King

Post Office Box 889
Morgantown, WV 26505
Telephone (304) 296-2562

TRIAD

April 12, 1990

National Radio Astronomy Observatory
Edgemont Road
Charlottesville, VA 22903-2475

Attention: Mr. William Porter
GBT Business Manager

Subject: Preliminary Recommendations for the
New 100 meter diameter Radio Telescope
Green Bank, West Virginia
Triad Project No. 90062

Gentlemen:

This letter presents our preliminary findings and recommendations for the planned radio telescope foundations. The subsurface investigation for this project consisted of seven (7) test borings drilled along the circumference and center of the planned telescope base. The drilling was completed on April 11 and the following recommendations are based on the data obtained from the seven test borings as well as our past experience with similar subsurface conditions.

Subsurface materials encountered in the borings consisted of alluvial overburden underlain by sedimentary rock. The upper stratum consisted of a topsoil and silty clay material to a depth of about 2 feet. The silty clay was underlain by a stratum of sandstone cobbles. The cobble stratum was found to vary in thickness from about 8.5 to 13.0 feet in the seven test borings. The cobble layer was underlain by a weathered shale bedrock. The weathered shale generally became more competent with depth and graded into a relatively hard shale.

We understand that the planned telescope's foundations can undergo very little to no settlements due to the sensitive nature of the telescope. It is for this reason that we recommend that the telescope be founded on bedrock. The weathered shale bedrock is deemed suitable for support of the telescope's foundations. Excavation depths of 12 to 15 feet below existing ground surface would be required to encounter this bearing stratum. Foundations bearing in the weathered shale bedrock may be designed utilizing a maximum allowable bearing pressure of 4,000 pounds per square foot. The foundations may also be founded on the hard shale bedrock which is present at depths ranging from 15 to 17 feet. We recommend that a maximum allowable bearing pressure of 15,000 pounds per square

foot be used for design of foundations bearing in the hard shale at the recommended depths.

Groundwater was encountered in the borings at depths ranging from 4.9 to 6.9 feet. Excavations to achieve the recommended bearing levels will most likely encounter the groundwater table. We recommend that groundwater interception trenches and sumps be utilized around the site to control the flow of groundwater into the foundation excavations. It is emphasized that groundwater levels typically fluctuate and are generally dependent upon seasonal and climatic factors.

We hope that this information is sufficient for your current needs. Our completed report will be submitted one or two weeks following completion of the laboratory and seismic testing. If you have any questions or require any additional information, please do not hesitate to contact us.

Very truly yours,

TRIAD ENGINEERING CONSULTANTS, INC.

John E. Nottingham, E.I.T.

Dennis C. Chambers, P.E.

cc: Mr. Bob Viers

Green Bank Radio Telescope

Core Sample From
Boring B-6

Depth: 11.4 to 26.0 feet

1st run: 11.4 to 19.5 feet

2nd run : 19.5 to 26.0 feet

Triad Engineering Consultants, Inc
Morgantown, WV
6/25/90

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TRIAD

MEMO

To: Mr. Richard Flemming
From: John Nottingham

RE: New Greenbank Telescope

I have sent you the core samples from Boring B-6 as well as six copies of the B-6 Boring Log. The core samples obtained from this boring are generally representative of the upper bedrock strata at this site. As the core box indicates, rock was cored in this boring from a depth of 11.4 ft. to 26.0 ft. in two core runs. The first run was from 11.4 ft. to 19.5 ft., and the second run was from 19.5 ft. to 26.0 ft. The first run of the core had a sample recovery of 80% which indicates that approximately 1.6 feet of rock was not recovered in this run. It is most likely that the 1.6 feet of unrecovered rock core occurred from depths 11.4 ft. to 15.0 ft. where the bedrock is more weathered (softer).

Another important factor that any potential contractor should be aware of is the relatively high ground water level at this site. It is important to keep the groundwater out of the foundation excavations and doing so will require some skill and experience on the part of the contractor.

I hope the core samples meet your needs. Please do not hesitate to call if your need further assistance or have any questions.

Triad Engineering Consultants, Inc.
Morgantown, WV
St. Albans, WV

BORING NO. B-6
SHEET 1 OF 2

TEST BORING LOG

PROJECT: NARO Radio Telescope — PROJECT NO.: 90062
STATION: — OFFSET: — SURFACE ELEVATION: 101.00
DATES: START: 4-4-90 — FINISH: 4-5-90 — INSPECTOR:
WATER LEVELS (DEPTH/DATE): 6.9 ft./4-11-90

DEPTH (FT.)	SAMP. NO. LENGTH TYPE	BLOW COUNTS / RECOV. (%)	STRATA DEPTH (FT.)	STRATA IDENTIFICATION	RQD
0.0					
	0.0	2			
	S-1	3	1.0	Topsoil	
	1.5	4			
			2.0	Brown sandy clay, moist, soft	
				Brown sandstone cobbles and sand, damp to wet, firm to dense	
	2.5	18			
	S-2	21			
	4.0	22			
5.0					
	5.0	25			
	S-3	35			
	6.5	34			
	7.5	29			
	S-4	22			
	9.0	31			
10.0					
	10.0	10			
	S-5	17	11.0		
	11.4	50/.4		Brown and gray weathered shale, soft	
15.0					
	RC-1	80%	15.5		
				Gray shale, medium hard to hard	29%
	19.5				
20.0	19.5				

GENERAL REMARKS:

BORING NO. B-6
SHEET 1 OF 2

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20.0					
				Gray shale (cont'd.)	
	RC-2	95%			29%
25.0					
	26.0		26.0		
				End of Boring @ 26.0 ft.	
30.0					
35.0					
40.0					

GENERAL REMARKS:

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	0.0 S-1 1.5	2 / 3 / 4	1.0	Topsoil	
			2.0	Brown sandy clay, moist, soft	
	2.5 S-2 4.0	18 / 21 / 22		Brown sandstone cobbles and sand, damp to wet, firm to dense	
5.0					
	5.0 S-3 6.5	25 / 35 / 34			
	7.5 S-4 9.0	29 / 22 / 31			
10.0					
	10.0 S-5 11.4	10 / 17 / 50/.4	11.0	Brown and gray weathered shale, soft	
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