

GR-05-041

TRANSPORTATION  
ENGINEERING, S-3

1973

1973

FOUNDATION EXPLORATION REPORT

BIG CREEK BRIDGE

Mile 122.3 Km 196.8

CAN-1976-1



PUBLIC WORKS  
CANADA

**PACIFIC REGION**

**WHITEHORSE, YUKON TERRITORY**

1973

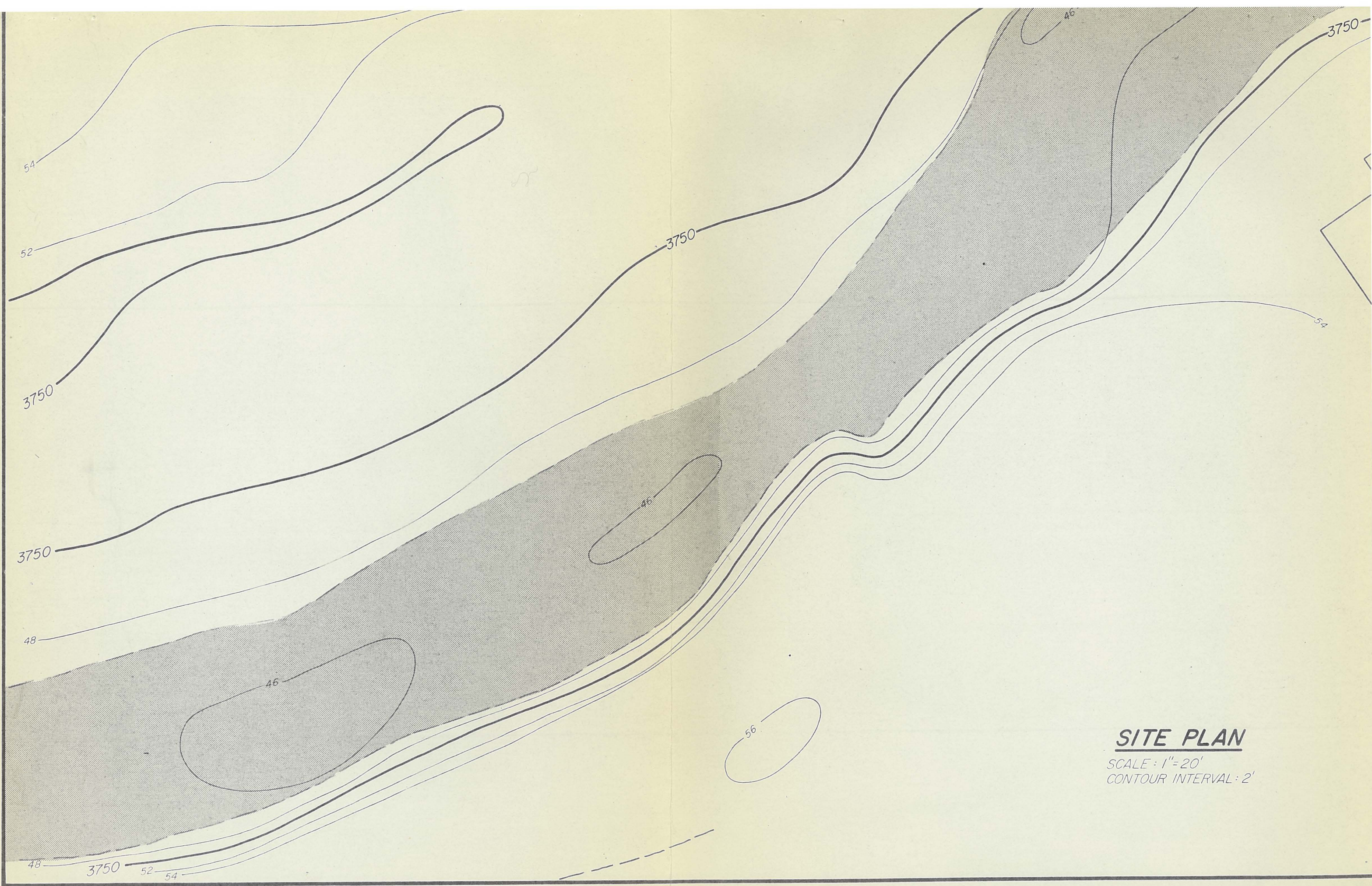
FOUNDATION EXPLORATION REPORT

BIG CREEK BRIDGE

Mile 122.3 Km 196.8

DEMPSTER HIGHWAY

Rec'd DEC. 24/76



**SITE PLAN**

SCALE: 1"=20'  
CONTOUR INTERVAL: 2'

TH72-6

TH72-9

EXISTING TRAILER

ACCESS ROAD

56

54

REC'D. DEC. 24/76

BIG CREEK  
DEMPSTER HIGHWAY  
MILE 122.3

CULVERT SPECIFICATIONS

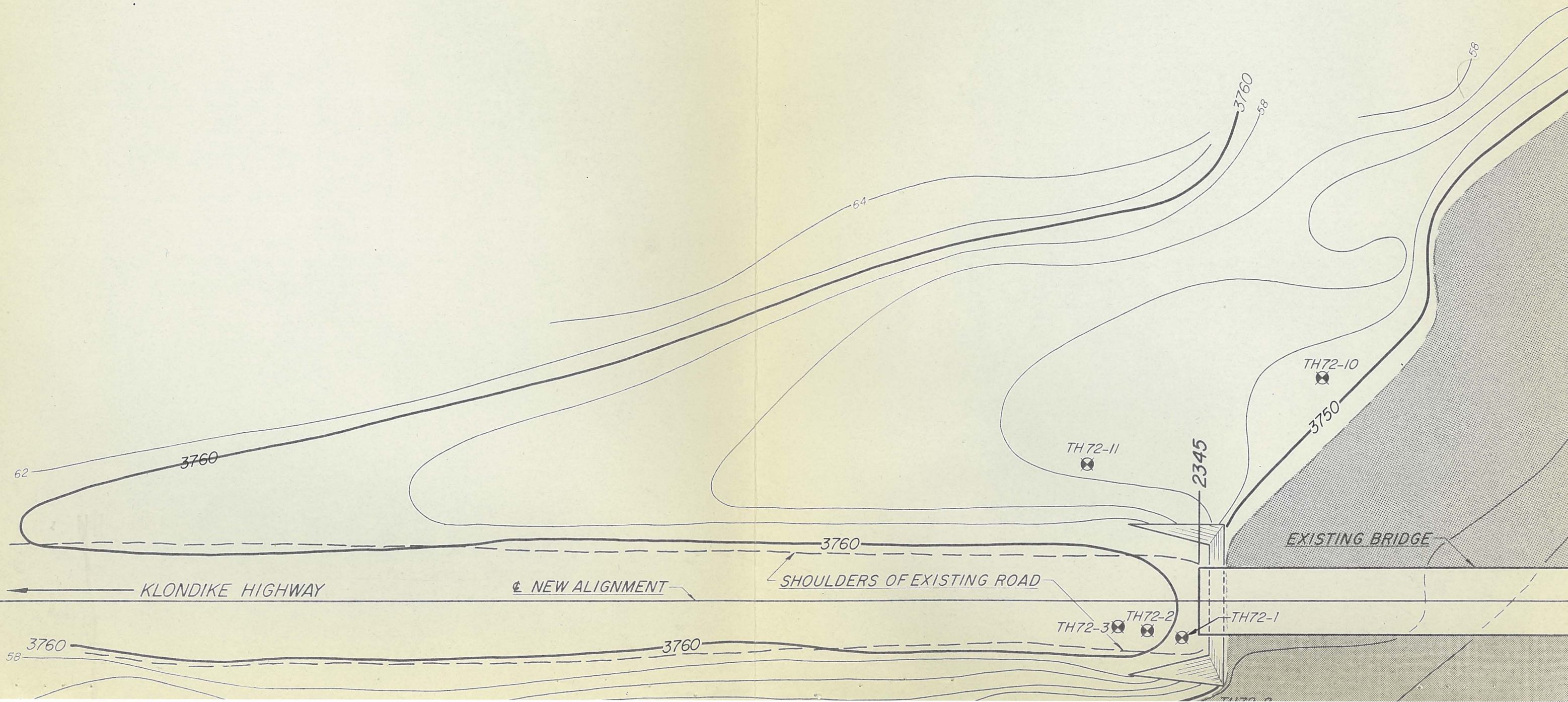
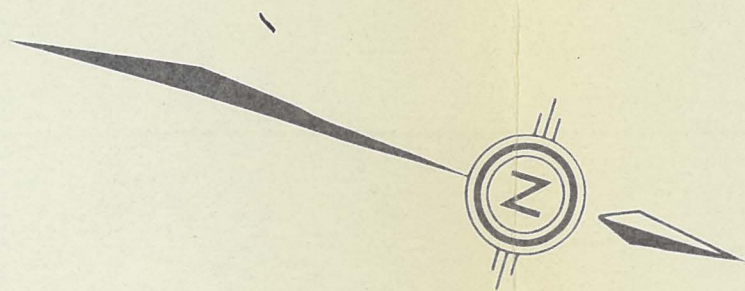
CULVERT		
LENGTH		
DIAMETER		
GAUGE		
LOCATION		
SKEW ANGLE		
INVERT ELEV.		
INLET		
OUTLET		
SLOPE		

- BM: SE CORNER CONCRETE GUARDRAIL PAD OGILVIE BRIDGE TO NAIL IN BAILY BRIDGE.  
OGILVIE BRIDGE ELEV. - 1962.00  
BAILY BRIDGE ELEV. - 1960.16
- COMPILED FROM BIG CREEK SURVEY BOOK (1976)
- SURVEYOR: G.WASON

SITE PLAN

Designed by J. QUONG	Conçu par
NOV. '76	
Drawn by E. LESLIE	Dessiné par
NOV. '76	
Checked by W. BROWN	Examiné par
NOV. '76	
Approved by J. QUONG	Approuvé par
NOV. '76	
Project Manager	Administrateur du projet
Project Number	no du projet
Drawing Number	dessin no

BIG CREEK





Department of Public Works  
Ministère des Travaux publics

# WHITEHORSE, YUKON

## LEGEND

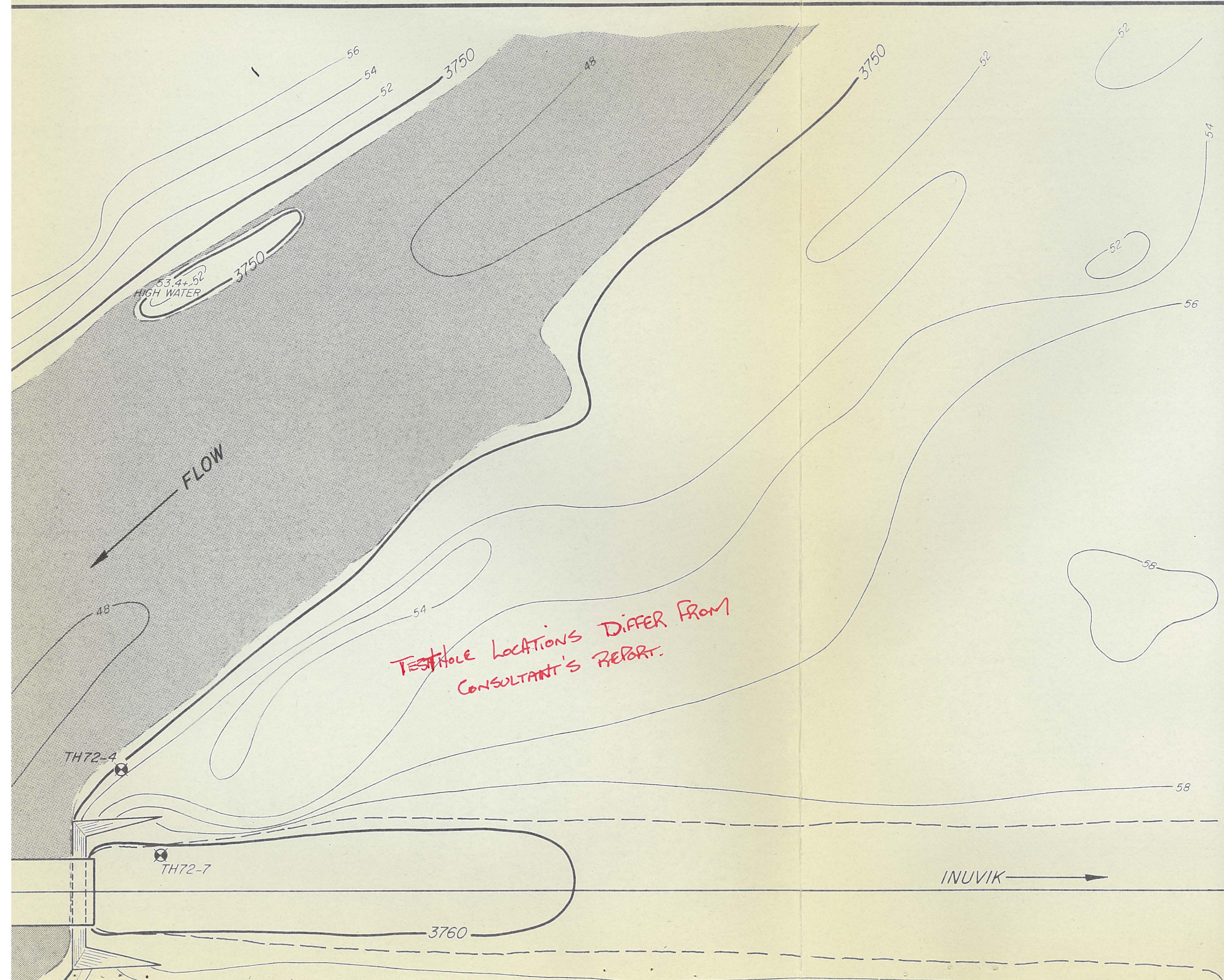
- T.D. .... TOP OF DYKE
- ..... EDGE OF WATER
- ..... RANDOM RIP-RAP
- ..... TEST HOLES



A. Date: \_\_\_\_\_

B. Location: Drawing No. \_\_\_\_\_

C. Drawing No. \_\_\_\_\_



TEST HOLE LOCATIONS DIFFER FROM  
CONSULTANT'S REPORT.

INUVIK →

53.4+52  
HIGH WATER

TH72-4

TH72-7

3760

3750

3750

56

54

52

48

52

52

54

52

56

58

58

**FOUNDATION EXPLORATION REPORT**

**BIG CREEK BRIDGE**

**Mile 122.3**

**DEMPSTER HIGHWAY**

**1972**

**Report Compilation**

**N.W. Richardson  
Field Engineer**

**Drilling Supervisor**

**N.W. Richardson  
Field Engineer**

**Driller**

**Phil Andrietz  
Driller-Technician**

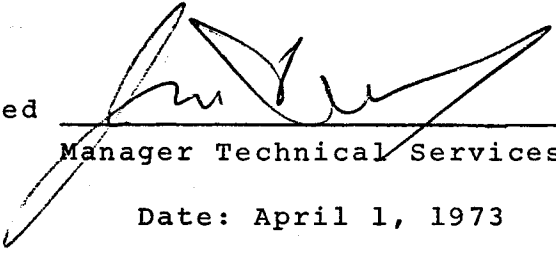
**Laboratory Testing  
Supervisor**

**Tony Parrottino  
Laboratory Supervisor**

**Petrographic Analysis**

**Carey Baillie  
Materials Technician**

Approved

  
\_\_\_\_\_  
**Manager Technical Services**

**Date: April 1, 1973**

Big Creek Bridge Foundation Exploration

(1973)

The site of the proposed bridge at Big Creek lies in a valley between ridges of grey limestone and lesser amounts of shale. Large quantities of boulder-size limestone talus cover the slopes of the ridges adjacent to the bridge site. To the right of centerline, just north of Big Creek, the ridge has been cut back to accommodate the road, and some of this material has been used as rip-rap in the vicinity of the present bridge.

The creek has deposited a layer of sediment in the valley, and in the present creek bed, this layer is comprised of sand, gravel and cobblestones. The material ranges from semi-angular to rounded in nature; the sand and gravel are largely made up of shale material while the cobblestones are a melange with limestone prevailing. No frozen material was encountered.

Eight test locations were drilled as required. The locations of the test holes are approximately that which was indicated, but problems of access with the machine and obstructions on or in the ground required some adjustment of the positions. The schematic diagram on Page 4 shows the locations of the test holes.

The ideal drilling procedure would have been to drive the seven inch hollow-stem augers to refusal and then to use the diamond drill apparatus inside the augers in order to penetrate into the bedrock. This procedure turned out to be impossible, however, as the diamond drill casing is marginally larger than the inside diameter of the augers. Four holes were diamond drilled, two in each abutment, and the five other holes done were by the hollow-stem auger. The details of the logs of the holes are shown on Pages 5 to 13, inclusive.

As was expected, the limestone comprising the surrounding ridges extended underneath the bridge site at shallow depth. As the ridge to the right of centerline is immediately adjacent to the bridge site, the limestone bedrock was found to be closest to the surface at this point. From this point, right of centerline on the northern side of Big Creek, the bedrock profile was found to dip southward along the highway and to dip towards the left-hand side of the road. Bedrock profiles, as determined by the drilling, are shown on Pages 14 to 16, inclusive.

No Shelby tube samples were taken in the course of the foundation exploration, due to the granular nature of the overburden covering the limestone bedrock.

Split-barrel samples were taken every five feet and at refusal as well, in those holes done by hollow-stem auger, but it is thought that the samples retained do not fully represent the strata in question as the grain size of the material probably often exceeded the capabilities of the sampler. Material did not tend to come up around the auger in a continuous fashion to permit proper sampling. Split-barrel samples were not taken through the diamond drill casing in the four holes done by that method as the wash-water tends to destroy the composition of the strata adjacent to the bit.

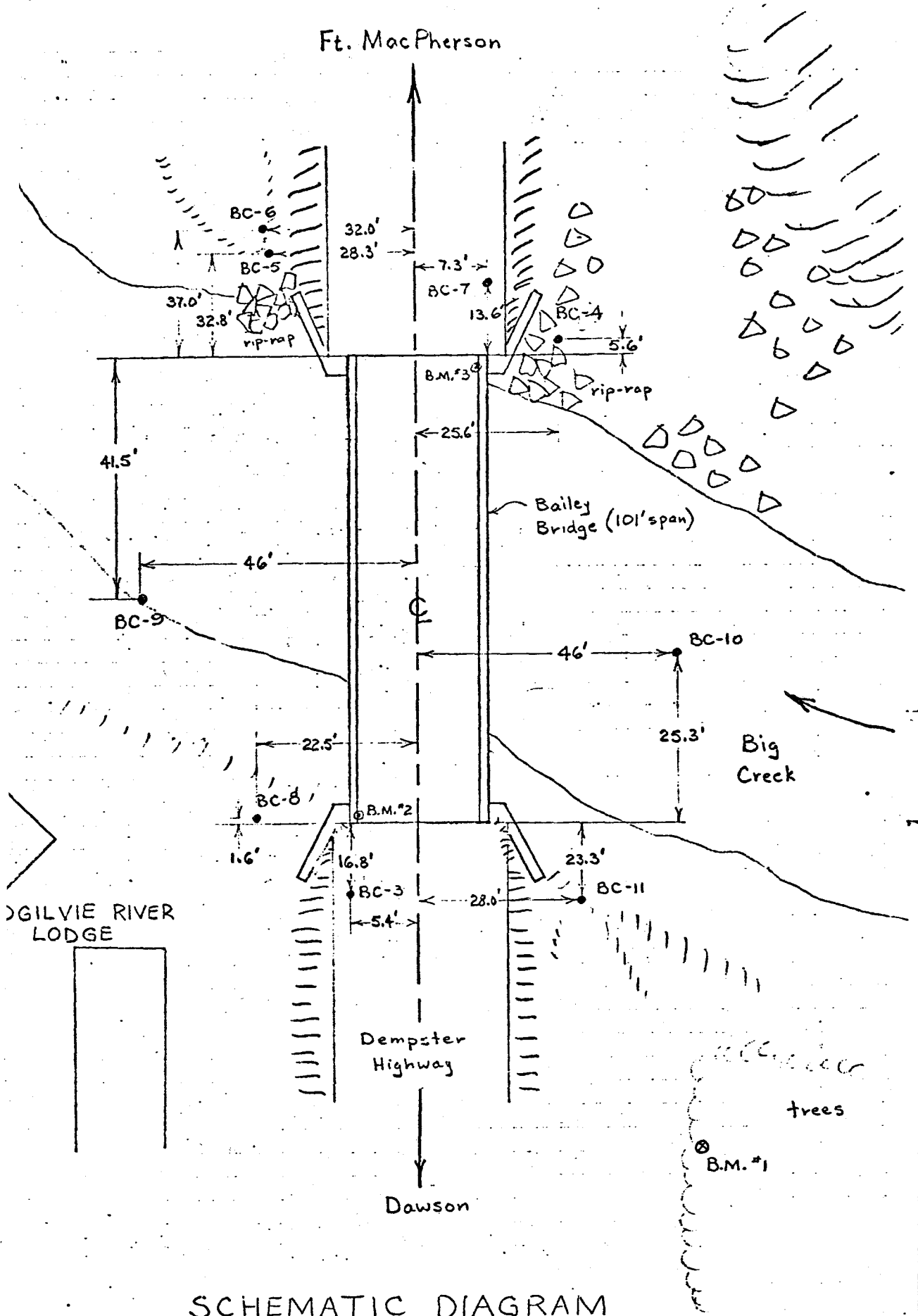
Core samples were taken in each of the four holes done by the diamond drill method. The rock retained was found to be a grey limestone, appearing slightly oolitic in nature, with a few pockets and stringers of quartz. The limestone reacted moderately well with vinegar. The core samples obtained were broken up by pre-existing fractures; the intensity of this fracturing varied leaving cores which ranged from gravel-size fragments to reasonably intact short sections. Most of the pre-existing fractures, at least in the upper layers of bedrock which were sampled, were weathered and exhibited a rusty-brown hue. Generally the intensity of the pre-existing fracturing decreased with depth.

The test holes were tied into bench-marks at their respective ends of the present bridge, with only elevation being considered. A third bench-mark was constructed from a tree, on the right of centerline, some three hundred feet south of the bridge, and a bench-mark circuit was run to tie-in the three bench marks. This third bench mark is designated as BM #1 and has been taken as datum instead of using the bridge deck as suggested; there are two main reasons for this deviation from instructions: it was felt that the bridge could, and probably does shift somewhat, and the distinct possibility exists that the children living in the Ogilvie River Lodge, next door to the bridge site, may take it upon themselves to remove as many of the markers left behind as possible. As the bridge site was left there were three bench marks, anyone of which can be used to tie-in the test holes. The locations of the test holes were also taken relative to the centerline of the road and to the ends of the present bridge, as shown on Page 4. The level data is shown on Page 17.

It is felt that the results gleaned from the drilling program at Big Creek indicate that the mission was accomplished reasonably well. The materials to be encountered during bridge construction were reasonably well established and, for the most part, their limits satisfactorily defined. It is thought, however, on compilation of the bedrock profiles, that all the holes drilled at the abutments should have been done with a diamond drill to more exactly pin-point the overburden bedrock horizon. While a hole done by seven inch hollow-stem auger was able to reach the vicinity of bedrock at the north abutment and thus provide a meaningful indication of bedrock depth, a similar attempt at the south abutment fell far short of achieving the expected results. The hole drilled by hollow-stem auger, in the south abutment, (BC-8) is believed to have met refusal on a boulder, as possible bedrock was encountered some fifteen feet deeper only seventeen feet closer to the centerline of the roadway, and from all indications previous to this, the bedrock profile dipped at a shallow angle in the opposite direction. In view of the large investment to be made in the construction of a bridge on the site, the additional time and effort that would have been spent while diamond drilling the other two abutment holes would have been well worthwhile in view of the fact that any doubt as to the location of bedrock would have been removed.

*W. Richardson*

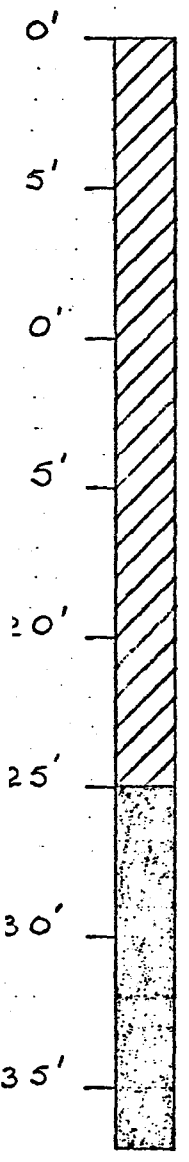
Ft. MacPherson



SCHEMATIC DIAGRAM  
SHOWING  
LOCATIONS OF TEST HOLES  
AND BENCH MARKS

hole: BC-3  
 location: on south approach, 5.4 ft left of center line,  
 16.8 ft south of bridge deck  
 and elevation: -0.1 ft, datum at BM #1  
 method: diamond drill

strata descriptions



- road surface - mainly semi-angular shale sand & gravel
- sand, gravel and cobblestone-size material  
 - largely shale material, semi-angular  
 (road-bed material)
- gravel and cobblestones; semi-round, transported material
- wash-water alternates between grey, muddy, and white; easy drilling
- gravel, cobblestones, rock fragments; material is loose and jams up the casing and core barrel.
- largely rock fragments; easy drilling
- lt. grey wash water, slow but rel. easy drilling
- alternating brown and grey wash-water
- grey limestone bedrock below 25'
- lt. grey wash-water
- no water return, easy drilling
- casing went down slowly, intermittently dropping approx. 1/2"; lt. grey wash water
- no water return; rel. easy drilling

40' .

- the core obtained below 25' was composed of grey limestone, slightly oolitic in nature, with pockets and stringers of quartz.
- a relatively solid core was obtained near 29' and near 37' but elsewhere the core was broken up by pre-existing fractures; the pre-existing fractures often exhibited weathering, especially at 32 ft.
- the grab sample of grey limestone was taken from the hillside near BC-4 and is almost identical to the rock

hole: BC-4

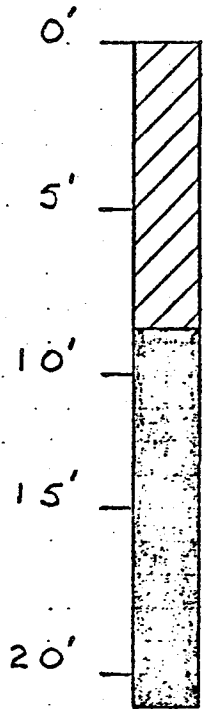
location: on north side of Big Creek, 25.6 ft right of center-line, 5.6 ft. north of bridge deck.

ground elevation: -8.77 ft, datum at BM #1

method: diamond drill

pth

strata descriptions



- broken limestone to 2 ft max, shale sand and gravel (fill material)

- broken limestone with shale material; rel. easy drilling

- grey limestone bedrock; light grey wash-water

- light grey, and clear wash-water

- steady drilling (4 → 6 in. per min).

- lt. grey wash-water

- rel. easy, steady drilling

- the core obtained below 8.5 feet was grey limestone, slightly oolitic in nature, with a few quartz stringers. The limestone was badly broken-up by pre-existing fractures at the upper levels and at this level the fractures were weathered. The core became less fractured as the depth increased.

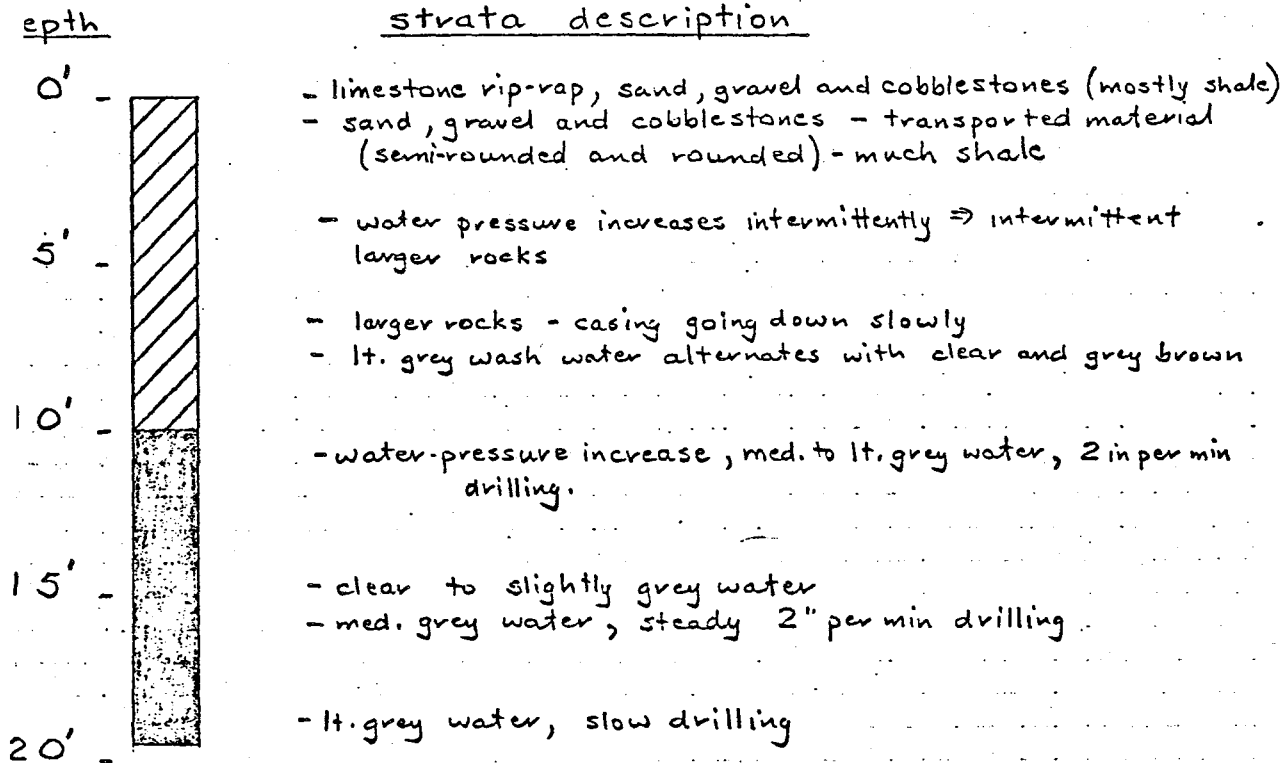
hole:

BC-5

location: on north side of Big Creek, 28.3 ft left of center-line and 32.8 ft north of the north end of the bridge deck.

ground elevation: -11.14 ft, datum at BM #1

method: diamond drill



- the core sample obtained below 10' contained grey limestone, slightly oolitic, with some quartz pockets and quartz stringers. The upper portion of the core was badly broken-up by pre-existing fractures; these fractures were weathered to approx. 14 ft.

ole:

BC-6

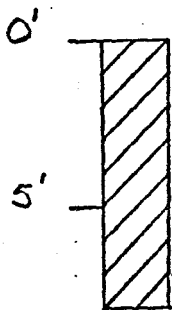
ation: north side of Big Creek; 32.0 ft left of center-line, 37.0 ft north of north end of bridge deck.

ound elevation: -10.1', datum at BM #1

ethod: 7" Hollow-stem auger

Depth

strata descriptions



- sand, gravel, small cobblestones - semi-angular shale material with other water-transported material.
- gravel to 2 in maximum; largely semi-angular shale material.
- water in hole due to creek nearby.
- larger rocks encountered
- refusal on rocks

10'

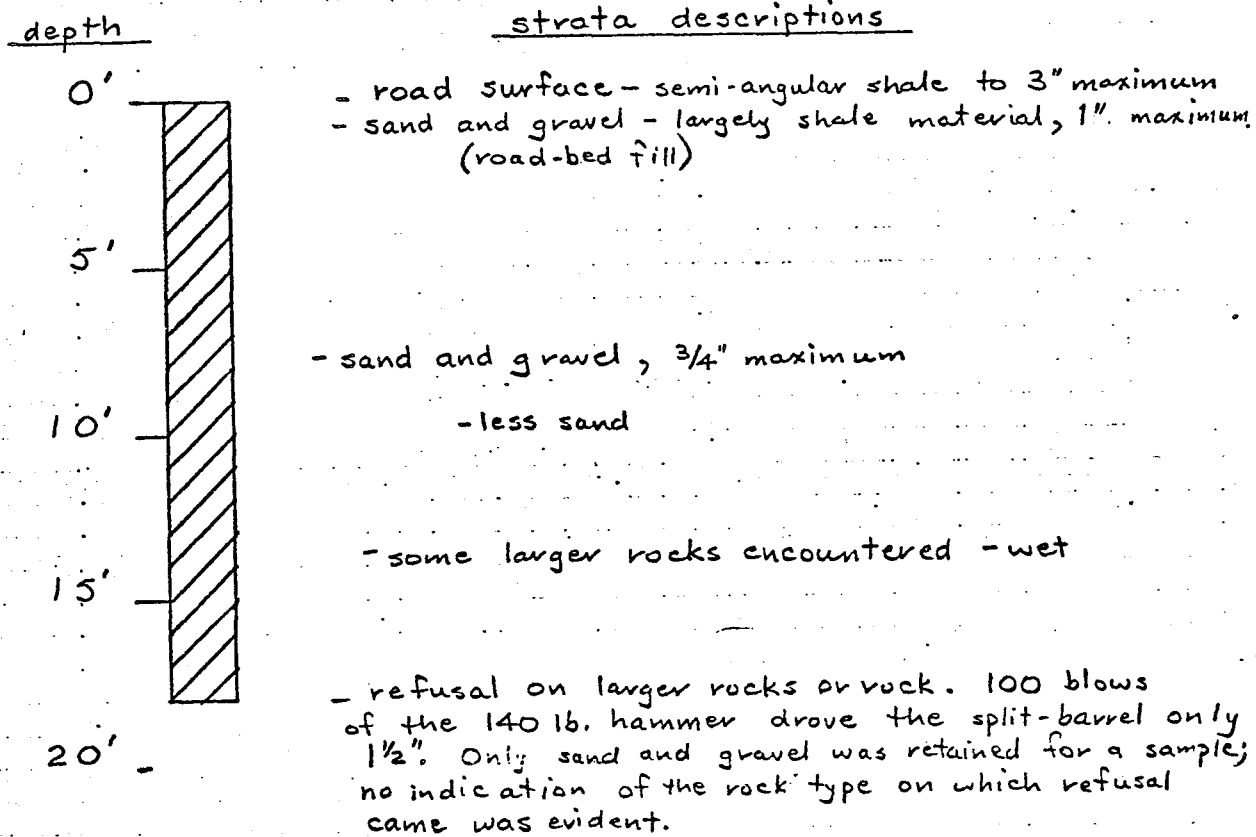
- a split-barrel sample was taken at 5 to 6 1/2 feet; only fine to med. sand was retained.

note :

location : on north approach, 7.3 ft right of center-line, 13.6 ft north of north end of bridge deck.

ground elevation : - 0.06' ; datum at BM #1

method : 7" Hollow-stem auger



hole: 000

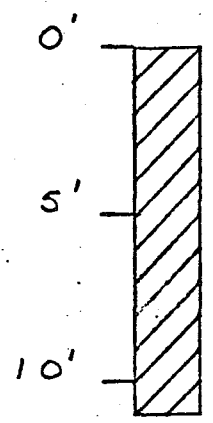
location: adjacent to south approach, 22.5 ft left of center-line, 1.6 ft north of south end of bridge deck.

ground elevation: -4.60'; datum at BM #1

method: 7" Hollow-stem auger

depth

strata descriptions



- sand, gravel, cobblestones, some organic material  
- sand and gravel; easy drilling

- some rock fragments with the sand and gravel  
- refusal on rocks

15' -

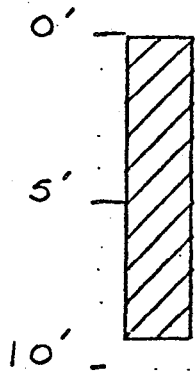
- a piece of broken rock obtained by a split-barrel sample at refusal depth was crushed and tested with mild acid (vinegar) but not effervescence was noted. The rock was mottled black and grey and had a somewhat granular nature.

location: on south shore of Big Creek, 41.5 ft south of north end of bridge deck, approximately 46 ft left of center-line.

ground elevation: -12.88 ft; datum at BM\*1

method: 7" Hollow-stem auger

depth                      strata descriptions



- gravel and cobbles - water transported, 8" maximum size
- sand, gravel, some cobbles; semi-rounded, much shale material

- some larger cobbles, with sand and gravel
- clean, fine sand
- hard drilling; sand & gravel with rocks

- refusal

- limestone fragments were obtained at refusal depth by a split-barrel sample.

hole:

BC-10

location: in Big Creek, 25.3 ft north of south end of bridge deck, approximately 46 ft right of center-line.

ground elevation: -13.51 ft; datum at BM #1

method: 7" Hollow-stem auger.

depth

strata descriptions

0



- gravel, cobblestones; 8" maximum size
- sand and gravel - dk. grey material washed away by the stream
- some larger rocks; hard going

5

- refusal on rock or large boulder

- a split-barrel sample taken at refusal depth did not obtain a sample of the rock on which the auger refused, but some white powder was noted on the end of the barrel.

hole:

BC-11

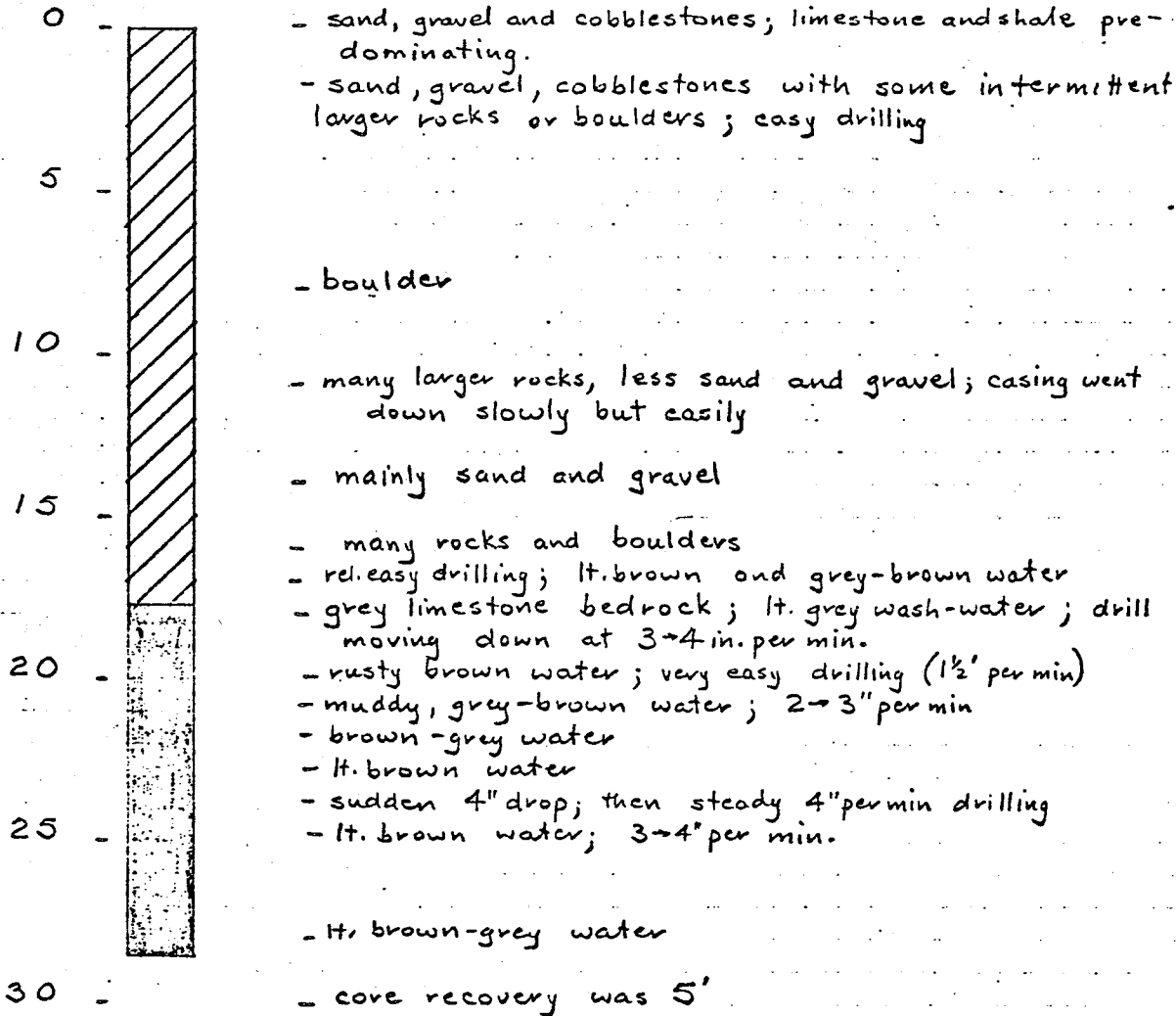
location: adjacent south approach; 28.0 ft right of center-line and 23.3 ft south of south end of bridge deck.

ground elevation: -8.20 ft; datum at BM #1

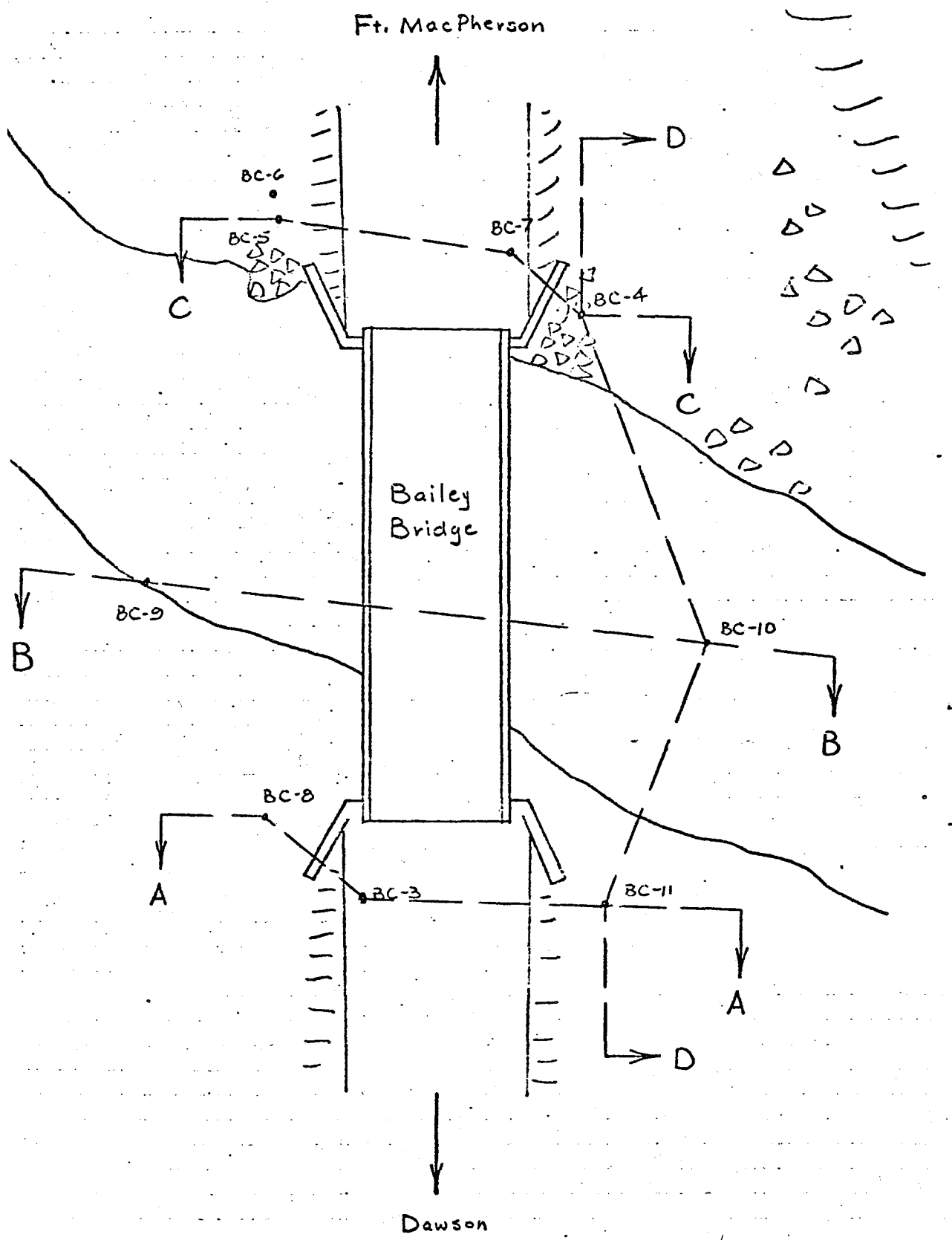
method: diamond drill

depth

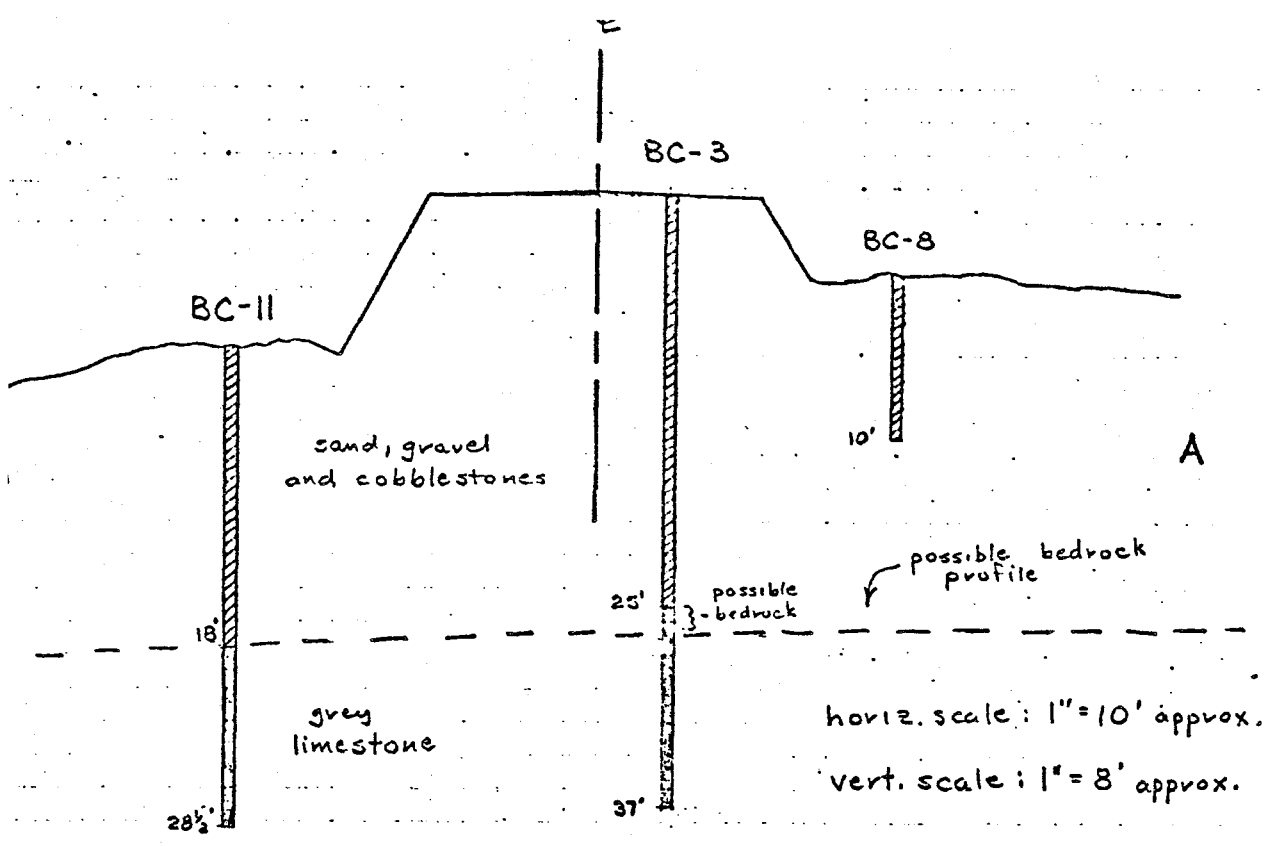
strata descriptions



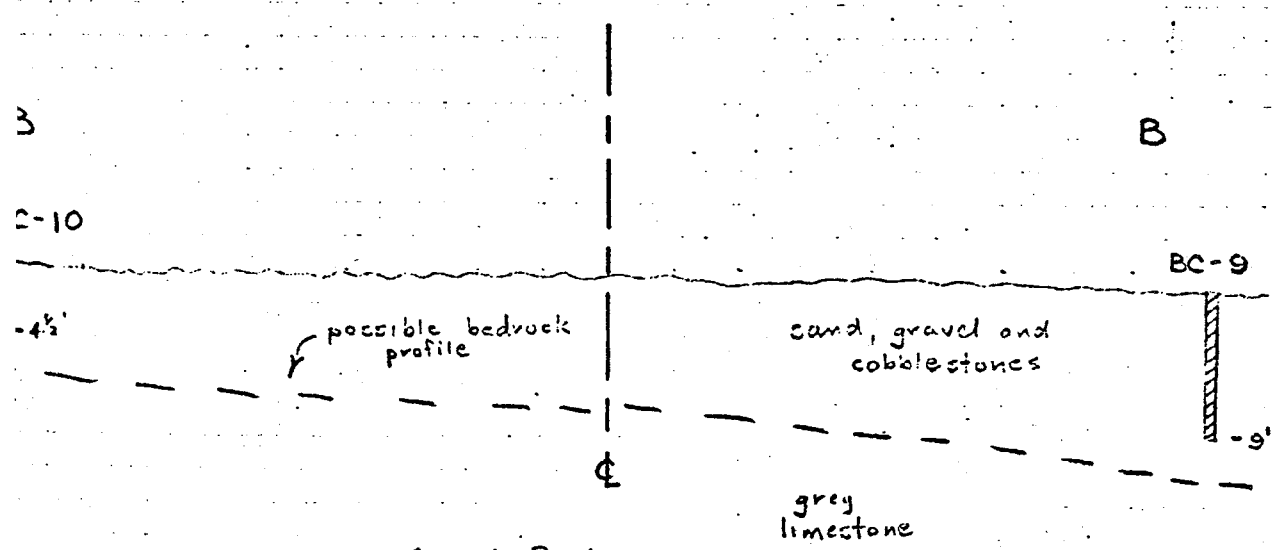
- grey limestone core obtained was badly broken-up; the pre-existing fractures were well-weathered; many small fragments present.
- the limestone was slightly oolitic, and contained quartz and quartz stringers.



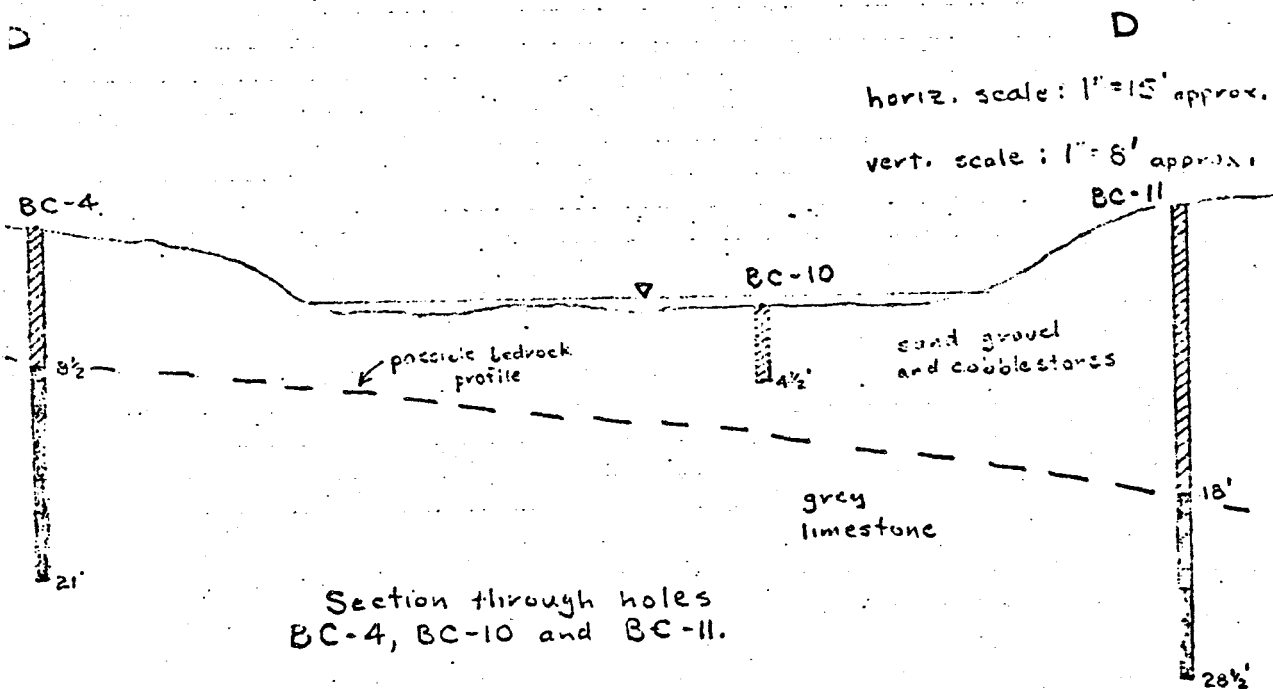
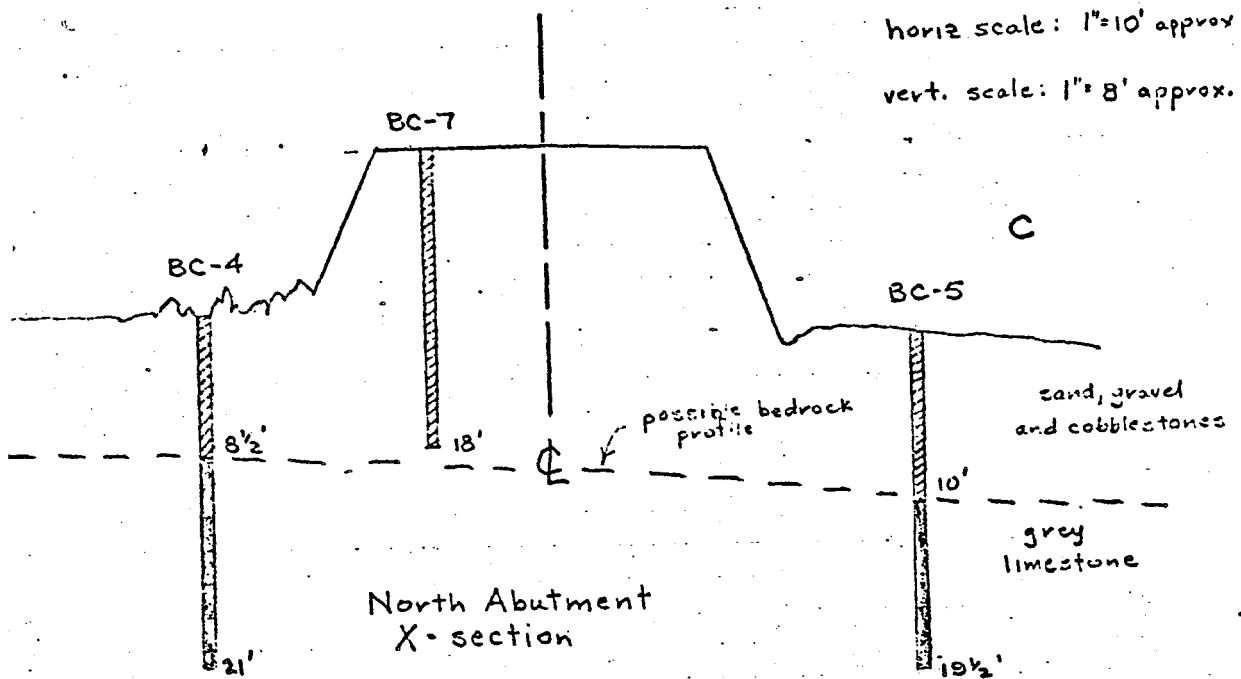
Sections Showing Possible  
Bedrock Profile



South Abutment  
X-section



Creek Bed  
X-section



Level Data

Bench-Mark Circuit

<u>location</u>	<u>rod reading</u>	<u>relative to BM#1</u>
BM #1	4.74'	
BM #2	4.10'	+ .64'
BM #3	4.26'	+ .48'

Test Hole Circuits

<u>location</u>	<u>rod reading</u>	<u>rel. to BM#2</u>	<u>rel. to BM#1</u>
BM #2	3.92'		
BC-3	4.66'	- 0.74'	- 0.10'
BC-8	9.16'	- 5.24'	- 4.60'
BC-9	17.44'	- 13.52'	- 12.88'
BM #2	3.68'		
BC-10	17.43'	- 14.15'	- 13.51'
BC-11	12.52'	- 8.84'	- 8.20'

<u>location</u>	<u>rod reading</u>	<u>rel. to BM#3</u>	<u>rel. to BM#1</u>
BM #3	4.44'		
BC-4	13.69'	- 9.25	- 8.77'
BC-5	16.06'	- 11.62	- 11.14'
BC-6	15.02'	- 10.58	- 10.10'
BC-7	4.98'	- 0.54	- 0.06'

Datum has been taken as BM #1







BORE HOLE NO.

BC-3

DPM TECHNICIAN

BORE HOLE LOCATION

on South Approach, 5.4 ft left of , 16.8 ft South of bridge deck.

DATE AND TIME

STARTED:

July 30 / 72

FINISHED:

DATUM

BML

GND SURFACE ELEVATION = 1'

CASING SIZE

N

GAUGE

READING

CONTRACTOR

DRILLER

METHOD OF BORING

Diamond Drill

SOIL:

ROCK:

CASING HAMMER WT. ....LBS.

DROP.....INCHES

DESCRIPTION OF STRATA	DEPTH (FT.)	ELEV. (FT.)	BLOWS PER FOOT	SAMPLE				BLOWS PER 6 IN.	SAMPLE NO.	SAMPLE DESCRIPTION AND BORING NOTES
				NO.	SYMBOL	TYPE	RETAINED (FT.)			
road surface	0									mainly semi-angular shale mat'l - sand, gravel, cobbles; some water transported gravel
road-bed mat'l										
- sand, gravel, cobbles	1									
"	2									"
"	3									casing went down rel. easily, as did core tube
"	4									wash-water alternates between grey, muddy, and white, indicating mixed material
"	5									"
"	6									"
"	7									"
gravel, cobbles, poss. some small boulders	8									
"	9									
"	10									easy drilling; tougher in boulders
"	11									boulders, cobbles, gravel - semi-rounded, limestone + shale predominating
"	12									"
"	13									"
"	14									easy drilling
"	15									largely rock fragments

BORE HOLE NO.

BC-3

DPW TECHNICIAN

BORE HOLE POSITION

on South Approach, 5.4 ft

left @ 16.8 ft South of bridge deck

DATE AND TIME

STARTED:

July 30/72

FINISHED:

DATUM

BM1

GND SURFACE ELEVATION: 1'

GAUGE

CASING SIZE

N

READING

METHOD OF BORING Diamond Drill

SOIL:

ROCK:

CASING HAMMER WT. ....LBS.

DROP.....INCHES

DESCRIPTION OF STRATA	DEPTH (FT.)	ELEV. (FT.)	BLOWS PER FOOT	SAMPLE				BLOWS PER 6 IN.	SAMPLE NO.	SAMPLE DESCRIPTION AND BORING NOTES
				NO.	SYM-BOL	TYPE	RE-TAINED (FT.)			
gravel, cobbles, rock fragments	16								B-40 drill... is grossly under-powered in this mat'l - drilling very slow	
"	17								- material loose	
"	18									
"	19									
"	20									
"	21									
"	22								heavier rock fragments drilling easier	
"	23									
boulders, gravel, cobbles	24									
"	25			1		C		1	lt. grey wash water, rel. easy going - boulder alternating brown & grey water	
"	26								"	
limestone bedrock	26								slow going	
- fractured	27			2		C		2	fairly easy going	
"	28									
"	29								rel. unfractured grey limestone core obtained at 29'	
"	30								- somewhat oolitic in nature?	
"	31			3		C		3	water pressure increase lt. grey wash water no water return	



BORE HOLE NO. **BC-4**  
 DPW TECHNICIAN

BORE HOLE POSITION  
 on North side of Big Creek, 25.6'

at of E, 5.6ft North of bridge deck  
 DATE AND TIME

CONTRACTOR \_\_\_\_\_ DRILLER \_\_\_\_\_

STARTED: **July 31/72** FINISHED: \_\_\_\_\_  
 DATUM **BMI**

METHOD OF BORING **Diamond Drill**

GND SURFACE ELEVATION **-8.77'** GAUGE READING \_\_\_\_\_  
 CASING SIZE **N**

SOIL: \_\_\_\_\_ ROCK: \_\_\_\_\_

CASING HAMMER WT. ....LBS. DROP.....INCHES

DESCRIPTION OF STRATA	DEPTH (FT.)	ELEV. (FT.)	BLOWS PER FOOT	SAMPLE			BLOWS PER 6 IN.	SAMPLE NO.	SAMPLE DESCRIPTION AND BORING NOTES
				NO.	SYM BOL	TYPE			
brkn limestone, gravel and sand	0				-				brkn limestone to 2' max., shale sand and gravel fill
brkn. limestone	1								- fill mat'l., grey in color.
	2								
	3								
	4								
	5								
	6								
	7								
grey limestone bedrock	8								
	9			5		C		5	- fractured badly, does not disintegrate when removed from core-barrel
	10								- a few quartz stringers; somewhat oolitic?
	11								- weathered fracture surfaces
	12								- lt. grey wash-water
	13								
	14			6		C		6	lt. grey wash-water alternating with clear; slow but steady, rel easy drilling (4-6" per min.)
	15								- continuous return of lt. grey wash-water



BORE HOLE NO.

BC-5

DPW TECHNICIAN

BORE HOLE POSITION

on North side of Big Creek, 25.3 ft left E, 32.8 ft North of end of North approach

DATE AND TIME

STARTED:

Aug. 1 / 72

FINISHED:

DATUM

BM1

GAUGE  
READING

GND SURFACE ELEVATION - 11.14'

CASING SIZE

N

CASING HAMMER WT. ....LBS.

DROP.....INCHES

CONTRACTOR

DRILLER

METHOD OF BORING Diamond Drill

SOIL:

ROCK:

DESCRIPTION OF STRATA	DEPTH (FT.)	ELEV. (FT.)	BLOWS PER FOOT	SAMPLE				BLOWS PER 6 IN.	SAMPLE NO.	SAMPLE DESCRIPTION AND BORING NOTES
				NO.	SYM-BOL	TYPE	RE-TAINED (FT.)			
gravel, cobbles, sand, limestone rip-rap	0								limestone rip-rap to 2 1/2' max, water transported gravel, sand + cobbles - largely shale mat'l	
gravel, sand + cobbles	1								casing moving down slowly but easily except in larger rocks	
poss. some boulders	2									
	3									
	4									
	5								water-pressure increases intermittently ⇒ intermittent boulders	
	6									
boulders + rocks	7								- slow drilling of casing (≈ 1/2" per min.)	
	8									
	9								lt. grey wash-water alternates with almost clear + grey brown water	
	10			8		C		8		
limestone bedrock	11									
	12								pressure increase, med-lt. grey water steady drilling (≈ 2" per min.)	
	13								- core sample badly fractured to almost 12'; fractures weathered	
	14			9		C		9	- more solid core below 12'; grey limestone with some quartz + quartz stringers - slightly oolitic	
	15								clear to sl. grey wash-water	





BORE HOLE NO.

BC-7

BORE HOLE POSITION

on North Approach, 7.3' rt E,

13.6' north of north end of bridge deck

DPW TECHNICIAN

DATE AND TIME

CONTRACTOR

DRILLER

STARTED: Aug. 2/72

FINISHED:

DATUM BMI

GAUGE  
READING

GND SURFACE ELEVATION -.06'

CASING SIZE




METHOD OF BORING 7" Hollow-stem auger

SOIL:

ROCK:

CASING HAMMER WT. 140 LBS.

DROP.....INCHES

DESCRIPTION OF STRATA	DEPTH (FT.)	ELEV. (FT.)	BLOWS PER FOOT	SAMPLE				BLOWS PER 6 IN.	SAMPLE NO.	SAMPLE DESCRIPTION AND BORING NOTES
				NO.	SYM-BOL	TYPE	RE-TAINED (FT.)			
road surface	0									semi-angular shale mat' 1 to 3"
road bed fill - sand + gravel	1									road-bed fill
	2									easy drilling
	3									
	4									
	5			12		S	1'	5	12	road-bed mat'l - sand + gravel to 1" max
	6							6		- largely shale mat'l, sl. moist, dk. grey.
	7									easy drilling
gravel + sand	8									
	9									
	10			13		S	1'	3	13	sl. moist, dk. grey, gravel to 3/4" max
	11							4		
	12									
	13									more gravel now easy drilling
	14									
	15			14		S	3/4'	5	14	- material rose in auger when plug removed - dk. grey





BORE HOLE NO. **BC-9**  
 DPW TECHNICIAN

BORE HOLE POSITION  
 in Big Creek, on south shore -

41.5 ft from north end of bridge deck; approx 46' left of  
 DATE AND TIME

CONTRACTOR \_\_\_\_\_ DRILLER \_\_\_\_\_



STARTED: **Aug. 2/72** FINISHED: **Aug. 2/72**  
 DATUM **BM-1**

METHOD OF BORING **7" Hollow-stem auger**

GND SURFACE ELEVATION **-12.83'** GAUGE READING \_\_\_\_\_  
 CASING SIZE \_\_\_\_\_

SOIL: \_\_\_\_\_ ROCK: \_\_\_\_\_

CASING HAMMER WT. **140** LBS. DROP.....INCHES \_\_\_\_\_

DESCRIPTION OF STRATA	DEPTH (FT.)	ELEV. (FT.)	BLOWS PER FOOT	SAMPLE				BLOWS PER 6 IN.	SAMPLE NO.	SAMPLE DESCRIPTION AND BORING NOTES
				NO.	SYMBOL	TYPE	RE-TAINED (FT.)			
gravel + cobblestones	0								8" max.; water transported mat'l (rounded)	
	1								less cobblestones, finer gravel (1/2" max)	
sand + gravel, some poss. silt	2								gravel to 1" max, much semi-rounded shale mat'l, with other rock types as well	
	3								rather slow going.	
, rocks	4									
sand, gravel with rocks	5			17		S	1'	13 18	17 gravel with sand wet, 3/4" max	
	6							19	clean, fine med. sand - dense at 6'	
	7								tough going	
rocks or rock	8								refusal	
	9			18		S	1 1/2'	6 17	18 - mat'l came up inside auger somewhat - sand + gravel	
	10							21	- limestone frags encountered at 9 - 9 1/2' at bottom of sample	



BORE HOLE NO. **BC-11**  
 BORE HOLE POSITION **South of Big Creek, adjacent to**  
 DPW TECHNICIAN  
 CONTRACTOR  
 DRILLER  
 METHOD OF BORING **Diamond Drill**  
 SOIL: ROCK:

**South Approach ; 28.0'rt E , 23.3' South of South end**  
 DATE AND TIME **Aug. 2 / 72** of bridge deck  
 STARTED: FINISHED:  
 DATUM **BM-1**  
 GND SURFACE ELEVATION **-8.20'** GAUGE READING  
 CASING SIZE **N**  
 CASING HAMMER WT. ....LBS. DROP.....INCHES

DESCRIPTION OF STRATA	DEPTH (FT.)	ELEV. (FT.)	BLOWS PER FOOT	SAMPLE			
				NO.	SYM-BOL	TYPE	RE-TAINED (FT.)
sand, gravel & cobble-stones	0						
"	1						
" , pass. some boulders	2						
sand, gravel, cobble-stones	3						
"	4						
"	5						
"	6						
"	7						
sand, gravel, cubble-stones	8			20		C	1/8'
" pass. boulders	9						
"	10						
many boulders with gravel, etc	11						
"	12						
"	13						
sandy gravel, etc	14						
"	15						

BLOWS PER 6 IN.	SAMPLE NO.	SAMPLE DESCRIPTION AND BORING NOTES
		7" max., predominantly limestone cobble-stones with shale sand & gravel
		casing down easily except for intermittent boulders
		some larger rocks
		boulder - med. grey wash-water followed by muddy water
20	20	- casing going down slowly but easily
		casing down very slowly in boulders, some layers of softer material
		rel. easy going

BORE HOLE NO. <b>BC-11</b>	BORE HOLE POSITION adjacent to south approach, 28.51 ft vt $\phi$ , 23.3' south of south end of bridge deck
DPW TECHNICIAN	DATE AND TIME Aug. 2/72
CONTRACTOR	DRILLER
METHOD OF BORING Diamond Drill	GND SURFACE ELEVATION CASING SIZE N
SOIL:	ROCK:
	CASING HAMMER WT. ....LBS.      DROP.....INCHES

DESCRIPTION OF STRATA	DEPTH (FT.)	ELEV. (FT.)	BLOWS PER FOOT	SAMPLE				BLOWS PER 6 IN.	SAMPLE NO.	SAMPLE DESCRIPTION AND BORING NOTES
				NO.	SYMBOL	TYPE	RE-TAINED (FT.)			
sand, gravel, cobble-stones, some boulders	16								casing down easily.	
rel. solid rock or rocks	17								lt. brown + grey-brown wash-water rel. easy drilling	
grey limestone	18								lt. grey wash-water; drilling core at 3-4 in. per min.	
"	19			21		C	2 1/2	21	lt.	
decomposed or weathered limestone?	20								rusty brown wash-water; very easy coring (1 1/2" per min.)	
	21								muddy, grey-brown water (2-3" per min.)	
	22								brown-grey water	
									- examination of core obtained shows pre-existing fractures weathered. - grey limestone, slightly oolitic with quartz and quartz stringers	
grey limestone & (fractured)	23								- lt. brown wash-water	
"	24								sudden 4" drop, otherwise steady, rel. easy going (4" per min.) lt. brown water	
"	25			22		C	2'	22	lt. brown water, steady drilling (3-4 in. per min.)	
"	26									
"	27									
pull out	28								lt. brown-grey water	



GRAIN SIZE ANALYSIS

sieve size	% FINER BY WEIGHT	sieve size	% FINER BY WEIGHT
#10	74.8	#10	74.8
20	67.4	20	67.4
40	63.6	40	63.6
100	61.0	100	61.0
200	60.6	200	60.6

PLE O.	CLASSIFICATION	L.L.	P.L.	P.I.	NAT. %W	F.M.
	SM-GM				N.P. 4.8	
					GRAVELLY SILTY SAND	

CRUSH COUNT %

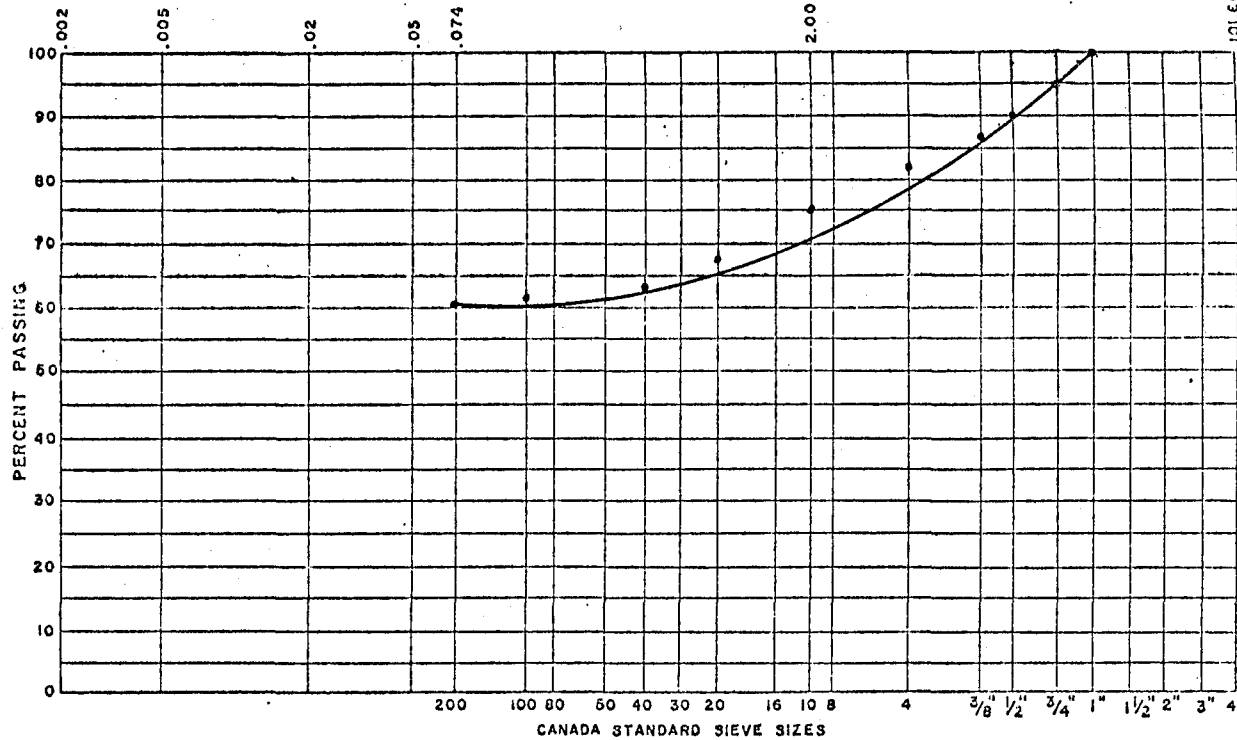
PETROGRAPHIC ANALYSIS

MATERIAL TYPE	% OF TOTAL SAMPLE
SALT	
LESTONE	
ANITIC	
NDSTONE	
IALE	
HIST	
IARTZITE	
HERS	

PARTICLE SHAPE ANALYSIS

UND	
B-ROUND	
GULAR	
B-ANGULAR	
ATS	
EDLES	

GRAIN SIZE IN MILLIMETERS



CLAY	SILT	SAND	GRAVEL
------	------	------	--------

PROJECT BIG CREEK BRIDGE - DEMPSTER HWY  
 LOCATION SEE LAB REMARKS  
 HOLE NO. BC-7  
 DEPTH 10' - 11 1/2' FIELD NO. 13  
 SAMPLE TYPE SPLIT TUBE

LAB. NO.  
**5231**

LABORATORY'S REMARKS	DATE SAMPLED
<u>C/N. APP. 7.3' R. E., 13.6' N. OF N. END</u> <u>BRIDGE DECK</u>	<u>2-8-72</u>
	DATE RECEIVED <u>5-8-72</u>
	DATE RECORDED <u>23-10-72</u>
	TESTED BY <u>Z.P.</u>
	CHECKED BY

GRAIN SIZE ANALYSIS

SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT
4"	100.0	#10	71.4
2	98.0	20	59.0
1/8	91.7	40	52.4
4	85.3	100	46.6
		200	44.6

CLASSIFICATION	L.L.	P.L.	P.I.	NAT. %W	F.M.
SM-GM - GRAVELLY SILTY SAND			TRACE	17.8	

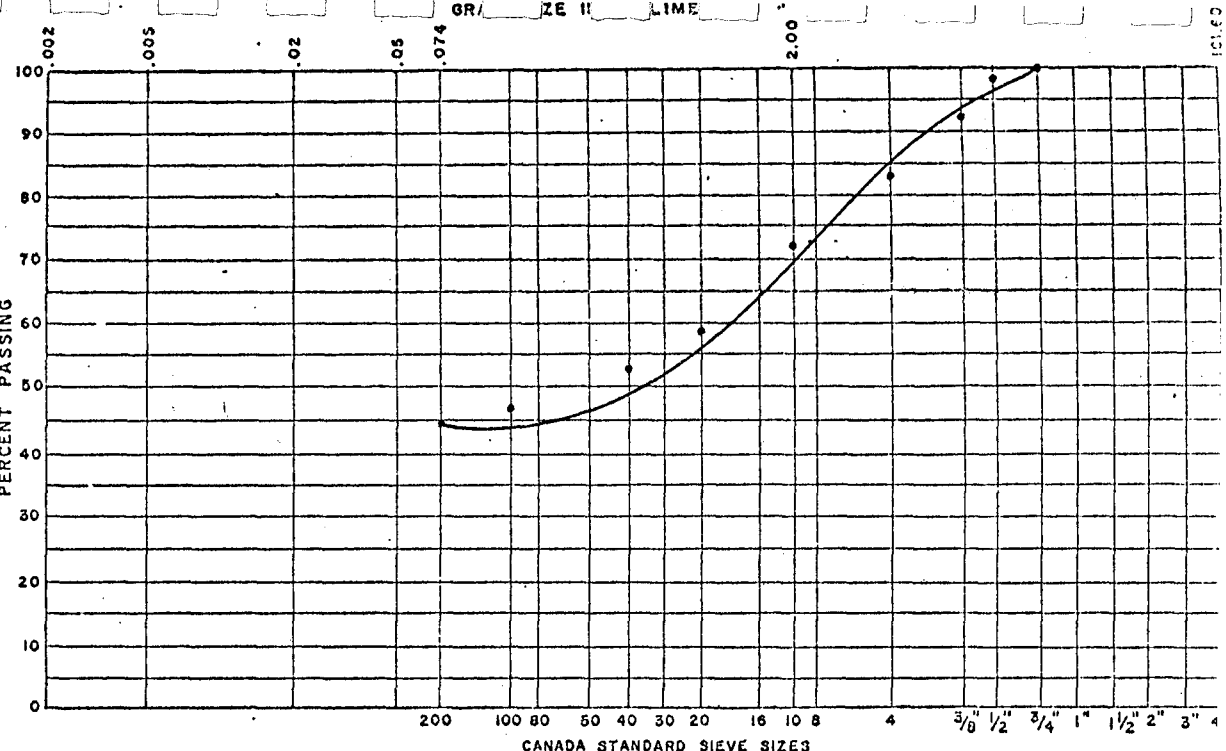
CRUSH COUNT: %

PETROGRAPHIC ANALYSIS

MATERIAL TYPE	% OF TOTAL SAMPLE
ASALT	
IMESTONE	
RANITIC	
ANDSTONE	
HALE	
CHIST	
UARTZITE	
THERS	

PARTICLE SHAPE ANALYSIS

OUND	
UB-ROUND	
NGULAR	
UB-ANGULAR	
LATS	
EEDLES	



CLAY	SILT	SAND	GRAVEL
------	------	------	--------

PROJECT: BIG CREEK BRIDGE - DEMISTER HI-WAY.  
 LOCATION: SEE LAB REMARKS  
 HOLE NO. 14  
 DEPTH: 15' - 16 1/2' FIELD NO. BC-7  
 SAMPLE TYPE: S.P.T.

LAB. NO.  
5232

LABORATORY'S REMARKS  
 OWN APP. - 7.3' R  $\phi$  - 13.6' N. OF N. END  
 OF BRIDGE DECK.

DATE SAMPLED: 2-8-72  
 DATE RECEIVED: 5-8-72  
 DATE RECORDED: 23-10-72  
 TESTED BY: SP  
 CHECKED BY:

GRAIN SIZE ANALYSIS

SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT
3/4"	100.0	#10	68.0
1/2	95.7	20	51.5
3/8	91.9	40	44.0
1/4	81.8	100	36.2
		200	33.2

MPLE NO.	CLASSIFICATION	L.L.	P.L.	P.I.	NAT. %W	F.M.
					TRACE 15.1	
	SM-GM GRAVELLY SILTY SAND					

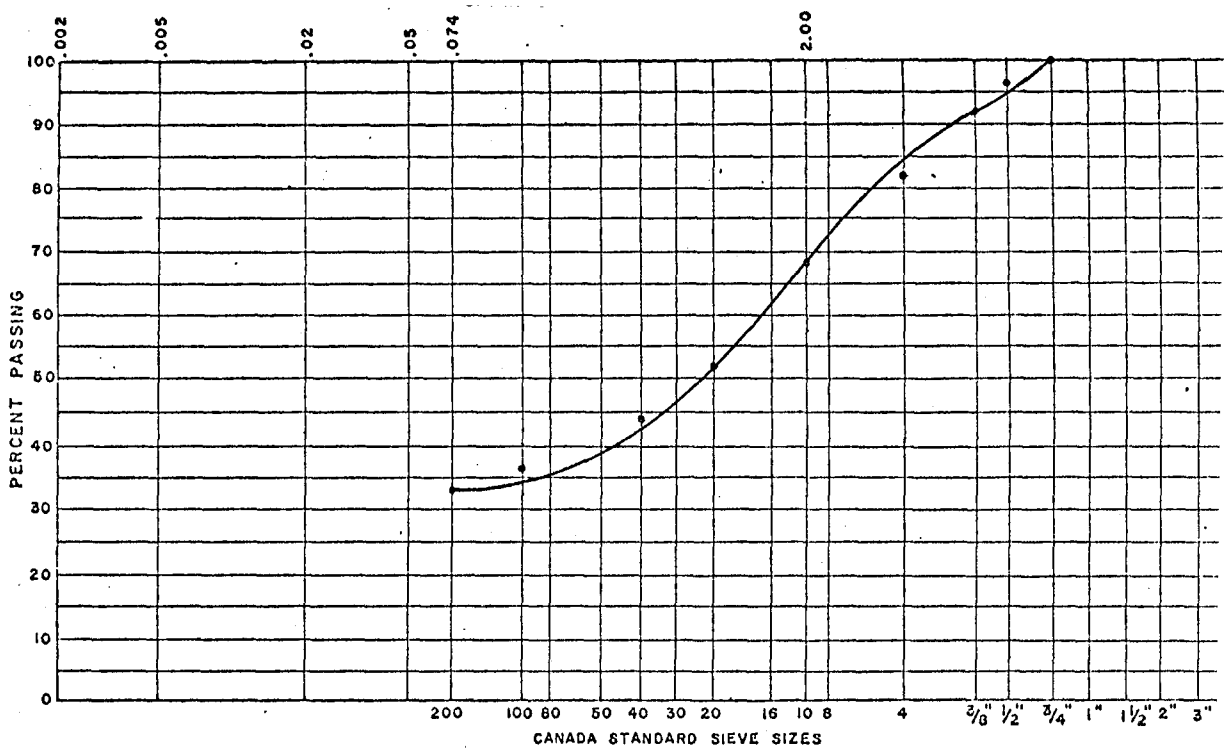
CRUSH COUNT %

PETROGRAPHIC ANALYSIS

MATERIAL TYPE	% OF TOTAL SAMPLE
BASALT	
LIMESTONE	
GRANITIC	
SANDSTONE	
SHALE	
SCHIST	
QUARTZITE	
OTHERS	

PARTICLE SHAPE ANALYSIS

ROUND	
SUB-ROUND	
ANGULAR	
SUB-ANGULAR	
FLATS	
NEEDLES	



CLAY	SILT	SAND	GRAVEL
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PROJECT BIG CREEK BRIDGE - DEMYSTER HWY.  
 LOCATION SEE LAB REMARKS  
 HOLE NO. 18'-19 1/2' BC-7  
 DEPTH 18'-19 1/2' FIELD NO. 15  
 SAMPLE TYPE S.P.T.

LAB. NO.  
**5233**

LABORATORY'S REMARKS	DATE SAMPLED
<u>CW N. APP. - 7.3' R.F. - 13.6' N. OF N. END OF BRIDGE DECK</u>	<u>2-8-72</u>
	<u>5-8-72</u>
	<u>23-10-72</u>
	TESTED BY <u>J.P.</u>
	CHECKED BY

GRAIN SIZE ANALYSIS

SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT
2	100.0			#10	59.0		
	87.2			20	50.8		
4	82.9			40	45.0		
3	74.4			100	37.0		
8	70.6			200	35.1		
7	67.0						

PLE O.	CLASSIFICATION	L.L.	P.L.	P.I.	NAT. %W	F.M.
	SM-GM - GRAVELLY SILTY SAND			N.P.	14.7	

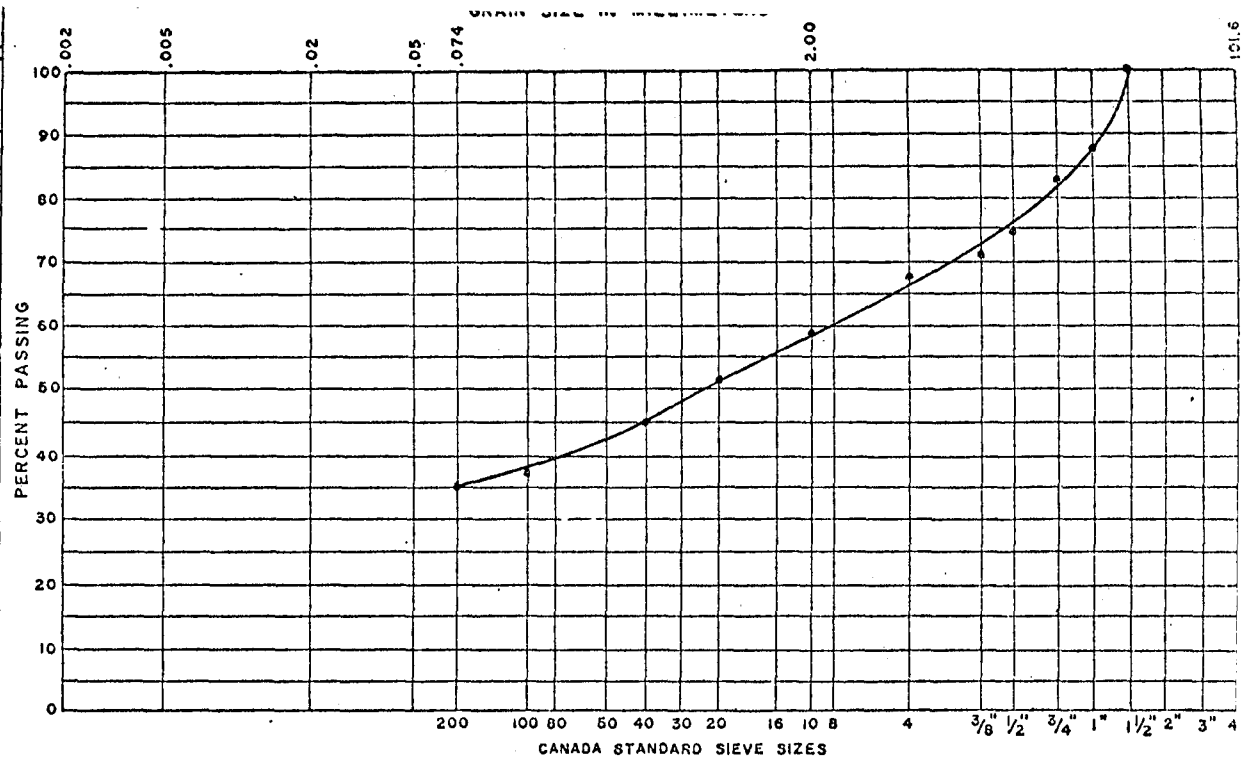
CRUSH COUNT %

PETROGRAPHIC ANALYSIS

MATERIAL TYPE	% OF TOTAL SAMPLE
USALT	
MESTONE	
RANITIC	
ANDSTONE	
HALE	
CHIST	
UARTZITE	
OTHERS	

PARTICLE SHAPE ANALYSIS

OUND	
UB-ROUND	
NGULAR	
UB-ANGULAR	
LATS	
EEDLES	



CLAY	SILT	SAND	GRAVEL
------	------	------	--------

PROJECT BIG CREEK BRIDGE - DEMPSTER HI-WAY  
 LOCATION SEE LAB REMARKS  
 HOLE NO. BC-8  
 DEPTH 10'-11 1/2' FIELD NO. 16  
 SAMPLE TYPE SPT.

LAB. NO.  
**5234**

LABORATORY'S REMARKS	DATE SAMPLED
ADJ. TO S. APR - 27.5' L. OF $\phi$ - 1.6' N. OF S. END OF BRIDGE DECK	2-8-72
	DATE RECEIVED 5-8-72
	DATE RECORDED 23-10-72
	TESTED BY J.P.
	CHECKED BY

GRAIN SIZE ANALYSIS

EVE IZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT
"	100.0			#10	62.0		
4	98.7			20	49.9		
10	91.3			40	47.3		
20	86.5			100	31.8		
40	76.9			200	29.9		

PLE O.	CLASSIFICATION	L.L.	P.L.	P.I.	NAT. %W	F.M.
	SM-GM	GRAVELLY	SILTY	SAND	TRACE 16.9	

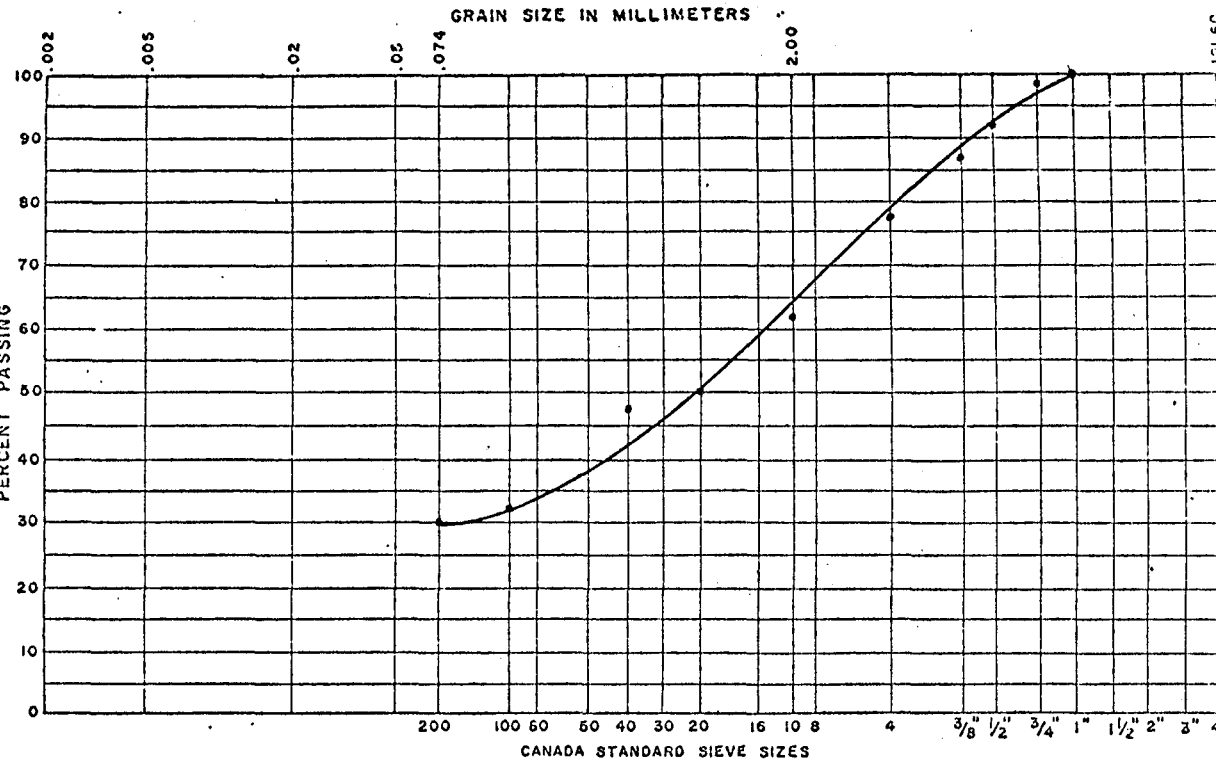
CRUSH COUNT %

PETROGRAPHIC ANALYSIS

MATERIAL TYPE	% OF TOTAL SAMPLE
SALT	
NESTONE	
ANITIC	
ANDSTONE	
ALE	
CHIST	
UARTZITE	
OTHERS	

PARTICLE SHAPE ANALYSIS

OUND	
JB-ROUND	
NGULAR	
JB-ANGULAR	
LATS	
EEDLES	



CLAY	SILT	SAND	GRAVEL
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PROJECT BIG CREEK BRIDGE - DEMISTER HI-WAY  
 LOCATION SEE LAB REMARKS  
 HOLE NO. BC-9  
 DEPTH 5'-6 1/2' FIELD NO. 17  
 SAMPLE TYPE S.P.T.

LAB. NO.  
5235

LABORATORY'S REMARKS  
IN CREEK ON S. SHORE - 4 1/2' FROM N.  
END OF BRIDGE DECK - APPROX. 46' L. E.

DATE SAMPLED 2-8-72  
 DATE RECEIVED 5-8-72  
 DATE RECORDED 23-10-72  
 TESTED BY J.P.

GRAIN SIZE ANALYSIS

SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT
#10	71.6		
#20	70.5		
#40	68.9		
#100	58.5		
#200	48.4		

CLASSIFICATION	L.L.	P.L.	P.I.	NAT. %W	F.M.
SM-GM GRAVELLY SILTY SAND LOW PLASTICITY	17.3	15.6	1.7	13.4	

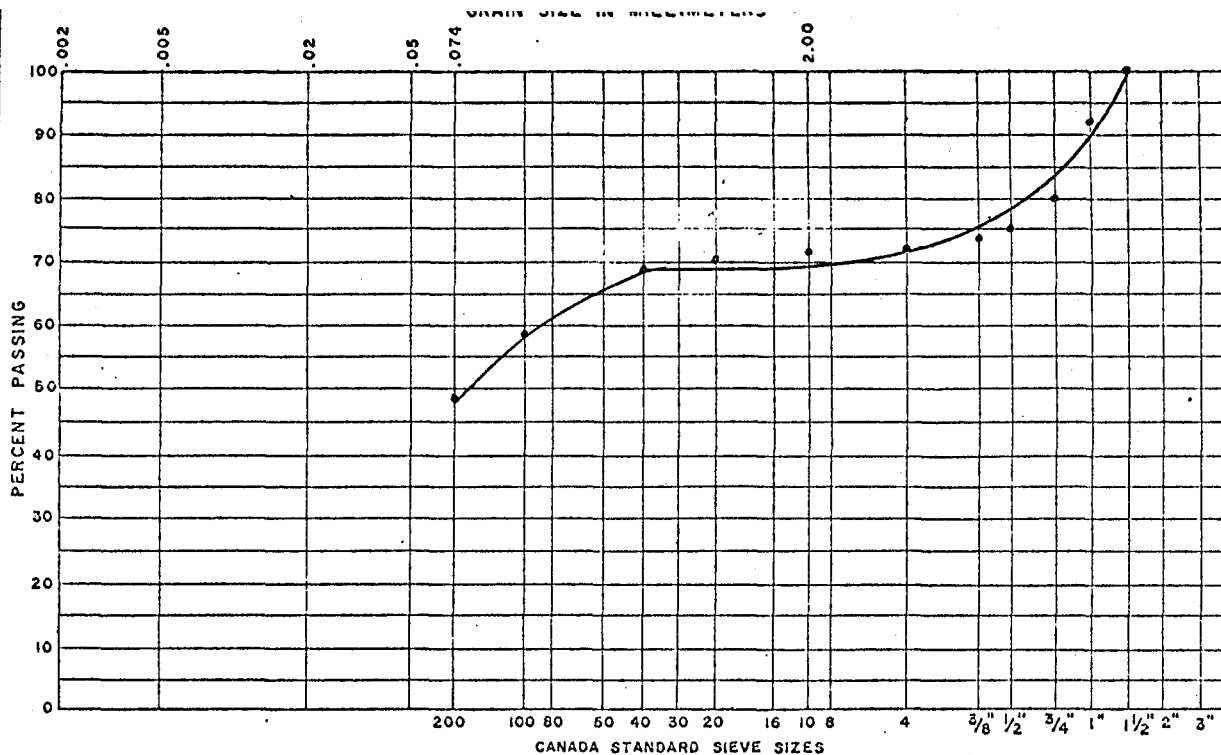
CRUSH COUNT %

PETROGRAPHIC ANALYSIS

MATERIAL TYPE	% OF TOTAL SAMPLE
ASALT	
IMESTONE	
RANITIC	
ANDSTONE	
HALE	
CHIST	
UARTZITE	
THERS	

PARTICLE SHAPE ANALYSIS

OUND	
UB-ROUND	
NGULAR	
UB-ANGULAR	
LATS	
EEDLES	



CLAY	SILT	SAND	GRAVEL
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PROJECT BIG CREEK BRIDGE - DEMETER HWY...  
 LOCATION SEE LAB REMARKS  
 HOLE NO. BC-9  
 DEPTH 9'-10 1/2' FIELD NO. 18  
 SAMPLE TYPE S.P.T.

LAB. NO.  
5736

LABORATORY'S REMARKS	DATE SAMPLED
<u>IN CREEK - ON S. SHORE - 41.5' FRONT N. FAULT BRIDGE DECK - APPROX. 46' L. &amp; E.</u>	<u>2-8-72</u>
	DATE RECEIVED <u>5-8-72</u>
	DATE RECORDED <u>23-10-72</u>
	TESTED BY <u>JP</u>
	CHECKED BY

GRAIN SIZE ANALYSIS

NO	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT
2"	100.0						
8	99.3						
4	95.4						
20	85.3						
40	73.8						
75	65.1						
150	57.4						
300	55.5						

CLASSIFICATION	L.L.	P.L.	P.I.	NAT. %W	F.M.
SM - SILTY SAND				N.P.	14.7
SAND - SILT MIXTURE					
CRUSH COUNT					
	%				

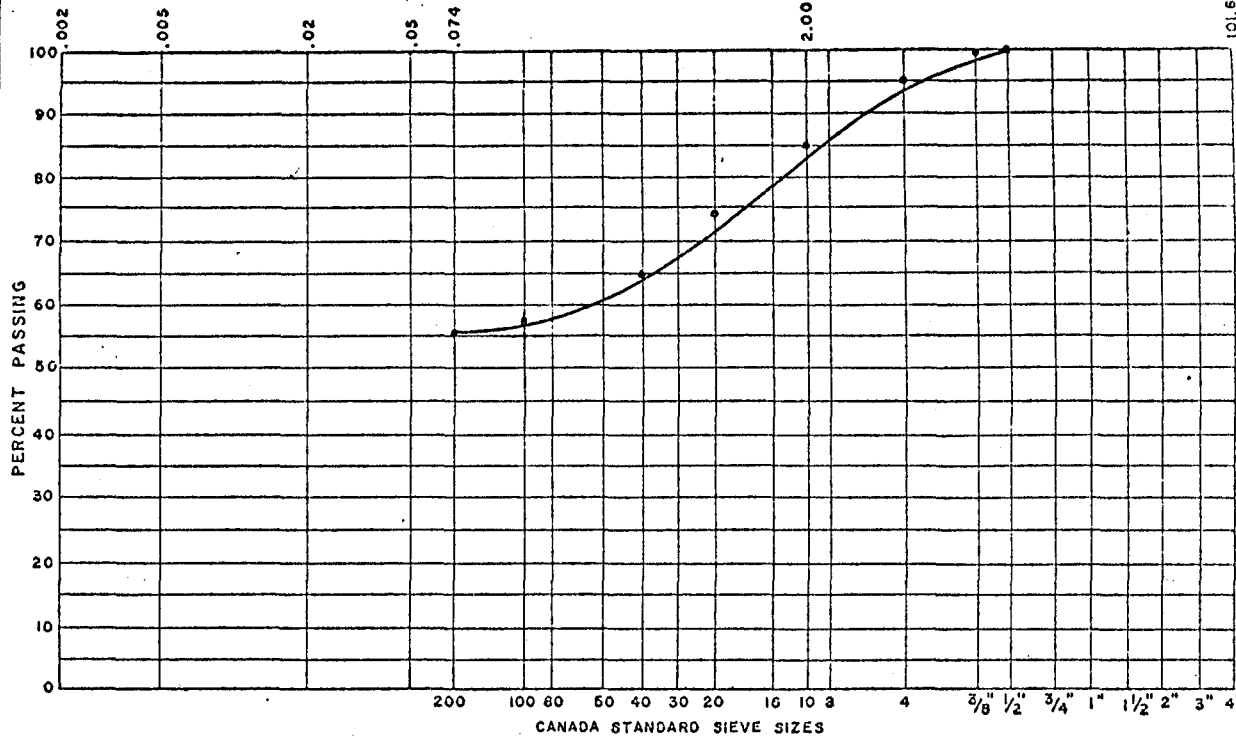
PETROGRAPHIC ANALYSIS

MATERIAL TYPE	% OF TOTAL SAMPLE
SALT	
TESTONE	
ANITIC	
VDSTONE	
ALE	
HIST	
ARTZITE	
HERS	

PARTICLE SHAPE ANALYSIS

UND	
B-ROUND	
GULAR	
B-ANGULAR	
ATS	
EDLES	

GRAIN SIZE IN MILLIMETERS



CLAY	SILT	SAND	GRAVEL
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PROJECT BIG CREEK BRIDGE - DEMASTER HI-WAY  
 LOCATION SEE LAB REMARKS  
 HOLE NO. BC-10  
 DEPTH 4'-4 1/2' FIELD NO. 19  
 SAMPLE TYPE S.P.T.

LAB. NO.  
**5237**

LABORATORY'S REMARKS	DATE SAMPLED
<u>IN CREEK - 25.3' N. OF SOUTH END OF BRIDGE</u>	<u>2-8-77</u>
<u>DECK - APPROX. 46' R. <math>\phi</math></u>	<u>5-8-77</u>
	<u>23-10-77</u>
	TESTED BY <u>ZP.</u>

GRAIN SIZE ANALYSIS

SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% FINER BY WEIGHT
3/8"	100.0						
#4	96.9						
#10	87.9						
#20	81.6						
#40	70.0						
#100	53.2						
#200	49.9						

SAMPLE NO.	CLASSIFICATION	L.L.	P.L.	P.I.	NAT. %W	F.M.
					N.P. 25.2	
	SM - SILTY SAND				SAND-SILT MIXTURE	

CRUSH COUNT %

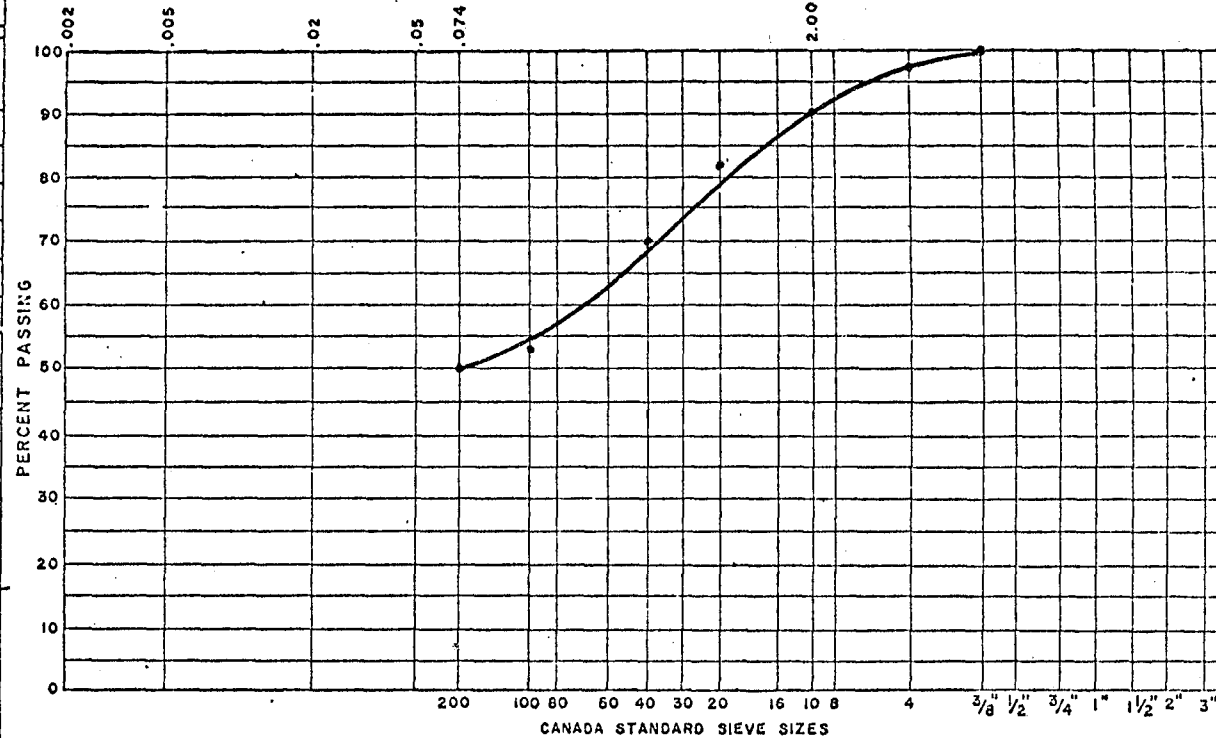
PETROGRAPHIC ANALYSIS

MATERIAL TYPE	% OF TOTAL SAMPLE
BASALT	
LIMESTONE	
GRANITIC	
SANDSTONE	
SHALE	
SCHIST	
QUARTZITE	
OTHERS	

PARTICLE SHAPE ANALYSIS

ROUND	
SUB-ROUND	
ANGULAR	
SUB-ANGULAR	
FLATS	
NEEDLES	

GRAIN SIZE IN MILLIMETERS



CLAY	SILT	SAND	GRAVEL
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PROJECT ..... BIG CREEK BRIDGE - DENVER HWY.  
 LOCATION ..... N. SIDE OF B.C. 28'3" L. & 328' N. END.  
 HOLE NO. .... BC-6 ..... OF N. APP.  
 DEPTH ..... 5'-6 1/2' ..... FIELD NO. 11  
 SAMPLE TYPE ..... S.P.T. ....

LAB. NO.  
5279.

LABORATORY'S REMARKS	DATE SAMPLED
LICE BOOK RECORDS: ON N. SIDE OF BIG CR. - 32.0' L. & - 37.0' N. OF END ON N. APP.	1-8-72
	DATE RECEIVED 5-8-72
	DATE RECORDED 23-10-72
	TESTED BY JP.

Petrographic Report on Big Creek  
from Cores Obtained

File: 6230-346

Date: Oct 25/72

BC - 11

- 8' - 8.5' - Limestone - Grey & Black - Brisk Effervescence with HCL. Also some fine grained Black Hard Quartzite.
- 17.5' - 23' - Grey Limestone - 18' Calcareous Conglomerate - 18' - 23' solid Limestone with Calcite Lenses and fractured at 23' level with Rust Colour stains in evidence 17.5' - 23'.
- 23' - 28' - Grey Limestone with Calcite Stringers & Lenses. Limestone slightly colitic throughout 8' level to 28' level. Brisk Effervescence from all Limestone using HCL. Rust Colour stains in evidence - 23' - 28'.

BC - 3

- 25' - 27' - Grey Limestone with Calcite Stringers. 25.6' level Rust Colour staining in evidence. Otherwise solid cores obtained.
- 27' - 29' - Grey Limestone with Calcite Crystals. Small amount of Rust Colour staining at 27' - 27.5 level. Fractured cores obtained at same level.
- 31' - 33' - Grey Limestone with Calcite Lenses 31' - 32' and fractured cores obtained. 32' - 33' solid Limestone core obtained. Slight weathering in evidence.
- 33' - 37' - 33'-35' Grey Limestone with Calcite Lenses - 33' shattered - 33' - 35' Oolitic. 35' - 37' solid cores obtained.

BC - 5

- 10' - 13' - Grey Weathered Limestone, fractured & slightly Oolitic (10'-12'). 12' - 13' solid cores with Calcite Stringers.
- 13' - 15' - 13' - 14' level shattered Limestone with Calcite Stringers. 14' - 15' some weathering in evidence. Otherwise solid Limestone with Calcite Stringers.
- 15' - 18' - Grey Limestone with Calcite crystals throughout. Slight fractures. Four approx 8" cores obtained. Through this depth thin Calcite Stringers.
- 18' - 19 $\frac{1}{4}$ ' - Grey Limestone - solid cores obtained. Calcite crystals throughout.

BC - 4

- 8' - 13' - Grey Limestone - Fractured at 8', 10' & 13' levels. Weathering in evidence at 13' level. Fine grained hard Quartzite showing at 8' level with Calcite coating. No further showings 8' - 13' levels. Limestone cores have Oolitic traces throughout with some Calcite Stringers. Cores are solid otherwise - with few fractures.
- 13' - 17' - 17' - 19' solid cores obtained - Grey Limestone - few fractures. Oolitic appearing at fractures. Few Calcite Stringers.
- 17' - 21' - Grey Limestone - Oolitic to 19' level. Few Calcite Stringers. Solid cores obtained throughout. Relatively unfractured cores obtained.

N.B. Major weathering (Rust Colour Staining) occurs in fractures & where fractures are forming in Limestone Bedrock.

All Limestone reacts with a brisk Effervescence using HCL.