

SECTION III

Geo-Engineering Aspects and Recommendations

Cut Section from Station 295/00 to Station 319/00

A thick deposit of glacial clay will be encountered through this area.

Backslopes

Backslopes of 3:1 or flatter are suggested for this glacial clay.

Excavation

All excavation will be common.

Cut Section from Station 323/00 to Station 327/00

The Fort Riley Member will be encountered through this area. It is overlain by 0.5 to 4.3 feet of silty clay.

Backslopes

Backslopes of 3:1 or flatter are suggested for the mantle.

An overall slope of $\frac{1}{2}$:1 or flatter is suggested for the Fort Riley Member which will be encountered through this area.

Excavation

The Fort Riley Member will be rock excavation except along its weathered upper contact where a small amount has weathered to common excavation.

Adjustment Factors

Fort Riley Member (common)	25%
(rock)	40%

Seep Area Station 334/41, 135 feet right

This seasonal seep area should not have any effect on the proposed project. At the time of this investigation it was only wet. Elevation of seep 1279.3.

Cut Section from Station 341/00 to Station 354/00

The Holmesville Member and Fort Riley Member will be encountered through this area. They are overlain by 2.5 to 14 feet of mantle.

Backslopes

Backslopes of 3:1 or flatter are suggested for this mantle.

Slopes of 2:1 or flatter for common excavation and $1\frac{1}{2}$:1 for rock excavation is suggested for the Holmesville Member.

The Fort Riley Member through this area is platy and will tend to pop out and slump. Therefore an overall slope of 1:1 or flatter is suggested for this member.

Excavation

The Holmesville Member has weathered to common excavation, except for a 1.1 to 3.8 foot zone which will be rock excavation.

The Fort Riley Member will be rock excavation

Adjustment Factors

Holmesville Member (common)	+ 0%
(rock)	+15%
Fort Riley Member (rock)	+30%

Hydrology

Between Station 344/00 and Station 350/00 groundwater was found moving through the lower portion of the Holmesville Member and the upper portion of the Fort Riley Limestone. If the final grade cuts the lower portion of the Holmesville Member Underdrainage will be needed. Underdrain layouts will be furnished as needed when the final grade is established.

Cut Section from Station 357/00 to Station 362/00

The Towanda Member and Holmesville Member will be encountered through this area. They are overlain by a thin covering of mantle.

Backslopes

Backslopes of 3:1 or flatter are suggested for the mantle.

An overall slope of 1:1 is suggested for the small amount of Towanda Member which will be encountered.

Slopes of 2:1 or flatter for common excavation and $1\frac{1}{2}$:1 for rock excavation is suggested for the Holmesville Member.

Excavation

The Towanda Member will be rock excavation.

The Holmesville Member will be common excavation where weathered and rock excavation where unweathered. Its weathering depth is around 10 to 12 feet.

Adjustment Factors

Towanda Member (rock)	40%
Holmesville Member (common)	0%
(rock)	15%

Cut Section from Station 372+00 to Station 396+00

The Towanda Member and a thick deposit of glacial till will be encountered through this area.

Backslopes

Backslopes of 3:1 or flatter are suggested for the glacial till.

An overall slope of $\frac{1}{2}$:1 is suggested for the Towanda Member.

Excavation

The Towanda Member will be rock excavation.

Adjustment Factors

Towanda Member (rock)	40%
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Cut and Fill Sections From Station 397+00 to Station 519+00

Depending upon final grade for the most part a thick deposit of glacial till will be encountered through these areas, except for a small amount of the Towanda Member which may be encountered in the ditch sections.

Backslopes

Backslopes of 3:1 or flatter are suggested for this glacial till.

An overall slope of $\frac{1}{2}$:1 is suggested for the Towanda Member.

Excavation

The Towanda Member will be rock excavation.

Adjustment Factors

Towanda Member (rock)	40%
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Well Location Station 420+27, 40 feet left

This well will be destroyed by the proposed construction. It has a wood cover. Pump and windmill are broken and in poor condition. Hand dug, depth 64 feet. Water level elevation 1354.9. This well is not being used.

Well Location Station 454+07, 48 feet left

A City or State well will be destroyed by the proposed construction at this

location. This well has a concrete cover. Depth and water level could not be obtained. This well can be relocated to the left off right of way.

Well Location Station 513/94, 3 feet left

An abandoned well will be destroyed by the proposed construction at this location. Depth of well 60.5 feet. Water level elevation 1381.9.

Fill Section from Station 519/50 to Station 530/00
Soft Area

Between Station 526/67 and Station 526/91 centerline crosses a small stream. This stream bed is filled with 4.5 feet of very soft unstable material. It is suggested that all of this material, under the fill section, be removed and wasted. This stream flows water year around.

Cut Section from Station 530/50 to Station 538/00

The Holmesville Member will be encountered through this area. It is overlain by a fairly thick deposit of glacial till.

Backslopes

Backslopes of 3:1 or flatter are suggested for the glacial till.

Slopes of 2:1 for common excavation and $1\frac{1}{2}$:1 for rock excavation is suggested for the Holmesville Member.

Excavation

The Holmesville Member will be common excavation where weathered and rock excavation where unweathered. Its weathering depth is variable due to a difference in lithology. It has weathered to common from 0.0 to 8.6 feet at this location.

Adjustment Factors

Holmesville Member (common)	0%
(rock)	15%

Cut Section from Station 543/00 to Station 551/00

The Fort Riley Member will be encountered through this area. It is overlain by 3.5 to 15 feet of silty clay.

Backslopes

Backslopes of 3:1 or flatter are suggested for the silty clay.

The upper portion of the Fort Riley Member is platy and will tend to pop out and slump. Therefore an overall slope of 1:1 is suggested for this member. -11-

Excavation

The Fort Riley Member will be rock excavation, except along its weathered upper contact where a small amount has weathered to common excavation.

Adjustment Factors

Fort Riley Member (common)	15%
(rock)	40%

Hydrology

In the vicinity of Station 546/00 groundwater was found to be moving through the upper portion of the Fort Riley Member. Underdrainage may be necessary depending upon final grade. Underdrain layouts will be furnished as needed when the final grade is established.

Seep Area Station 552/85, 90 feet left

This seasonal seep area should not have any effect on the proposed project. At the time of this investigation it was flowing water. Elevation of seep is 1387'.

Cut Section from Station 560/50 to Station 572/00

The Towanda Member and Holmesville Member will be encountered through this area. They are overlain by 4.5 to 14.5 feet of silty clay.

Backslopes

Backslopes of 3:1 or flatter are suggested for this silty clay.

The Towanda Member through this cut is well jointed and contains numerous horizontal partings. An overall slope of $\frac{1}{2}$:1 or flatter is suggested for this member.

Slopes of 2:1 for common excavation and $1\frac{1}{2}$:1 for rock excavation is suggested for the Holmesville Member.

Excavation

The Towanda Member will be rock excavation.

The Holmesville Member will be common excavation where weathered and rock excavation where unweathered. The upper 12.8 feet has weathered completely to common where it could be encountered. The lower limy portion has weathered very little, generally around 2 feet along its outcrop edge.

Adjustment Factors

Towanda Member (rock)	40%
Holmesville Member (common)	0%
(rock)	15%

Hydrology

Underdrainage may be necessary at the base of the Towanda Limestone in the vicinity of Station 563+00 and Station 571+00 depending on the final grade. Underdrain layouts will be submitted as needed when the final grade is established.

Fill Section from Station 574+00 to Station 575+00

Bedrock through this area is overlain by 3 feet of silty clay. This clay will be encountered in the ditch sections.

Backslopes

Backslopes of 3:1 or flatter are suggested for this material.

Cut Section from Station 579+00 to Station 583+00

The Holmesville Member will be encountered through this area. It is overlain by 3 to 7.5 feet of mantle.

Backslopes

Backslopes of 3:1 or flatter are suggested for the mantle.

Slopes of 2:1 or flatter for common excavation and 1½:1 for rock excavation is suggested for the Holmesville Member.

Excavation

The Holmesville Member has weathered to common excavation to depths varying from 1.5 to 8.5 feet, except for a 1 to 1.6 zone which will be rock excavation.

Adjustment Factors

Holmesville Member (common)	0%
(rock)	10%

Spring Location

In the vicinity of Station 584+85, 55 feet right of centerline, is located a spring which will be covered by the proposed construction. This spring has been improved and is enclosed by a concrete wall and partly by a limestone block wall. The owner Mr. R. J. Keefover stated that this is the only usable source of water for his cattle.

The source of this spring is the movement of groundwater through the Fort Riley Member. This groundwater is now flowing from the lower portion of the Fort Riley Member at this location. Care should be taken during construction to avoid the use of explosives in the cut section between Station 579/00 and Station 583/00 and also in the vicinity of the spring area so as not to disturb the Fort Riley Member.

It is suggested that the present spring enclosure not be disturbed and that this area first be filled to an elevation of 1381.5 with underdrain aggregate. Upon this aggregate, along the inside of this enclosure, a perforated underdrain pipe should be installed to intersect this water and carry it out under the fill section to the proposed pond area. This underdrain pipe is to have at flow line an approximate elevation of 1381.5. After this pipe is installed it should be covered with underdrain aggregate to an elevation of 1383.5.

Outlet pipe should connect to the perforated pipe placed along the inside edge of the concrete enclosure, Station 584/75, 59 feet right, and extend to an outlet in a proposed concrete box to be located at Station 584/60 140 feet right. This box should have protected openings. It is suggested that this box be 2 x 2 feet or larger with some type of a removable cover so that the enclosure can be cleaned. The above outlet pipe will have to be kept covered with a minimum of 30 inches of clay to prevent freezing.

A new pond area will have to be constructed to replace the present storage area. This storage area is to be constructed to an elevation of 1378.0. The material from this area may be used to construct a dike around the new storage area. This dike is needed to protect this new storage area from overflow from the small stream to the left and also to prevent silting from the fill section. This dike is to be constructed at an elevation of 1386.0.

See Figures I and II for the plan and cross section of this spring area.

The present pond area is filled with 3 feet of soft unstable material. It is suggested that all of this material under the fill section be removed. The limits of this material can be obtained from Figure I. This material can also be used in the construction of the above dike. This area should be backfilled with a select material.

Cut Section from Station 590/00 to Station 608/00

Bedrock through this cut section is overlain by a thick deposit of glacial till. A small amount of Fort Riley Member and Oketo Member will probably be encountered between Station 603/00 and Station 608/00 in the ditch sections.

Backslopes

Backslopes of 3:1 or flatter are suggested for this material.

Excavation

The Fort Riley and Oketo Members will be rock excavation.

Adjustment Factors

Fort Riley Member	40%
Oketo Member	15%

Well Location Station 609/10, 13 feet right

An abandoned well will be destroyed by the proposed construction at this location. Hand dug with stone wall. Depth of well 7 feet. Water level 6.4.

Cut Section from Station 612/00 to Station 614/50

Bedrock through this area is overlain by 3 to 7.5 feet of silty clay.

Backslopes

Backslopes of 3:1 or flatter are suggested for this silty clay.

Cut Section from Station 621/00 to Station 627/50

The Fort Riley Member will be encountered through this location. It is overlain by 1.5 to 7 feet of mantle.

Backslopes

Backslopes of 3:1 or flatter are suggested for this mantle.

The Fort Riley Member through this area is platy and will tend to pop out and slump. Therefore an overall slope of 1:1 or flatter is suggested for this member.

Excavation

The Fort Riley Member will be rock excavation, except along its weathered upper contact where a small amount has weathered to common excavation.

Adjustment Factors

Fort Riley Member (common)	15%
(rock)	40%

Hydrology

In the vicinity of Station 624/00 groundwater was found moving through the Fort Riley Member. Depending upon final grade underdrainage may be advisable through this area. Underdrain layouts will be furnished as needed.

Cut and Fill Sections from Station 629/00 to Station 732/00

Depending on final grade for the most part a thick deposit of glacial till will be encountered through these areas, except for a small amount of the Fort Riley Member which may be encountered in the ditch sections.

Backslopes

Backslopes of 3:1 or flatter are suggested for this glacial till.

An overall slope of 1:1 or flatter is suggested for the Fort Riley Member.

Excavation

The Fort Riley Member will be rock excavation, except along its weathered upper contact where a small amount has weathered to common excavation.

Adjustment Factors

Fort Riley Member (common)	/15%
(rock)	/30%

Cut Section from Station 734/00 to Station 740/00

Depending upon final grade the Fort Riley and Oketo Members may be encountered in the ditch sections through this area. They are overlain by 3.5 to 9.5 feet of mantle.

Backslopes

Backslopes of 3:1 or flatter are suggested for the mantle.

An overall slope of 1:1 or flatter is suggested for both the Fort Riley and Oketo Members.

Excavation

The Fort Riley and Oketo Members will be rock excavation, except for a small amount along their weathered upper contact which has weathered to common excavation.

Adjustment Factors

Fort Riley Member (common)	/15%
(rock)	/30%
Oketo Member (common)	0%
(rock)	/15%