedded, dense limestones in upper Towanda contain abundant bivalve molds, *Permrphorus*, some are butterflyed indicating rapid burial; two digital photos; Center of NW1/4, SW1/4, Sec. 24, T.11S., R.4E., Geary Co., Kansas.

GE-280 = Road cut exposures on both sides of Union Road (Dickinson-Geary Co. line) of Winfield (Stovall limestone, Grant shale, and Cresswell limestone) Limestone, Grant shale and Cresswell limestone are exposed on both sides of the road with the best exposure on the West side, Stovall limestone poorly exposed on East side of road with top at 365m (1197'); two digital photos; approx. 200' South of Center of West line, SW1/4, SW1/4, Sec. 26, T.11S., R.4E., Geary Co. Kansas.

GE-281 = Lake shore exposure of Barneston (upper beds of Fort Riley) Limestone and Doyle (Holmesville shale and Towanda limestone) Shale; $\pm 6.5'$ of upper Fort Riley limestone, $\pm 13.6'$ of Holmesville shale, and 5.4' of Towanda limestone with the base of the Towanda limestone at 349m (1145'); one digital photo; approx. 200' West of Center of SE1/4, Sec. 24, T.11S., R.4E., Geary Co., Kansas.

REFERENCE SECTION FOR WINFIELD LIMESTONE

DK-1 = Road cut exposure along both sides (NW and SE) of Union Road of Winfield (Stovall limestone, Grant shale, and Cresswell limestone) Limestone with top of the Stovall limestone at 363m (1191'), see graphic section; eleven digital photos; near Center NE1/4, NW1/4, NW1/4, Sec. 15, T.11S., R.4E., Dickinson Co., Kansas.

GE-282 = Lake shore exposure of Barneston (possibly the upper beds of Fort Riley) Limestone and Doyle (Holmesville shale and lower Towanda limestone) Shale, base of Towanda limestone at 350m (1148'), see graphic section; one digital photo; approx. 200' South and 100' West of the Center, SE1/4, NW1/4, Sec. 25, T.11S., R.4E., Geary Co., Kansas.

Point H = Lake shore exposure like that at GE-282, but the Towanda limestone and Holmesville shale are thicker here with what might be the upper beds of the Fort Riley limestone below; approx. 300' South of Center of North line, NW1/4, NE1/4, Sec. 25, T.11S., R.4E., Geary Co., Kansas.

GE-283 = Road cut exposure on both sides of Kansas Highway 244 of Doyle (Gage) Shale (mostly covered) and Winfield Limestone (lower beds of the Cresswell limestone) with the base of the Stovall limestone at 370m (1214'), see graphic section; two digital photos of the exposure on the North side of Kansas Highway 244; approx. 200' North and 100' West of Center of South line, SE1/4, SW1/4, Sec. 25, T.11S., R.4E., Geary Co., Kansas.

GE-284 = Road cut exposure on both sides of Kansas Highway 244 of Doyle (Gage) Shale with a thin limestone bed approx. 6.0' below the base of the Stovall limestone and Winfield (Stovall limestone and lower Grant shale) Limestone with the base of the Stovall limestone at 375m (1230') on the North side of Kansas Highway 244; one digital photo of the base of the Stovall limestone; approx. 200' North and 200' West of Center of South line SW1/4, Sec. 30, T.11S., R.5E., Geary Co., Kansas.

GE-285 = Milford Spillway section of Barneston (Fort Riley "rim rock") Limestone with the top of the Fort Riley "rim rock" at 349m (1145'), see graphic and described section in Kansas Geological Survey Open-File Report 94-47; two digital photos; approx. 300' South and 100' West of Center, Sec. 29, T.11S., R.5E., Geary Co., Kansas.

GE-286 = Milford Spillway section of Matfield (upper Blue Springs) Shale and Barneston (Florence) Limestone with the base at 336m (1103'), see graphic and described section in Kansas Geological Survey Open-File Report 94-47; two digital photos; approx 500' East of Center of Sec. 29, T.11S., R.5E., Geary Co., Kansas.

NOTE: One digital photo of the upper Florence limestone, Oketo shale, and Fort Riley ("rim rock") limestone about half way between GE-285 and GE-286.

GE-287 = Road cut exposure on the northwest side of Kansas Highway 244 Spur of Doyle (lower Towanda limestone and 10.8' of Holmesville shale above a vuggy limestone encountered in the Holmesville shale and below the Towanda limestone) Shale with base of Towanda at 365m (1197'); one digital photo; approx. 500' North of Center of Sec. 29, T.11S., R.5E., Geary Co., Kansas.

GE-288 = Lake shore exposure of Barneston (upper Fort Riley) Limestone and Doyle (Holmesville shale and lower Towanda limestone) Shale with base of Towanda limestone

at 362m (1187'), see graphic section; one digital photo; approx. 400' West and 200' South of Center of NE cor. Sec. 30, T.11S., 348*3.2808=.5E., Geary Co., Kansas.

GE-289 = Lake shore exposure at the south end of dam at Milford Lake near Gaging Station of the Barneston (Fort Riley) Limestone with the top of the "rim rock" at 348m (1142'), see graphic section; one digital photo; approx. 200' North and 100' West of Center of SW1/4, SW1/4, Sec. 20, T.11S., R.5E., Geary Co., Kansas.

NOTE: Water level on the day sequence was measured was 1140', normal water level is 1444' according to the U. S. Army Corps of Engineers office at Milford Lake.

GE-290 = Exposure at the North end of the road below the dam at Milford Lake in a South facing bluff of the Blue Springs shale and Barneston (Florence) Limestone with the base of the Florence limestone at 335m (1165'), see geologic column in Milford Lake construction area report; one digital photo; approx. 200' West and 100' South of Center of S1/2, SE1/4, Sec. 17, T.11S., R.5E., Geary Co., Kansas.

GE-291 = Road cut exposure on both sides of road to fish hatchery at the South end of the dam at Milford Lake, just about and South of outlet tubes, 360*3.2808=of the Barneston (Florence, Oketo shale, and Fort Riley) Limestone with the top of the Fort Riley ("rim rock") at 348m (1142'); Griffin's Section 12; two digital photos of exposure on southwest side of road; approx. 300' West and 100' North of Center of SW1/4, SE1/4, Sec. 20, T.11S., R.5E., Geary Co., Kansas.

GE-292 = Poorly exposed base of the Towanda Limestone Member (Doyle Shale) in a road bank on the East side of road, base of limestone at 360m (1181'); one digital photo; near Center of NW1/4, NE1/4, Sec. 8, T.11S., R.5E., Geary Co., Kansas.

GE-293 = Base of Towanda Limestone Member (Doyle Shale) exposed at 1170*56m (1168') in a hillside on the southwest side of road; one digital photo; approx. 200' South of Center of North line NE1/4, SW1/4, Sec. 8, T.11S., R.5E., Geary Co., Kansas.

GE-294 = Lake shore exposure along the east side of Milford Lake on the Barneston (upper Fort Riley) Limestone and Doyle (Holmesville shale and lower Towanda limestone) Shale with the base of the Towanda limestone 30' above water level, and based on a water level of 1140' the base of Towanda is at 1170' (357m), see graphic section; three digital photos; approx. 300' South and 100' East of Center of s1/2, Sec. 7, T.11S., R.5E., Geary Co., Kansas.

NOTE: At this site there are two limestones in the Holmesville, the thicker vuggy one we often see with a reddish mudrock with a greenish gray mudrock above and then a thin bed of dense, light yellow to greenish gray limestone; we've only seen this thin, dense limestone one other time and were not sure it was in the Holmesville shale; approx. 300' South and 100' East of Center of S1/2, Sec. 7, T.11S., R.5E., Geary Co., Kansas.

GE-296 = Exposure of Barneston (Fort Riley "rim rock") Limestone in a road ditch on the WSW side of road at 351m (1152'); one digital photo; approx. 200' North and 200' West of SE cor., NE1/4, SE1/4, SW1/4, Sec. 16, T.11S., R.5E., Geary Co., Kansas.

GE-297 = Exposure of Barneston (Fort Riley "rim rock") Limestone in a road ditch on the SW side of Walla Walla Road at 353m (1158'); one digital photo; near NE cor. NW1/4, NW1/4, Sec. 33, T.11S., R.5E., Geary Co., Kansas.

GE-298 = Road cut exposure of Doyle (Towanda limestone) Shale on both sides of Munson Road N with the base of Towanda limestone at 368m (1207'); one digital photo of exposure on East side of road; Center West line SW1/4, SW1/4, Sec. 9, T.12S., R.5E., Geary Co., Kansas.

GE-299 = Excellent road cut exposure of Doyle (Towanda limestone) Shale on South side of West Rucker Road with base of Towanda limestone at 368m (1207'); two digital photos; approx. 200' West of NE cor. Sec. 5, T.12S., R.5E., Geary Co., Kansas.

GE-300 = Road cut exposure of Winfield (Stovall) Limestone on Liberty Hall Road with Stovall limestone at 386m (1266'); two digital photos, one on each side of road; approx. 200' East of SW cor. SW1/4, SE1/4, SW1/4, Sec. 9, T.12S., R.5E., Geary Co., Kansas.

GE-301 = Road cut exposure of Doyle (lower Towanda limestone) Shale on both sides of Liberty Hall Road with base of Towanda limestone at 365m (1197'); one digital photo of exposure on North side of road; approx. 500' East of SW cor. Sec. 7, T.12S., R.5E., Geary Co., Kansas.

GE-302 = Road cut of Winfield (Cresswell) Limestone (or a limestone in the Doyle (Gage) Shale on the West side of Gefeller Road N with the base of the Cresswell limestone at 381m (1250') in the road ditch; two digital photos; near Center of East line Sec. 6, T.12S., R.5E., Geary Co., Kansas.

GE-303 = Road cut exposure of Doyle (Towanda limestone) Shale on both sides of Liberty Hall Road with the base of the Towanda limestone at 358m (1175') on the South side of road; one digital photo; near Center of South line Sec. 12, T.12s., R.5E., Geary Co., Kansas.

GE-304 = Road ditch exposure of Winfield (Stovall) Limestone on the South side of Liberty Hall Road with base of Stovall limestone at 373m (1224'); one digital photo; near Center of South line SW1/4, SW1/4, Sec. 13, T.12S., R.5E., Geary Co., Kansas.

GE-305 = Excellent exposure of Winfield Limestone on the East side of Milford Lake Road with the top of the Stovall limestone at 374m (1227'), see graphic section; three digital photos, Stovall, close-up of cherty beds in Cresswell, and one of the entire exposure; near Center of West line NW1/4, NW1/4, Sec. 13, T.12S., R.5E., Geary Co., Kansas.

GE-306 = Poor exposure of Nolans (Krider?) Limestone on the East side of Dietrich/Union Road (Geary-Dickinson county line) at an elevation of 390m (1279'); one digital photo; approx. 100' North of Center of West line NW1/4, Sec. 11, T.12S., R.4E., Geary Co., Kansas.

GE-307 = Road cut exposure on both sides of Kansas Highway 18 of Winfield (Cresswell) Limestone with base of Cresswell limestone at 375m (1230'), discontinuous bed (approx. 1dm thick) of chert in the Cresswell limestone about 1m above the base; three digital photos; approx. 250' East of Center of North line Sec. 11. T.12S., R.4E., Geary Co., Kansas.

GE-308 = Road cut exposure on West Rucker Road of a yellowish brown limestone, probably Nolans (Krider) Limestone at 387m (1270'); one digital photo; near Center of North line Sec. 2, T.12S., R.4E., Geary Co., Kansas.

Thicknesses at Milford Lake Spillway (Miller and. Twiss, 1994):

Matfield Shale

Blue Springs Shale Member = 4.57+m (14.99+')

Barneston Limestone

Florence Limestone Member = 9.55m (31.33')

Oketo Shale Member = 1.58m (5.18')

Fort Riley Limestone Member = 10.61m (33.33') [thickness to top of
"rim rock" = 2.04m (6.69')]

Doyle Shale

Holmesville Shale Member = 2.66+m (8.73+')

WOODBINE QUADRANGLE – GEARY CO.

EXPLANATION - CONTROL POINTS FOR THE GEARY COUNTY MAP ARE IDENTIFIED AS FOLLOWS:

(1) NUMBERS PRECEDED BY THE LETTER **G** REFER TO MEASURED SECTIONS IN THE GEARY COUNTY, KANSAS BOOKS IN THE FILES OF THE KANSAS GEOLOGICAL SURVEY, NUMBERING BEGAN AT FIRST SECTION IN THE BOOK AND PRECEDED SEQUENTIALLY TO THE LAST SECTION;

(2) NUMBERS PRECEDED BY THE LETTER **J** REFER TO MEASURED SECTIONS CONTAINED IN KGS BULL. 39 (JEWETT, 1941);

(3) NUMBERS PRECEDED BY THE LETTERS **GE** ARE SITES EXAMINED AND EVALUATED SPECIFICALLY FOR THIS MAPPING PROJECT; AND

(4) THERE ARE ALSO SITES INDICATED THAT ARE CONTAINED IN: a) A KSU MASTER'S THESIS BY VORAN (1977), b) A SOUTH-CENTRAL GSA GUIDEBOOK ON THE CROUSE LIMESTONE (1972), c) A KGS TECHNICAL SERIES 6 BY MAZZULLO, ET AL. (1997), AND d) A KSU MASTER'S THESIS BY GRIFFIN, 1974.

OBVIOUSLY, ANY GIVEN SITE MAY BE IDENTIFIED BY ANY ONE, TWO, THREE OR ALL FOUR OF THESE DESIGNATIONS.

NOTE: There are no data points in the Geary County, Kansas part of the Woodbine quadrangle.

REFERENCES

Chaplin, J. R., 1988, Lithostratigraphy of Lower Permian rocks in Kay County, north-central Oklahoma, and their stratigraphic relationships to lithic correlatives in Kansas and Nebraska, p. 79-111, *In*, Morgan, W. A., and Babcock, J. A., (eds.), Permian rocks of the mid-continent: Society of Economic Paleontologists and Mineralogists, Midcontinent Section, Special Publication, no. 1, 224 p.

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Mazzullo, S. J., C. S. Teal, and C. A. Burnett, 1997. Outcrop Stratigraphy and Depositional Facies of the Chase Group (Permian, Wolfcampian) in Kansas and Southeastern Nebraska: Kansas Geological Survey Technical series 6, 210p.

Miller, K. B. (compiler), 1992, Fieldtrip Guidebook to the Lower Permian Council Grove and Chase Groups of Northeast Kansas: Prepared for AMOCO Production Company, July 13-14, 1992.

Miller, K. B., and Twiss, P.C., 1994, Rocks of the Milford Lake Spillway – Facies, Cycles, and Environments of Deposition: Kansas Geological Survey Open-File Report 94-47, 33p.

Sellards, E. H., and Beede, J. W., 1905, Stratigraphy of the eastern outcrop of the Kansas Permian: American Geologist, vol. 36, p. 83-111.

U.S. Army Corps of Engineers, undated, Geologic Map and Column of the Milford Lake Construction Area.

Voran, R. L., 1977, Fossil Assemblages, Stratigraphy, and Depositional Environments of the Crouse Limestone (Lower Permian) in North Central Kansas: Unpublished Master's Thesis, Kansas State University, 208 p.

West, R. R. (ed.), 1972, Stratigraphy and Depositional Environments of the Crouse Limestone (Permian) in North-Central Kansas: Field Trip Guidebook for 6th Annual Meeting, South Central Section, Geological Society of America, 109p.

APPENDICES

Digital Photographs

At least one digital photograph was taken at each control point and are identified by the control point number. Photos are not included in this report but are available at the Kansas Geological Survey, Lawrence, Kansas.

Appendix 1 - Graphic Sections

Measured graphic sections corresponding to control points are listed below. The thicknesses and general lithologies of the units are accurate, but detailed lithologic characteristics and descriptions were not recorded.

Junction City Quad. – GE-245

Kansas Falls Quad. – GE-216

Milford Quad. – GE-257, GE-260, GE-262 & 263, GE-266, GE-267

Milford Dam Quad. – DK-1, GE-274, GE-282, GE-283, GE-288, GE-289, GE-294,
GE-305

GEARY COUNTY QUADRANGLE MAPS

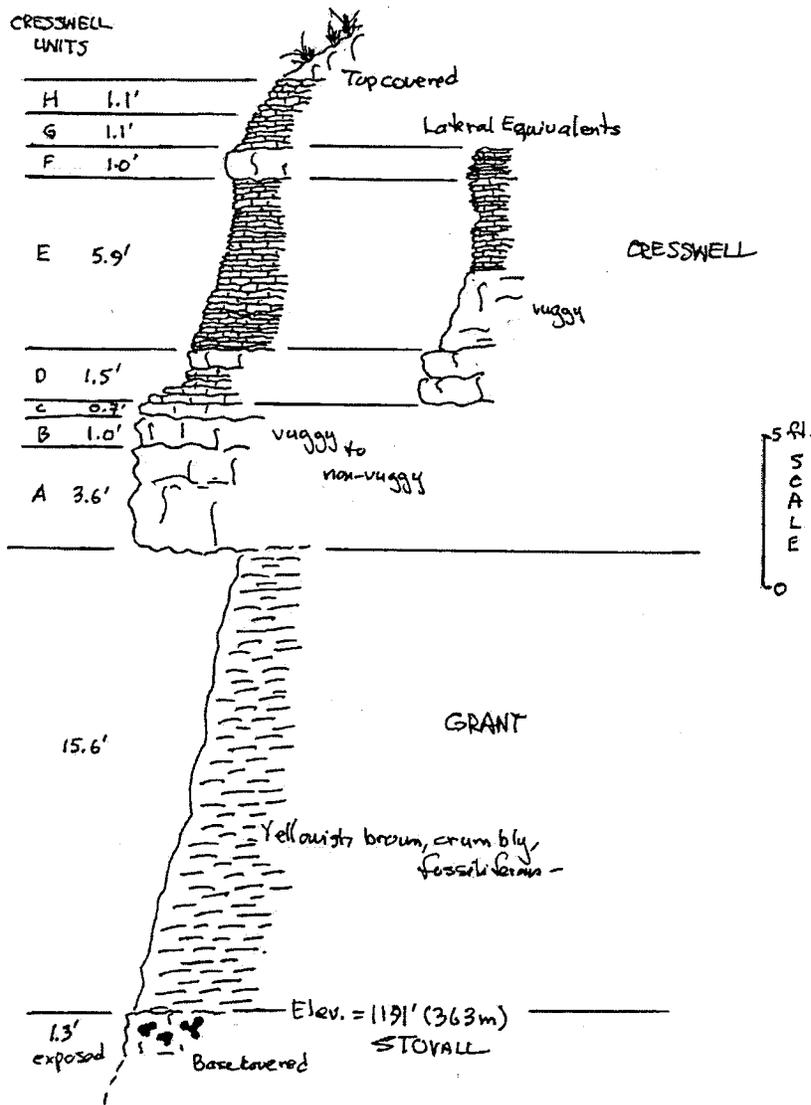
The field geology map compiled from four quadrangle maps mapped in the field by use of a computer is here submitted by the Kansas Geological Survey as part of the STATEMAP Agreement #06HQAG0018 for FY06 (May 1, 2006 to April 30, 2007). The following four quadrangles are compiled into one map at a 1:24,000 scale to form **Kansas Geological Survey Open-File Report 2006-15 "Preliminary Geologic Field Maps of Portions of Geary County, Kansas."** In addition to the field maps, a report is also included in the open-file report and with these deliverables that includes a general stratigraphic section, and locations of measured stratigraphic sections that were utilized in the mapping of the enclosed quadrangles.

Quadrangles included in the FY06 mapping effort –

Partial Quadrangles

Milford
Fort Riley NE
Milford Dam
Junction City

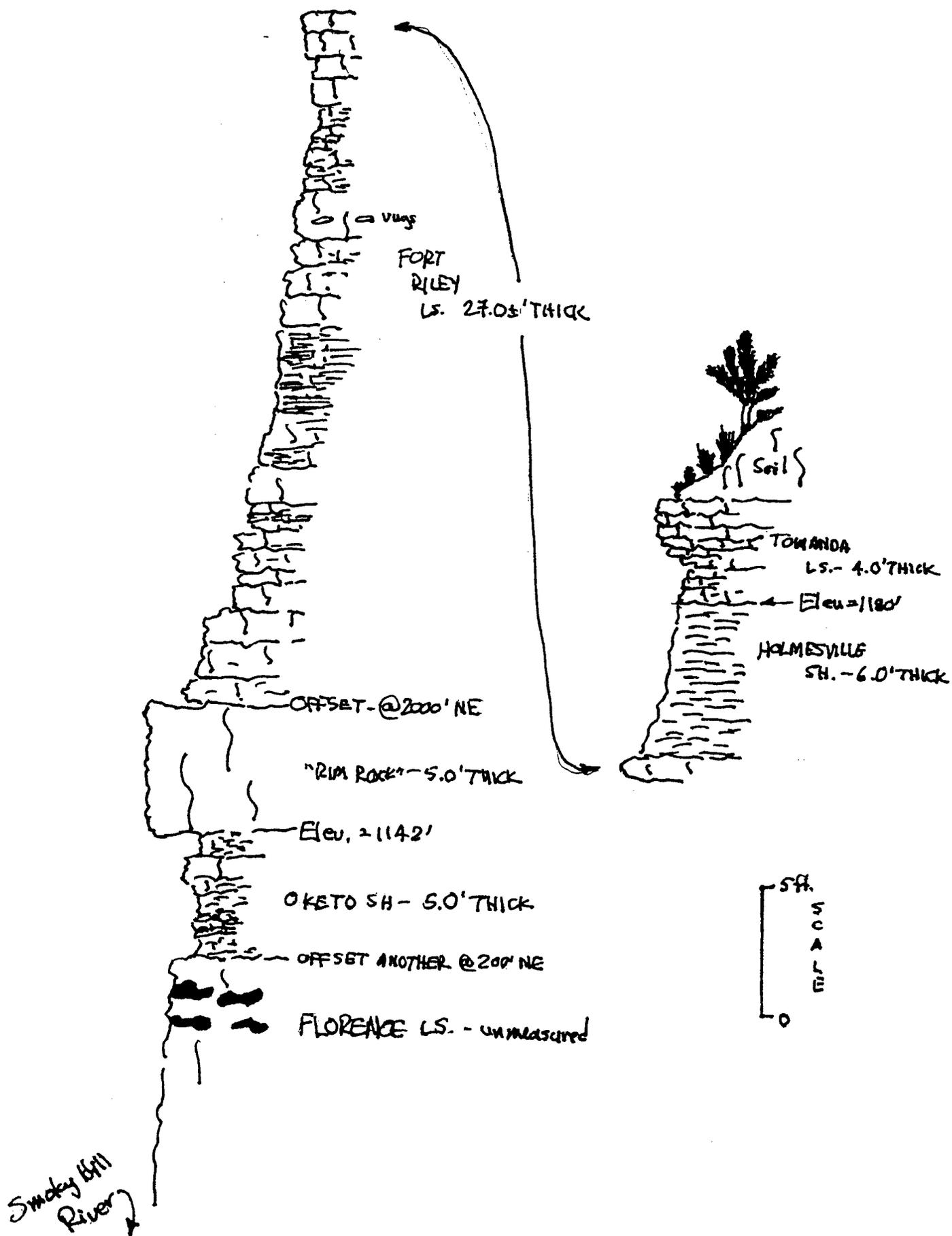
SITE ~ DK-1 - MILFORD DAM QUAD ~ WINFIELD LS. REFERENCE SEC.



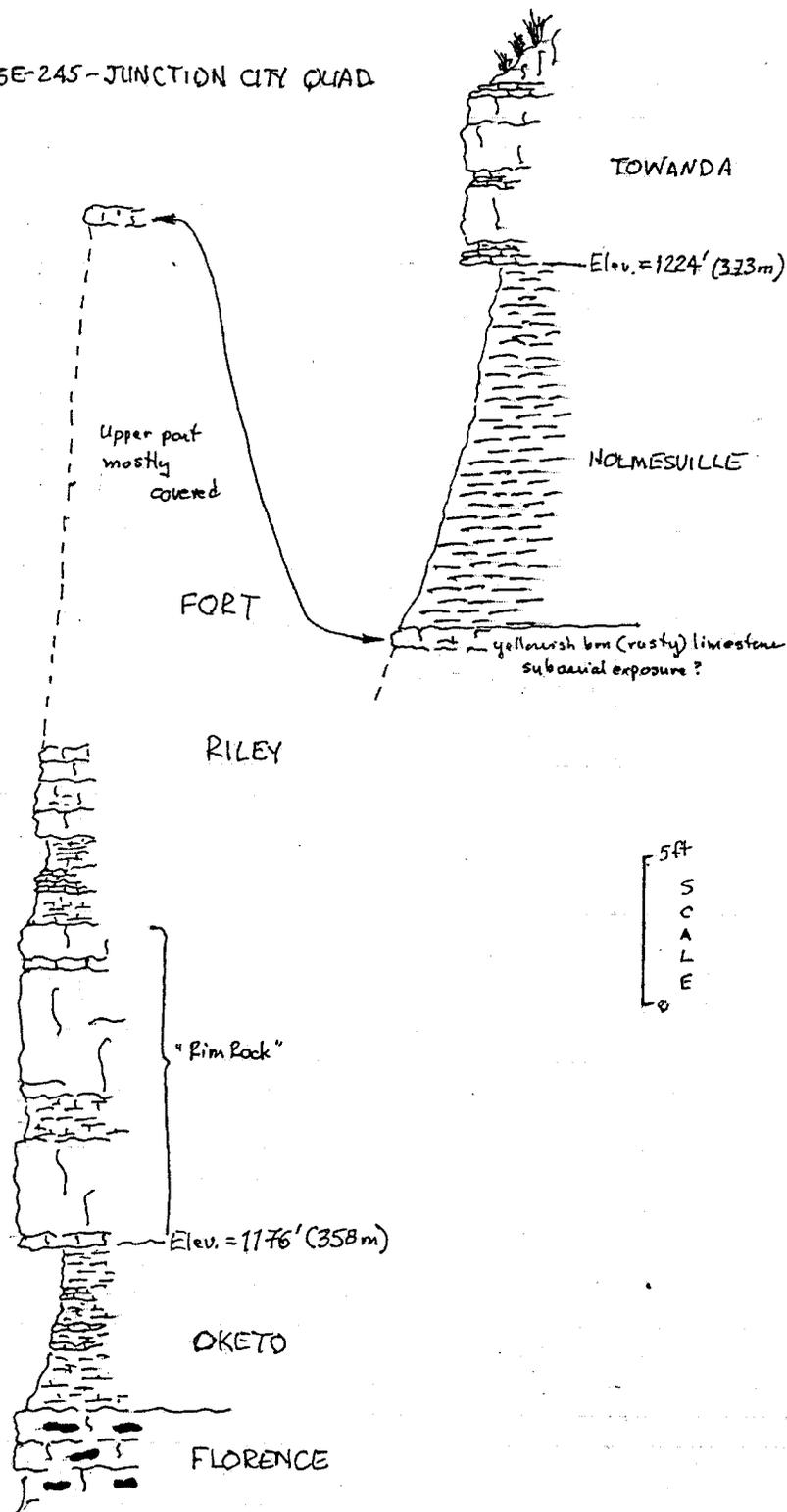
CRESSWELL LIMESTONE UNITS

- A = yellowish brown to medium gray fossiliferous (brachiopods and crinoid and echinoid debris) limestone with a few small vugs in the upper part.
- B = like unit A except that the vugs are more numerous and larger and reddish brown, no fossils observed.
- C = medium gray, thin bedded limestone.
- D = thin to medium beds of light yellowish brown, finely laminated limestone that becomes platy and "slabby" when weathered, lateral equivalent is two medium beds.
- E = similar to unit D, becomes a "dirty" white (chalky), very platy, "slabby" limestone, lateral equivalent is a thick to medium bed of limestone overlain by platy limestone.
- F = similar to unit D, a medium bed of limestone that upon weathering becomes platy and "slabby".
- G = light greenish gray, thin bedded limestone.
- H = light greenish gray, slightly thicker bedded limestone than unit G.

SITE GE-216 - KANSAS FALLS QUAD. - DICKINSON CO., KANSAS

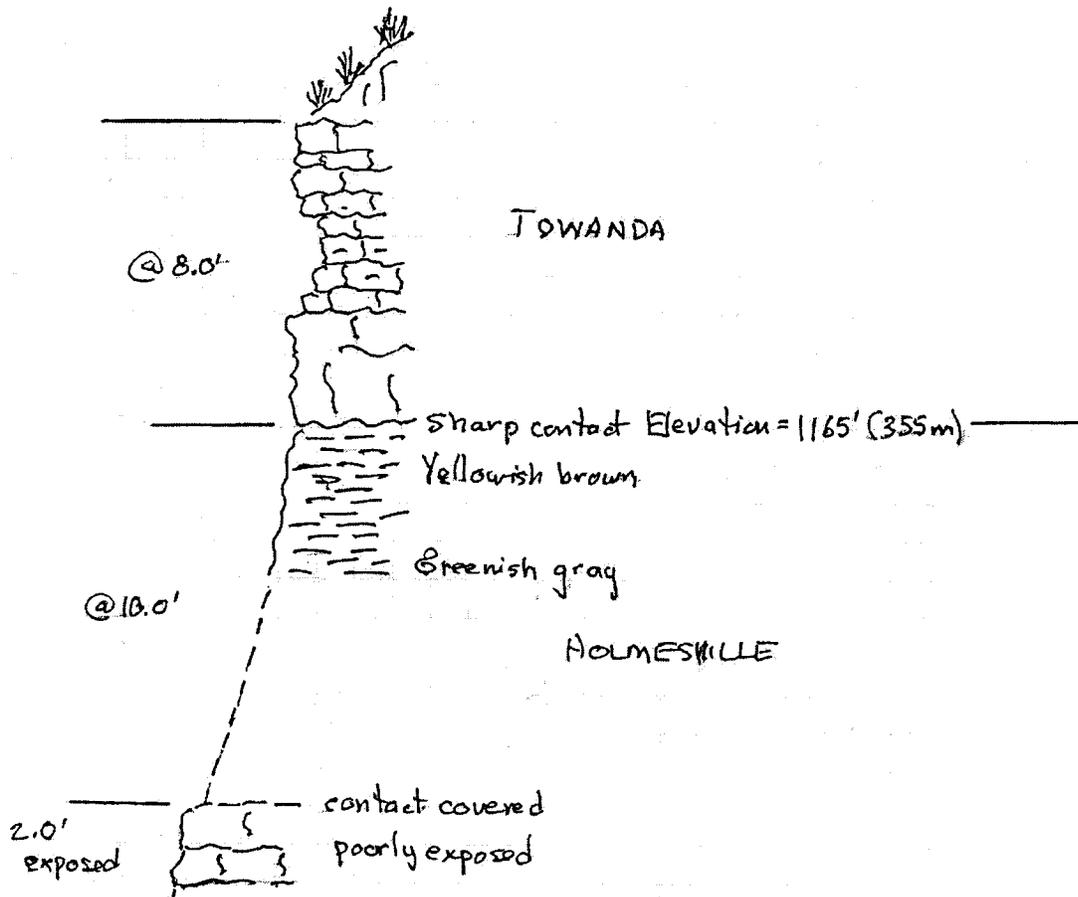


SITE - GE-245 - JUNCTION CITY QUAD

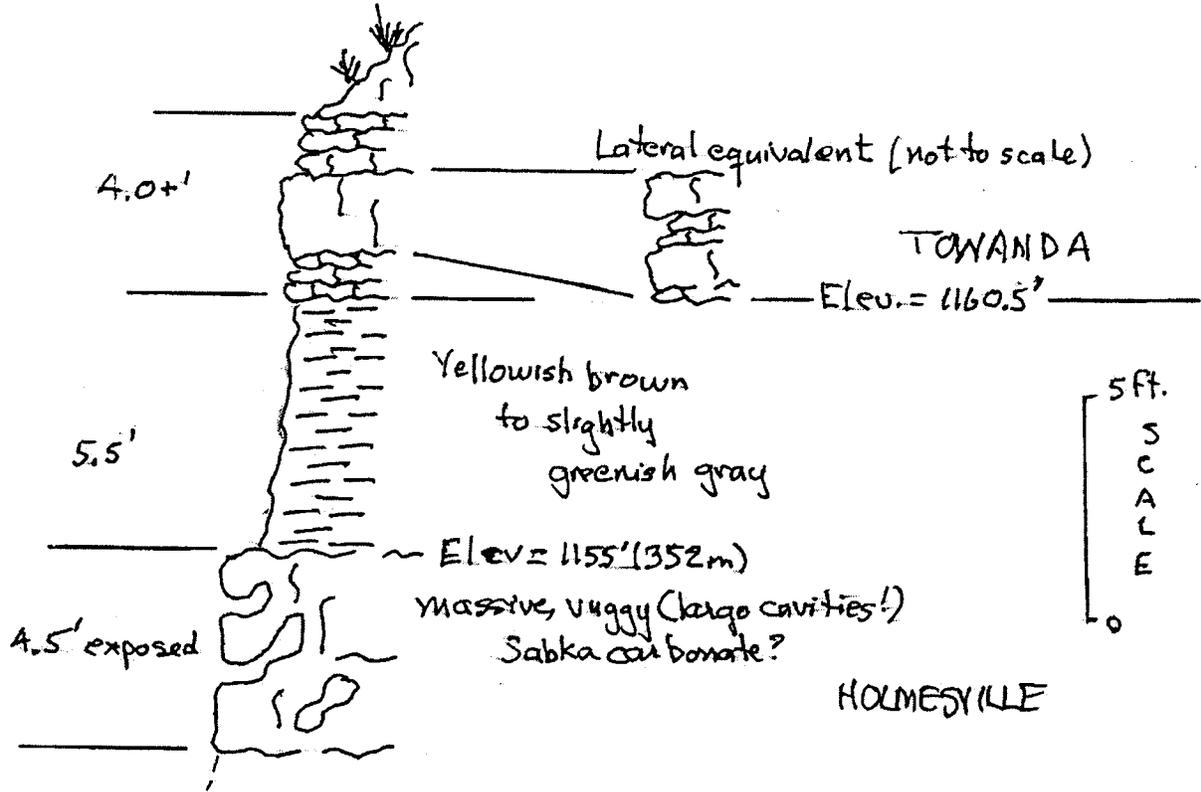


SITE - GE-257 - MILFORD QUAD.

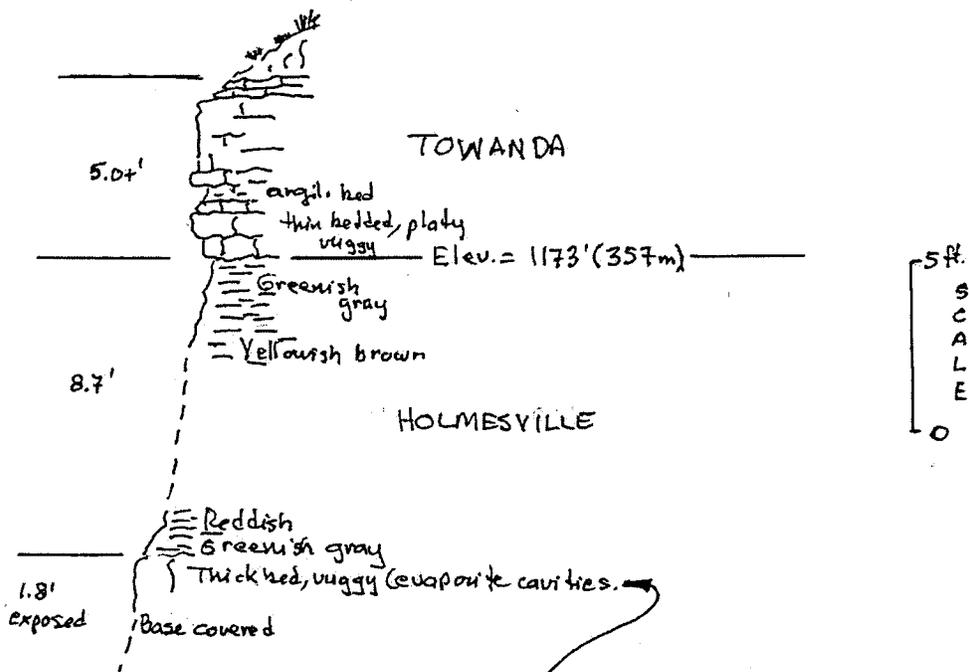
5ft.
SCALE



SITE ~ GE-260 ~ MILFORD QUAD.

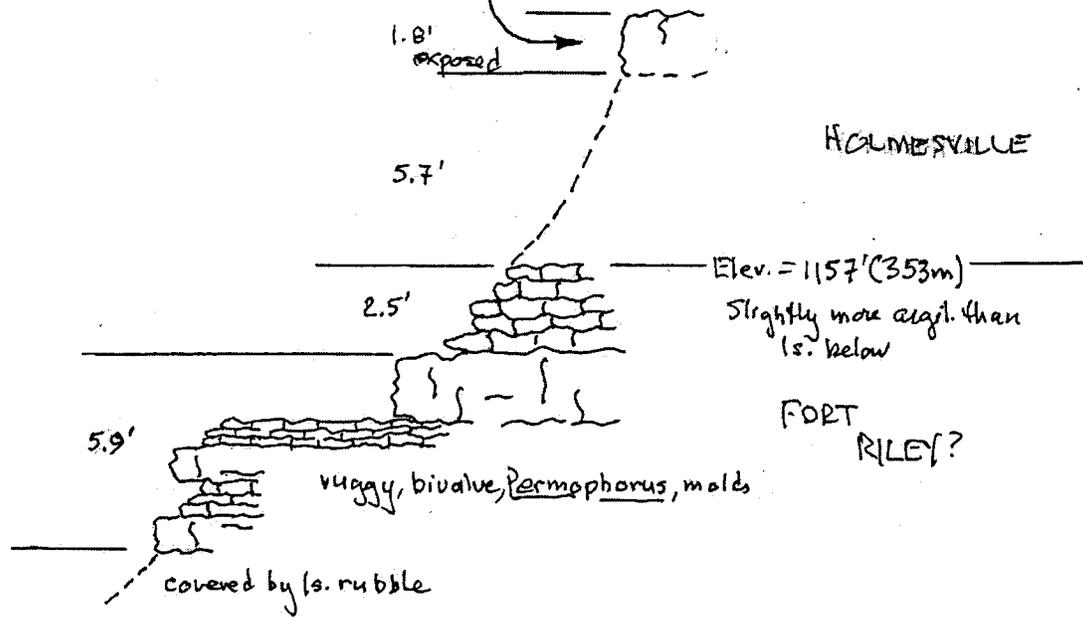


SITE ~ GE-262 - MILFORD QUAD.

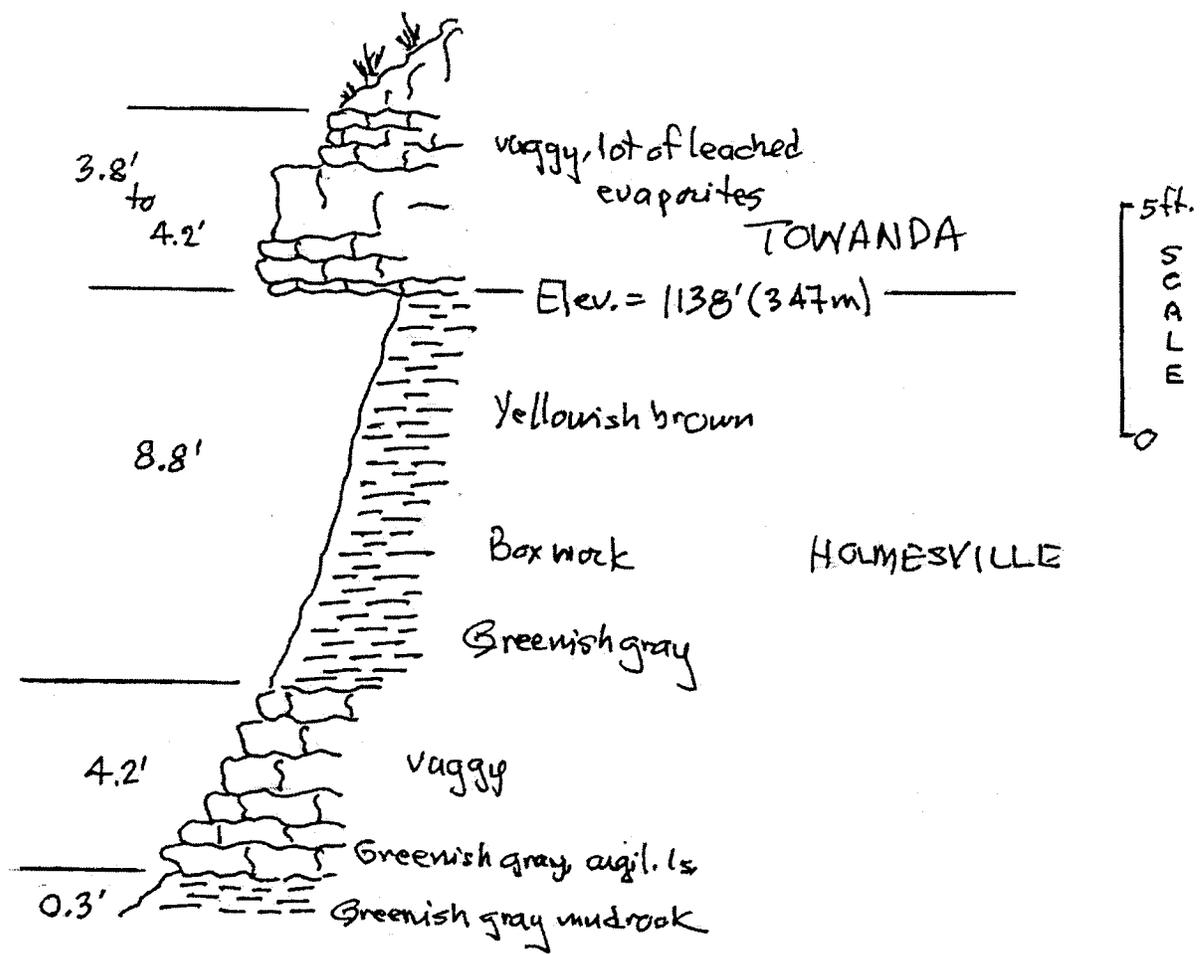


5 ft.
SCALE
0

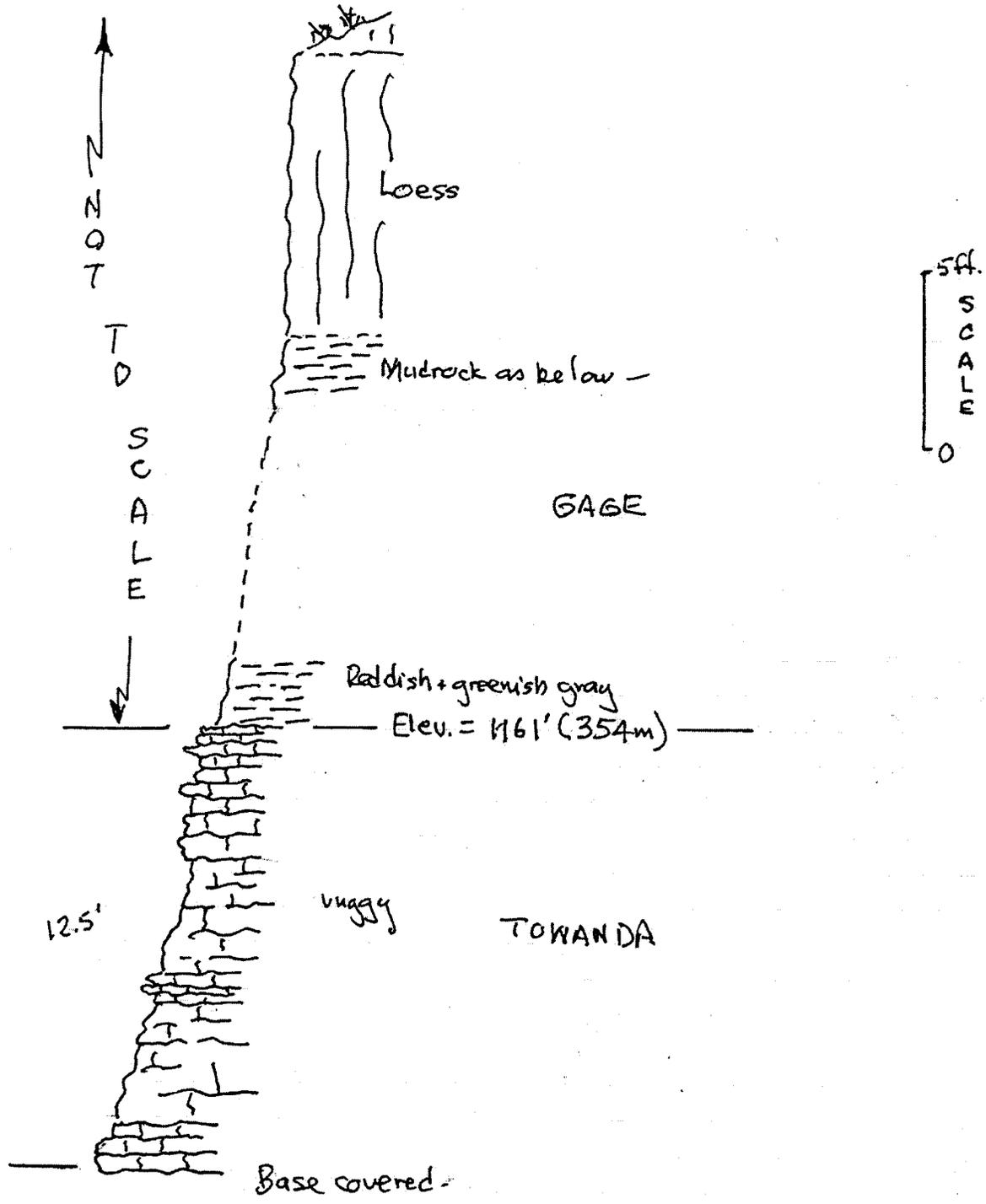
SITE ~ GE-263 - MILFORD QUAD.



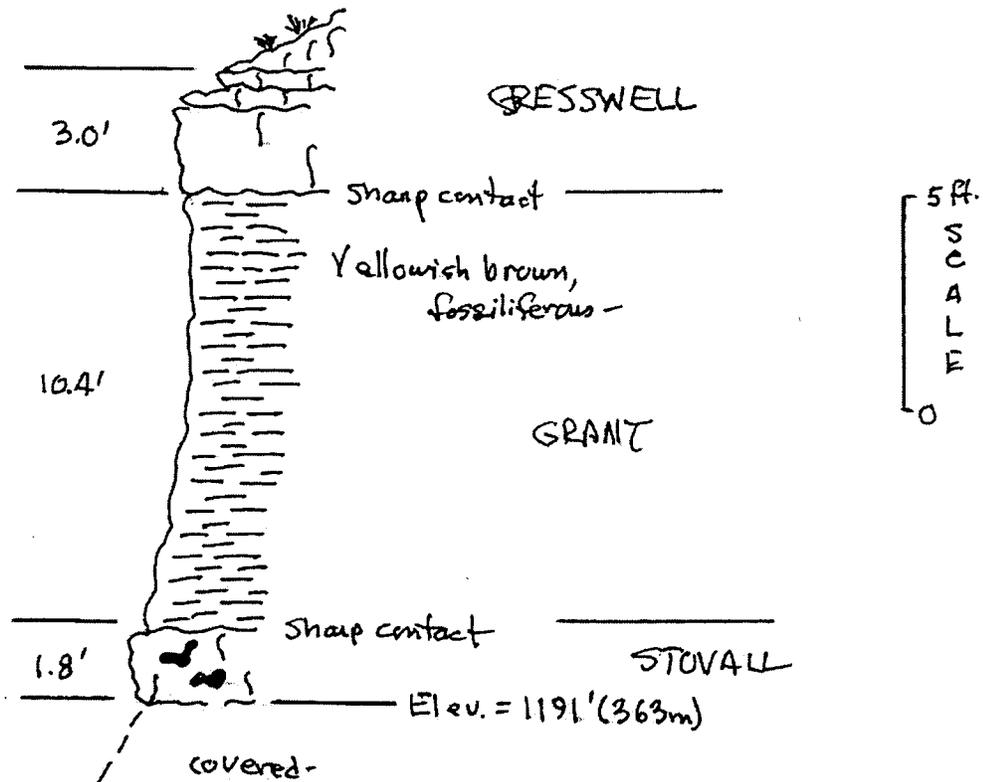
SITE ~ GE-266 ~ MILFORD QUAD



SITE GE-267 - MILFORD QUAD.



SITE ~ GE-274 ~ MILFORD DAM QUAD.

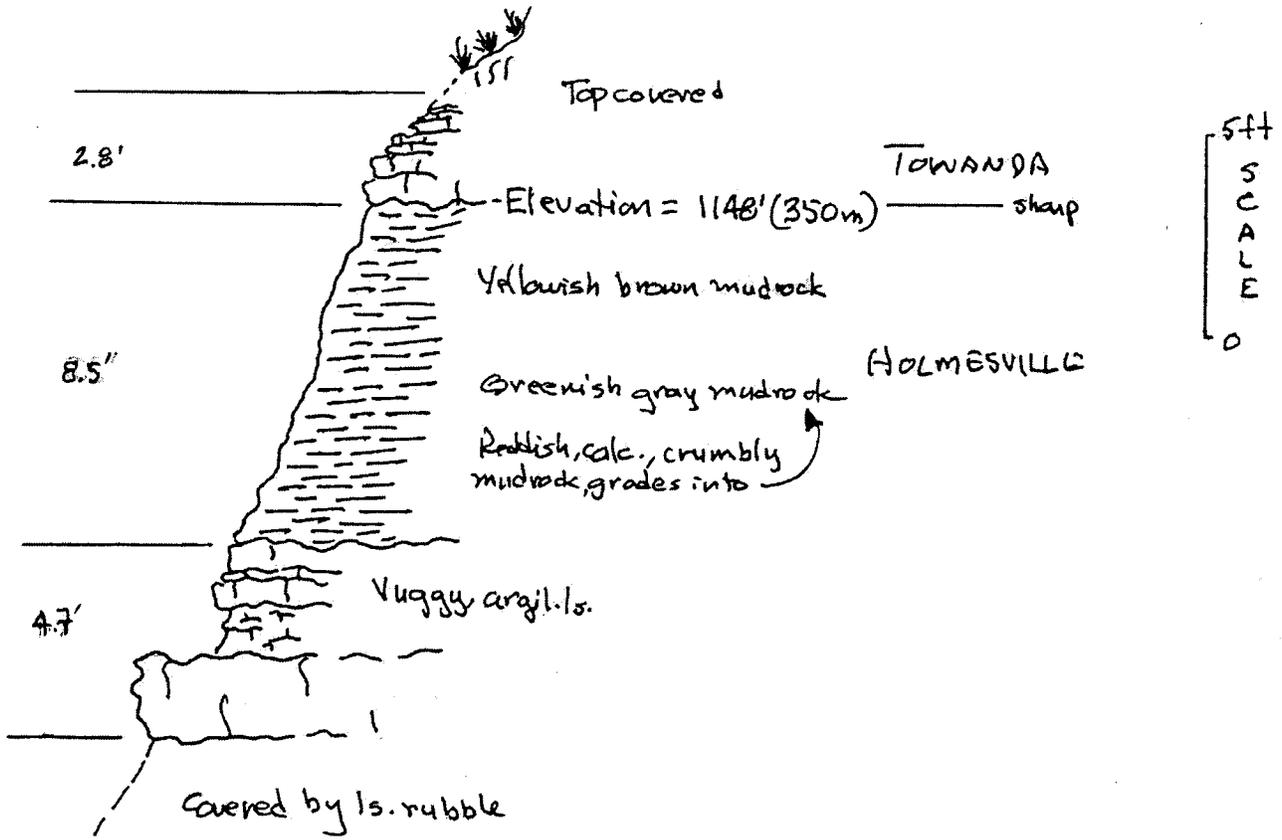


Cresswell limestone – weathers light gray, thick to thin bedded limestone with silicified crinoid and echinoid debris.

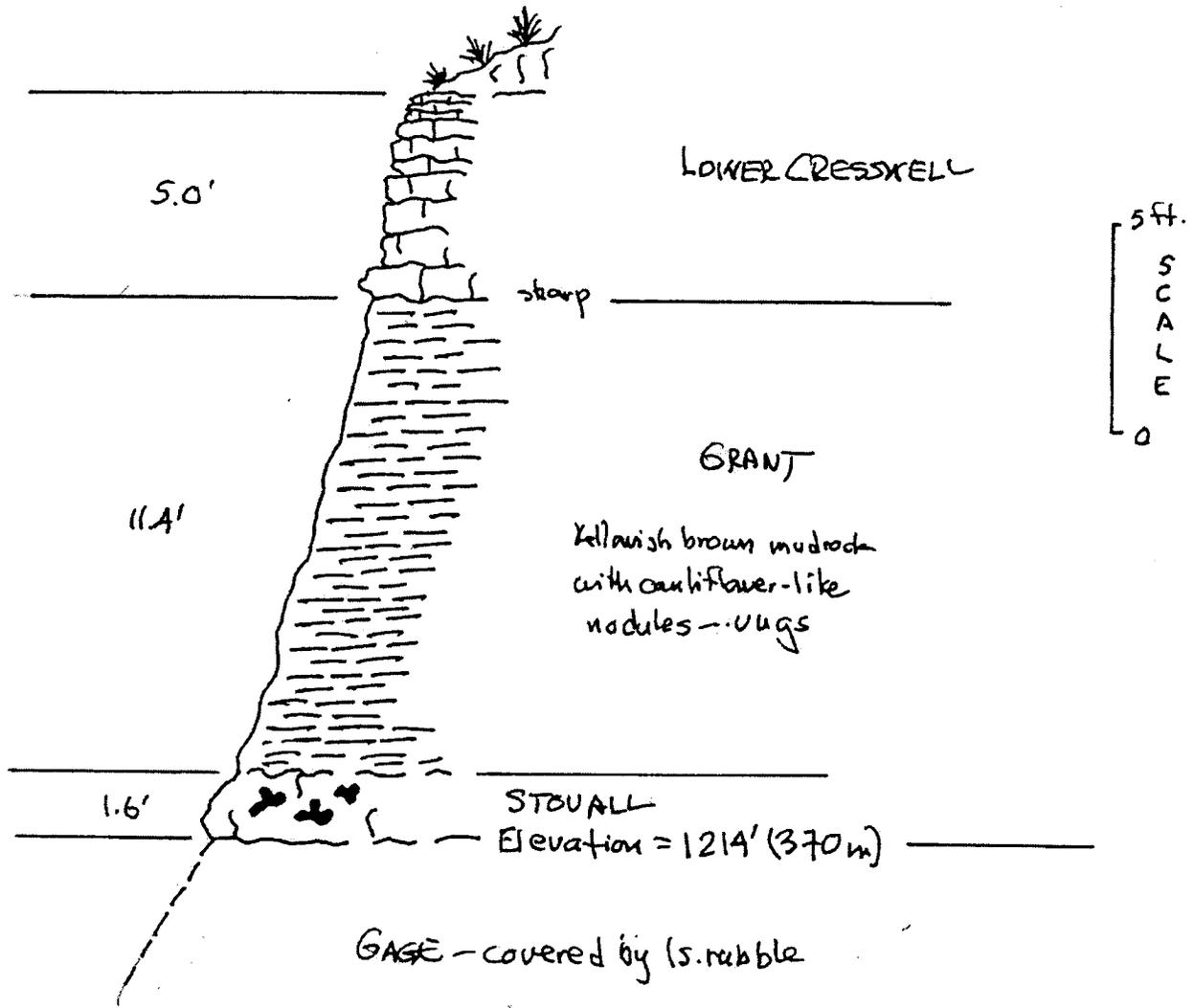
Grant shale – yellowish brown, fossiliferous (ramose bryozoans, productid brachiopods, *Composita*, *Neochonetes*, crinoid and echinod debris, and fillings of generally horizontal burrows) mudrock.

Stovall limestone – light gray (fresh) to medium gray (weathered) cherty, fossiliferous (disarticulated myalinids and productids, *Wilkingia* in life position) limestone; chert is light to medium and dark gray (fresh) with a light yellowish brown weathered rind.

SITE - GE-282 - MILFORD DAM QUAD.

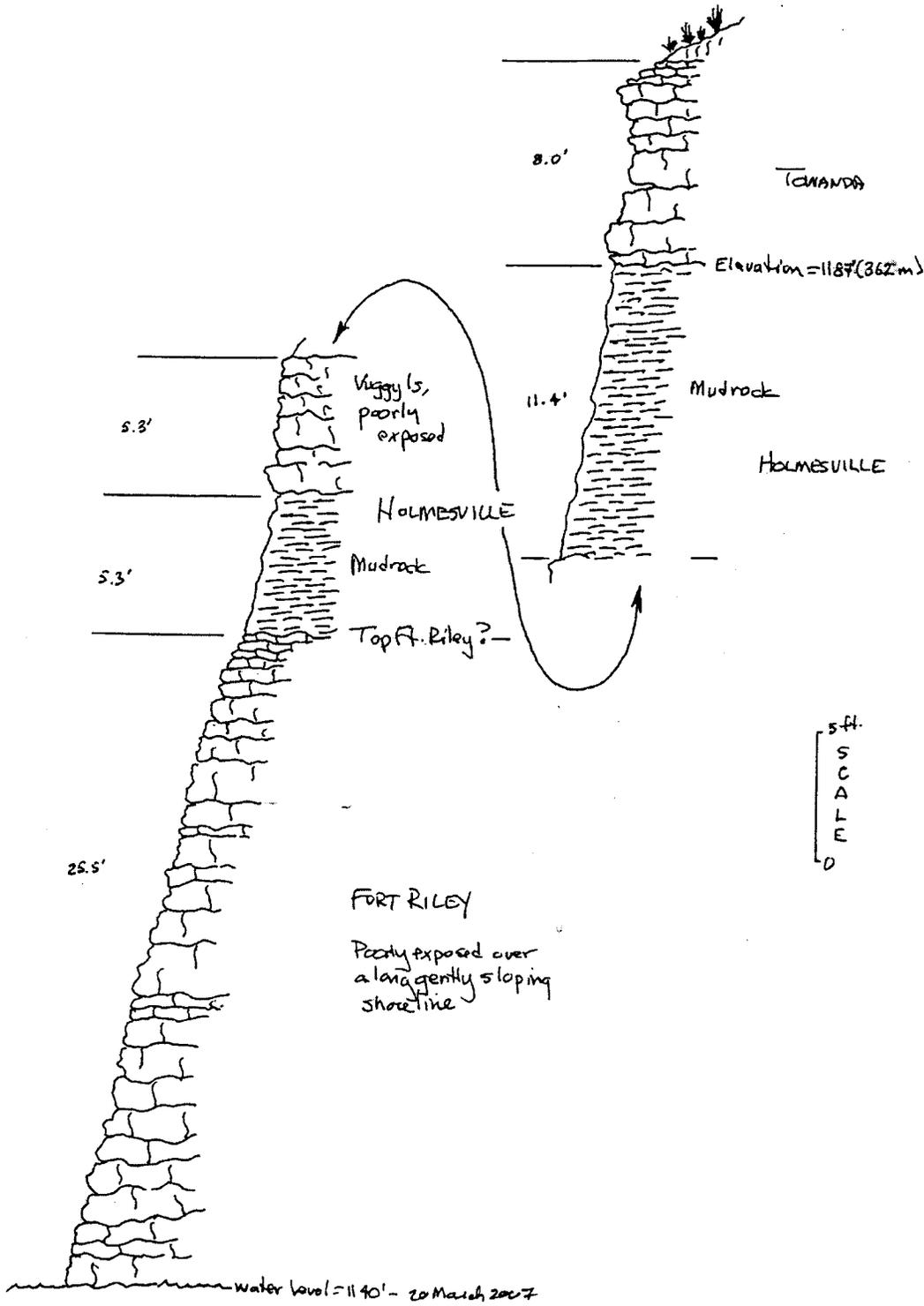


SITE ~ GE-283 - MILFORD DAM QUAD.

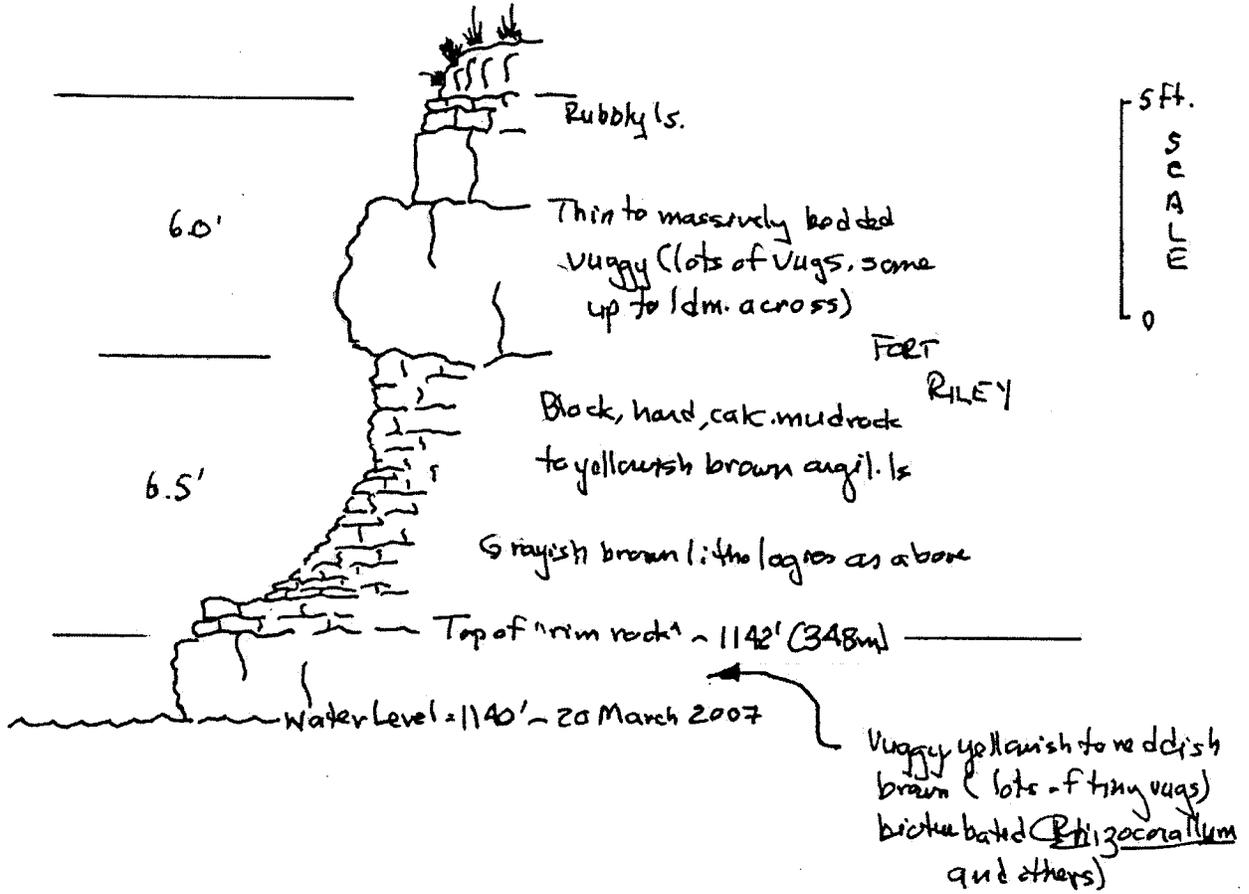


Stovall is poorly exposed by
chert rubble is abundant
and a bit of digging exposes it.

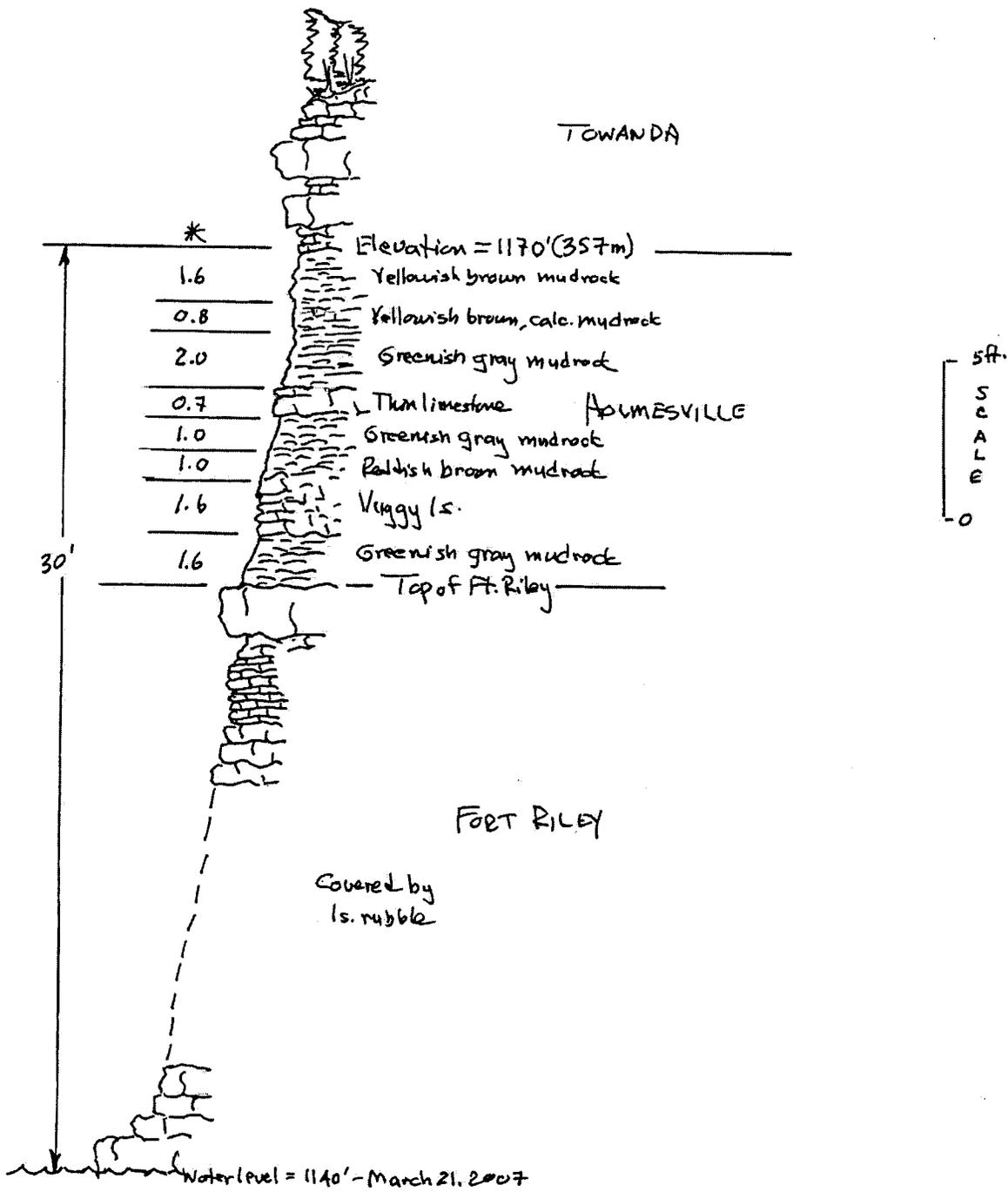
SITE ~ GE-288 ~ MILFORD DAM QUAD.



SITE ~ GE ~ 289 ~ MILFORD PAM QUAD.

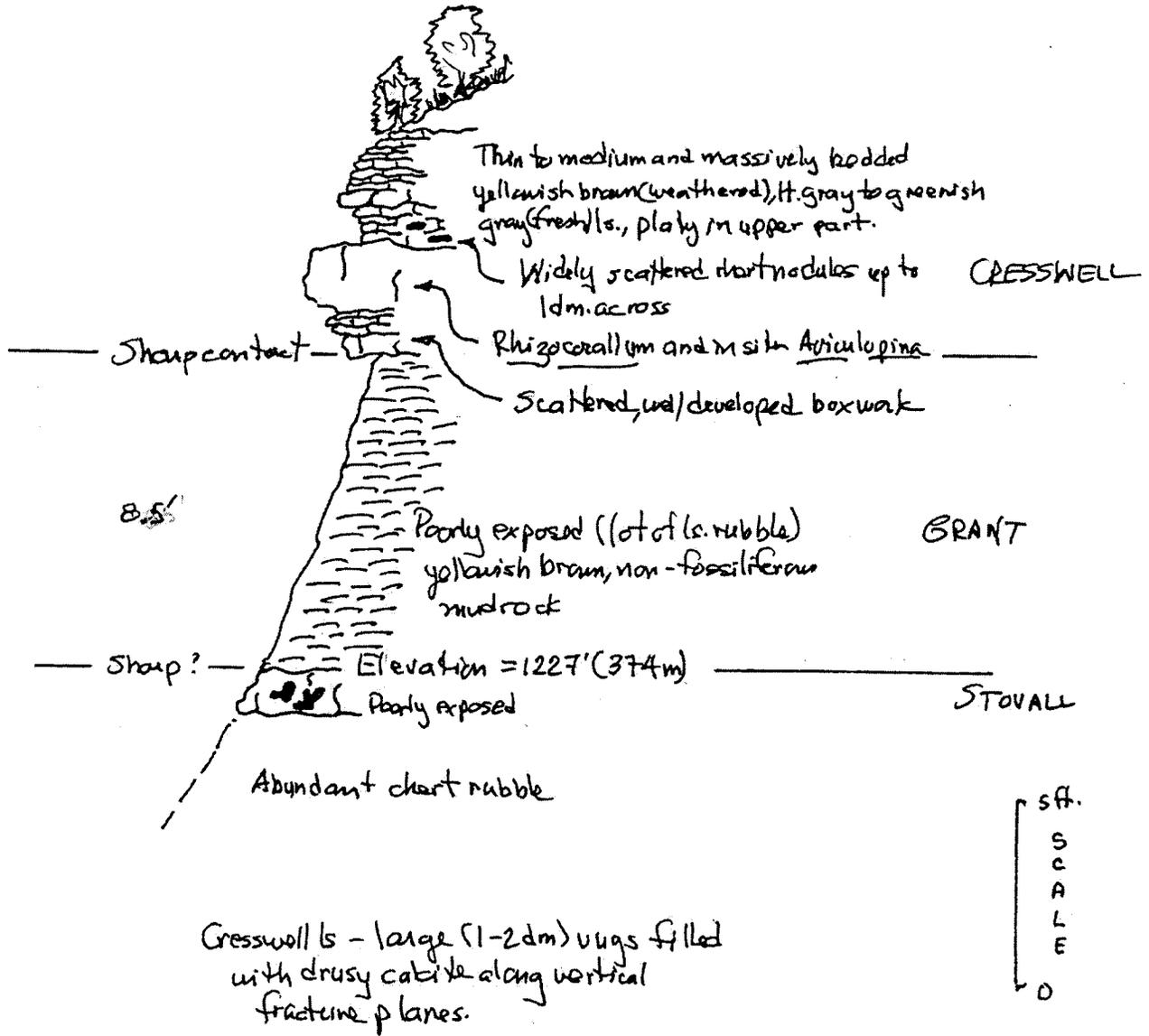


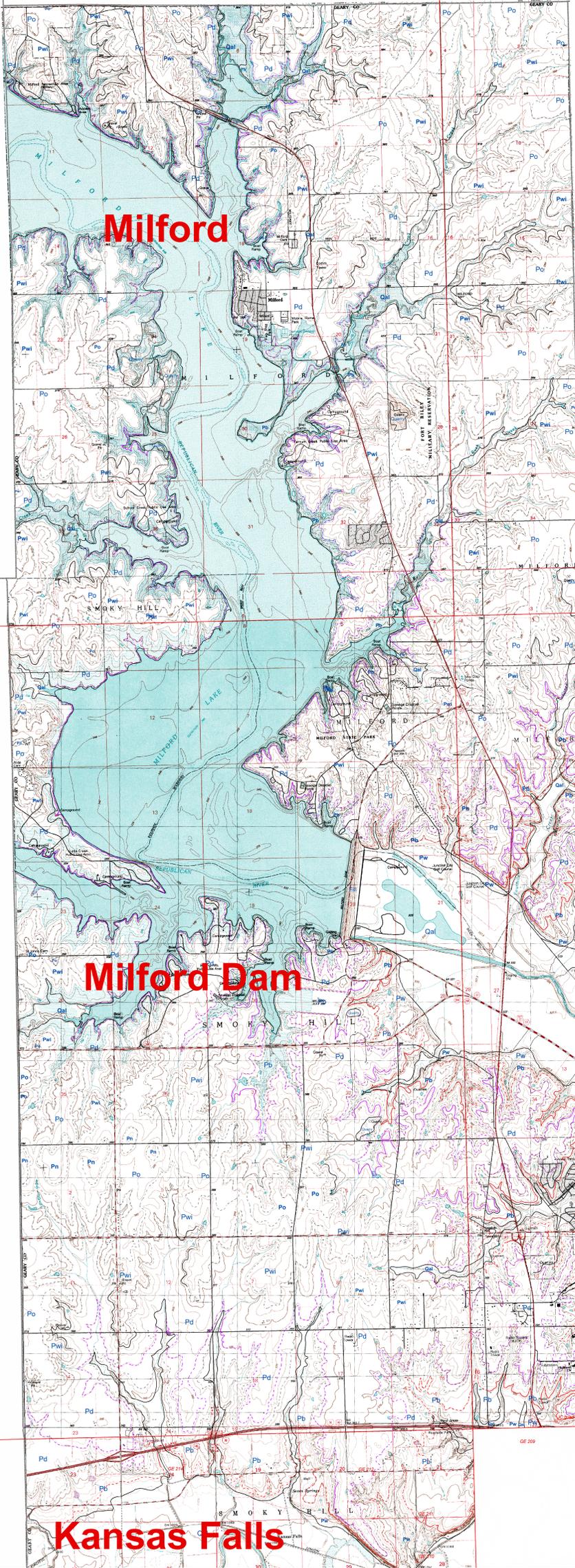
SITE ~ GE-294 - MILFORD DAM QUAD.



* Estimated thicknesses in feet from photograph

SITE ~ GE ~ 305 - MILFORD DAM QUAD.





Milford

Milford Dam

Kansas Falls

Fort Riley NE

Junction City



GE-105
GE-100
GE-87
GE-83
GE-209
GE-171
GE-167
GE-168
GE-169