

APRIL 1979

NATIONAL RADIO ASTRONOMY OBSERVATORY

APRIL PROGRESS REPORT

VLA PROGRAM

MAY 16, 1979

PROPERTY OF THE U.S. GOVERNMENT
NATIONAL RADIO ASTRONOMY OBS
VLA LIBRARY

MAY 24 1979

NATIONAL RADIO ASTRONOMY OBSERVATORY

MONTHLY PROGRESS REPORT

VLA PROGRAM

APRIL 1979

SYSTEMS INTEGRATION DIVISION

The array was scheduled for 44 percent of the time; 34 percent went to astronomical programs and the remaining 10 percent to tests. The average downtime for the month was approximately 15 percent.

Antenna 19 was moved to N6 on April 16. The nineteen antennas currently outfitted with electronics are located at stations W8, W32, E1, W16, E2, W24, E4, W40, W48, E3, E8, E16, E12, W56, W64, E18, N8, N4, and N6. These stations are positioned approximately 0.48, 5.2, 0.08, 1.6, 0.05, 3.2, 0.15, 7.7, 10.5, 0.09, 0.48, 1.6, 0.97, 13.6, 17.2, 1.95, 0.44, 0.13, and 0.27 km respectively from the array center. Our longest astronomically usable baseline is approximately 18 km. Antenna 7 was returned to operation on April 16. Antennas 5 and 9 are presently decommissioned for electronic retrofits and Antenna 3 has been decommissioned for electronic tests. Antennas 16, 18 and 19 are in the shakedown stage. The test array consists of antennas 3, 5 and 11.

ELECTRONICS DIVISION

Construction and testing of the front end for antenna 20 was completed and the front end was installed in the vertex room ready for operation in early May. Tests have been made on the old style AIL paramps and it has been found that circulator demagnetization becomes significant after four thermal cycles of the paramps. Tests on new style AIL paramps show no sign of demagnetization after 14 thermal cycles. Negotiations with AIL are continuing towards having the circulators on all old style paramps replaced.

In the waveguide area all couplers have been replaced with units that have their coupling systems correctly bonded to the waveguide wall. TE₀₂ mode filters were installed on all arms between the signal distributors and the 60-mm waveguide in the Control Building. Finally, pressure regulators to provide absolute (rather than gauge) control of the nitrogen pressure in the waveguide have been installed and are operational on all three arms.

In the monitor and control system, the problem of lost commands was solved by replacing an integrated circuit in the M3 (central buffer) modules.

Preliminary system tests on the new baseband system (modules T3, T4, T5, T6) have now been completed. The tests showed that significant compression is occurring in the system which causes errors in the system

temperature measurement made in the Control Building. This problem was not considered sufficiently important to delay the start of production of the baseband system and improvements to improve the compression problem will be retrofitted in the future.

In the delay/multiplier system the new integrator was installed and shows a very significant improvement in integrator errors caused by cross talk. During two observing periods no integrator errors at all were detected.

COMPUTER DIVISION

An implementation of the clean algorithm for the PDP-11/70 has been completed.

Work on the spectral line sorting system is progressing. The system was delivered with the wrong version of one of the controller printed circuit boards. Century has supplied the correct board for one of the controllers, and we have demonstrated the capability of running that disk under the Files II file manager. This will enable us to at least get started on software.

The on-line software for the interim spectral line system has progressed to the point that it can output data to tape; significant further development will wait for some DEC-10 data reduction software.

We have ordered an additional 64 k words of memory for the image display system, which will allow room for two simultaneous functions.

ANTENNA DIVISION

At the end of April the status of the work of the Antenna Division was as follows:

Antenna No. 20

Mechanical outfitting completed on April 6 and antenna moved on April 16 to Station CW5 for installation of receivers and control module and for initial operation.

Antenna No. 21

Moved on April 16 to maintenance pad and mechanical outfitting started. Access stairway modified, cryogenic platform installed and waveguide support arms installed.

Antenna No. 22

Awaiting mechanical outfitting.

Antenna No. 23

Servo Tests completed on April 3 with an exhibited Natural Frequency of 2.42 Hz in elevation and 2.3 Hz in azimuth. All mechanical checks completed and antenna moved on April 23 to Station CN5 to await mechanical outfitting.

Antenna No. 24

Reflector was mated to the pedestal assembly on April 4 and the antenna returned to the assembly foundation. Axis alignment completed, gear racks aligned, gear reducers, surface panels and feed support legs installed and aligned. Checkout of surface panels completed on April 24 with a measured rms of 0.011 inches. On April 30 the antenna was moved to the master pad for servo installation and final checkout.

Antenna No. 25

Hub assembly started on April 17. Trial assembly completed in Hobbs and reflector and base triangle shipped to site.

Antenna No. 26

Trial assembly in progress at Hobbs.

Miscellaneous

Antenna 19 moved on April 16 from Station CW6 to Station DN6. Procurement of materials for Transporter No. 2 is underway by the sub-contractor.

SITE AND WYE DIVISION

Waveguide Installation

Installed approximately 2320 feet of waveguide, set to line and grade and backfilled between AE7 and AE8. Trenched approximately 6100 feet. Completed zinc ribbon installation to AN7. Installed intermediate manholes from AE7 to AE8.

Phase IV

Overall completion 74%. Track work on the West arm is still 98% complete with small modifications required before final acceptance. Track work has started on the East arm and is partially complete to AE5. First lift of ballast has been placed to BE9. Round Place Construction is 95% complete with the earthwork. Subgrade preparation is complete to AE6 and is ready for trackage. All antenna foundation concrete tie beams have been poured, along with foundation pedestals except at Stations BE6, BE7 and BE8.

An approved contract in the amount of \$2,820,000 was sent to Wm. A. Smith Contracting Co., Inc. for Phase V work.

PROJECT MANAGEMENT

General

Land Acquisitions: To date the Commission, appointed by Federal Judge Bratton, to recommend a value for the land taken from ranchers Taylor, Ake, and Dunlap have not made their report.

New Mexico Gross Receipts Tax: The final judgement in favor of the U. S. Government was issued by Federal Judge Santiago Campos on April 19, 1979. The State has until June second to appeal this judgement.

Personnel

The personnel changes as of April 30, 1979 are as follows:

Division	Budgeted 12/79 Level	3/31/79 Level	Additions	Reductions	4/30/79 Level
Site & Wye	9	9	1	1	9*
Antenna	17	13	1	0	14
Electronics	54	52	3	1	54*
Operations Management	3	3	0	0	3
Computer	14	12	0	0	12
Array Operations	11	9	0	0	9*
Program Management	28	27	1	1	27**
Totals	136	125	6	3	128

* Does not include one part-time employee

** Does not include three part-time employees



p4-79-1

Pacific R.R. Construction Co. Diesel Engine
Spreading Ballast on East Arm Construction



p4-79-2

Diesel Engine Returning Cars to Load Ballast
for East Arm Construction

4/30/79

VLA PROGRAM
MAJOR SUBCONTRACTS AND PURCHASE ORDERS PLACED

NUMBER P.O. SUBCONTRACT	VENDOR	ITEM DESCRIPTION	DATE PLACED	DOLLAR AMOUNT	DELIVERY DATE	CURRENT STATUS - ALL FIRM FIXED PRICE CONTRACTS EXCEPT WHERE NOTED
VLA-5 Amend. #12	BWH/CVA Joint Venture	E/A Title I and II	6/11/73	\$ 1,090,684		Title I -Completed Title II -Completed Title III -Completed Title IV -VLA-325 Supervision
VLA-6 Amend. #21	E-Systems, Inc.	28 Radio Telescopes	10/18/73	\$ 18,156,054		Delivery in Progress.
VLA-29 Amend. #5	Sterling-Detroit	Focusing Feed Mounts thru Antenna 28 plus spares	6/17/74	\$ 1,002,380		Delivery in Progress. (Mounts for Antennas 23-28 complete by 7/13/79. Amend. #5 issued 11/9/78.
VLA-70 P.O. 52322 CO. #7	Sumitomo Electric USA, Inc.	3000 pieces of waveguide and 3900 pieces of coupling sleeves.	11/03/78	\$ 3,215,847	7/31/79; 10/31/79; and 1/31/80	Next 1000 pieces of waveguide and coupling sleeves to arrive Oakland port by 7/31/79.
VLA-233 P.O. S-02611	Silicon Systems, Inc.	Custom Integrated Circuits	12/12/76	\$ 206,375	5/31/79	Complete except for 468 each of Item 4.
VLA-256	New Mexico State University	Archaeological Exca- vation	9/20/77	\$ 107,000	2/20/79 Completion	\$80,633 invoiced thru 12/31/78 Final reports due 2/20/79.
P.O. S-07990	AIL Division Cutler- Hammer	Parametric Amplifiers	9/21/78	\$ 197,600	Complete by 1/21/80	4 received. 2 promised 5/31 and 6/30, 4 per month until on schedule.
P.O. S-08085	AIL Division Cutler- Hammer	Parametric Upconverters	10/23/78	\$ 102,525	4/13/79 thru 8/13/79	
P.O. S-08510	RLC Electronics, Inc.	Switch filter assemblies and filters	12/12/78	\$ 193,943	Start 4/3/79	Diode delivery problems from their supplier.
P.O. S-08535	RF Systems, Inc.	Ku and K Band Feed Horns	12/14/78	\$ 71,554	5/15/79	Promised partials 5/15/79. Complete 5/31/79.
P.O. S-08558	Allen Avionics	L.C. Filters	1/08/79	\$ 69,500	Complete by 6/30/79	

VLA PROGRAM
MAJOR SUBCONTRACTS AND PURCHASE ORDERS PLACED

NUMBER P.O. SUBCONTRACT	VENDOR	ITEM DESCRIPTION	DATE PLACED	DOLLAR AMOUNT	DELIVERY DATE	CURRENT STATUS - ALL FIRM FIXED PRICE CONTRACTS EXCEPT WHERE NOTED
P.O. S-08329	Contact Systems, Inc.	Various Wiring Modules	10/31/78 1/19/79	\$ 30,486	Complete by 9/30/79	
P.O. S-06387 Amend. #2	Milliflect	Subreflectors	10/23/78	\$ 61,200	Complete by 8/01/79	
P.O. S-08422	Rimo Manufacturing, Inc.	L Band Horns	12/7/78	\$ 71,190	Complete by 9/1/79	
P.O. S-08423	Rimo Manufacturing, Inc.	C Band Horns	11/17/78	\$ 36,600	Complete by 10/01/79	
P.O. S-08443	Avantek, Inc.	Transistor Ampli- fiers	11/17/78	\$ 23,636	Complete by 4/15/79	To ship complete 5/15/79.
VLA-323	Logemann Bros.	Transporter	1/17/79	\$ 788,758	1/17/80	
P.O. S-08684	A & K Railroad Materials, Inc.	Wood Cross Ties	1/17/79	\$ 375,000	Complete by 10/79	
P.O. S-08685	Standard Pipeprotection	Coating of Waveguides	2/2/79	\$ 61,793	Complete by 2/15/80	
VLA-345	G. C. Dean	Labor Hour (Waveguide installation)	3/19/79	\$ 170,000	One Year Completing 3/18/80	
VLA-346	Wm. A. Smith Con- tracting Co., Inc.	Phase V Construction	4/26/79	\$2,820,000	June, 1980	

VLA PROGRAM
MAJOR SUBCONTRACTS AND PURCHASE ORDERS PLACED

NUMBER P.O. SUBCONTRACT	VENDOR	ITEM DESCRIPTION	DATE PLACED	DOLLAR AMOUNT	DELIVERY DATE	CURRENT STATUS - ALL FIRM FIXED PRICE CONTRACTS EXCEPT WHERE NOTED
P.O. S-08645	DEC	Computer Maintenance	1/08/79	\$ 90,063	CY '79	Monthly expenditure rate estimated at \$7,500.
P.O. S-06827 Amend. #2	C.T.I. Cryogenics	Cryocooler	5/23/78	\$ 239,760	2/15/80	
VLA-325	Pacific Railroad Constructors, Inc.	Phase IV Construction	6/23/78	\$2,916,080	9/16/79	Work progressing satisfactorily.
VLA-326 P.O. S-08191 C.O. #1	California Computer Products, Inc.	Data Storage Subsystem	11/12/78 12/18/78	\$ 221,190	2/01/79	99% complete.
VLA-340 P.O. S-08227 C.O. #1	Digital Equipment Corp.	Computer System	11/06/78 12/08/78	\$ 102,977	2/09/79	99% complete.
VLA-344 P.O. S-08595	Wheeler Construction Co.	Crushed Stone	1/08/79	\$ 668,660	Complete by 4/01/80	
P.O. S-08222	Structures, Inc.	Transition & Towers for K, Ku and C-Band Horn, L-Band Towers	10/19/78	\$ 23,955	Complete by 6/01/79	L-Band Towers Complete.
P.O. S-08230	Structures, Inc.	Feed Support Structures	10/23/78	\$ 26,855	Complete by 6/01/79	
P.O. S-08269	Superior Electric Co.	Motors & Translators	10/26/78	\$ 30,643	1/29/79	Shipment complete.

4/30/79

VLA PROGRAM

PROCUREMENT ACTIVITIES INITIATED

<u>RFP NUMBER</u>	<u>ITEM DESCRIPTION</u>	<u>ESTIMATED COST</u>	<u>ISSUE DATE</u>	<u>PROPOSAL/BID DUE DATE</u>	<u>SUBMISSION TO NSF DATE</u>	<u>AWARD DATE</u>	<u>CURRENT STATUS</u>
S-09818	Very Large Memory	\$161,625			5/2/79		
S-09849	E/A Services - Phase V	\$ 39,000			5/2/79		

NATIONAL RADIO ASTRONOMY OBSERVATORY
 VERY LARGE ARRAY
 STATUS AS OF APRIL 30, 1979
 CY - 1979

<u>PROJECT NUMBER</u>	<u>DESCRIPTION</u>	<u>ALLOCATION</u>	<u>EXPENDED MONTHLY</u>	<u>TOTAL EXPENDED</u>	<u>TRANSFER TO FIXED ASSETS</u>	<u>BALANCE CONSTRUCT. IN PROGRESS</u>	<u>TOTAL COMMITTED</u>	<u>TOTAL EXPENDED & COMMITTED</u>	<u>NET BALANCE</u>
11000	SITE AND WYE	5,356,050	177,129	397,117	3,695	393,422	2,031,962	2,429,079	2,926,971
12000	ANTENNA	1,549,000	122,555	334,101	23	334,078	918,105	1,252,206	296,794
13000	ELECTRONICS	2,764,000	191,538	590,120	6,281	583,839	894,016	1,484,136	1,279,864
14000	COMPUTER	1,392,000	9,081	43,879	---	43,879	40,362	84,241	1,307,759
17000	PROGRAM MANAGEMENT	120,000	10,386	39,556	---	39,556	75	39,631	80,369
18000	COMMON COSTS	487,752	36,655	144,083	---	144,083	18,499	162,582	325,170
19000	CONTINGENCY	504,004	---	---	---	---	---	---	504,004
	TOTAL PROGRAM	12,172,806	547,344	1,548,856	9,999	1,538,857	3,903,019	5,451,875	6,720,931

Note: Project allocation consists of \$11,500,000 in new funding, \$7,752 in Common Cost commitments carried forward, and \$665,054 in prior years funds. A portion of the prior year funds were re-allocated in February, 1979.

NATIONAL RADIO ASTRONOMY OBSERVATORY
VERY LARGE ARRAY
STATUS AS OF APRIL 30, 1979

TOTAL PROGRAM

<u>PROJECT NUMBER</u>	<u>DESCRIPTION</u>	<u>ALLOCATION</u>	<u>EXPENDED MONTHLY</u>	<u>TOTAL EXPENDED</u>	<u>TRANSFER TO FIXED ASSETS</u>	<u>BALANCE CONSTRUCT. IN PROGRESS</u>	<u>TOTAL COMMITTED</u>	<u>TOTAL EXPENDED & COMMITTED</u>	<u>NET BALANCE</u>
11000	SITE/WYE	24,541,144	394,821	18,350,221	7,223,325	11,126,896	3,264,764	21,614,985	2,926,159
12000	ANTENNA	22,600,391	234,997	20,120,003	11,783,289	8,336,714	2,183,504	22,303,507	296,884
13000	ELECTRONICS	16,947,720	257,723	14,152,217	6,854,046	7,298,171	1,522,176	15,674,393	1,273,327
14000	COMPUTER	5,126,512	9,081	3,757,695	2,503,607	1,254,088	60,254	3,817,949	1,308,563
16000	SYSTEMS INTEGRATION	201,022	---	201,022	179,370	21,652	---	201,022	---
17000	PROGRAM MANAGEMENT	1,905,296	10,386	1,823,977	1,676,390	147,587	949	1,824,926	80,370
18000	COMMON COST	1,723,100	36,655	1,379,431	1,235,347	144,084	18,499	1,397,930	325,170
19000	CONTINGENCY/RESERVE	504,004	---	---	---	---	---	---	504,004
	SUB TOTAL	73,549,189	943,663	59,784,566	31,455,374	28,329,192	7,050,146	66,834,712	6,714,477
30000	RETIREMENTS	(10,820)	---	(10,820)	(10,820)	---	---	(10,820)	---
	TOTAL PROGRAM	73,538,369	943,663	59,773,746	31,444,554	28,329,192	7,050,146	66,823,892	6,714,477

Note: Project allocation excludes \$325,811 withheld and paid directly to other agencies by the NSF in prior years.

Project allocation includes \$11,500,000 for CY-79 funding, of this amount, the NSF has made \$11,480,000 available.

NATIONAL RADIO ASTRONOMY OBSERVATORY
VLA PROGRAM

FINANCIAL STATUS REPORT
(in thousands)

As of: April 30, 1979

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Item	(A) Program Ceiling	Allocation to Date (C)			Un-allocated Balance	Outlook (B)			Not
		Allocated	Expended and Committed	Allocated Balance		Estimate to Complete	Estimate Total	(Over) Under Ceiling	
Site and Wye	27,860	24,541	21,615	2,926	3,319	5,352	26,967	893	
Antennas	20,400	22,600	22,304	296	(2,200)	395	22,699	(2,299)	
Electronics	17,000	16,948	15,674	1,274	52	1,998	17,672	(672)	
Computer	4,850	5,127	3,818	1,309	(277)	1,901	5,719	(869)	
Systems Integration	400	201	201	-	199	-	201	199	
Program Management	2,650	1,905	1,825	80	745	380	2,205	445	
Common Cost	-	1,723	1,398	325	(1,723)	709	2,107	(2,107)	
Subtotal	73,160	73,045	66,835	6,210	115	10,735	77,570	(4,410)	
Contingency	2,840	504	-	504	2,336	1,000	1,000	1,840	
TOTAL	76,000	73,549	66,835	6,714	2,451	11,735	78,570	(2,570)	

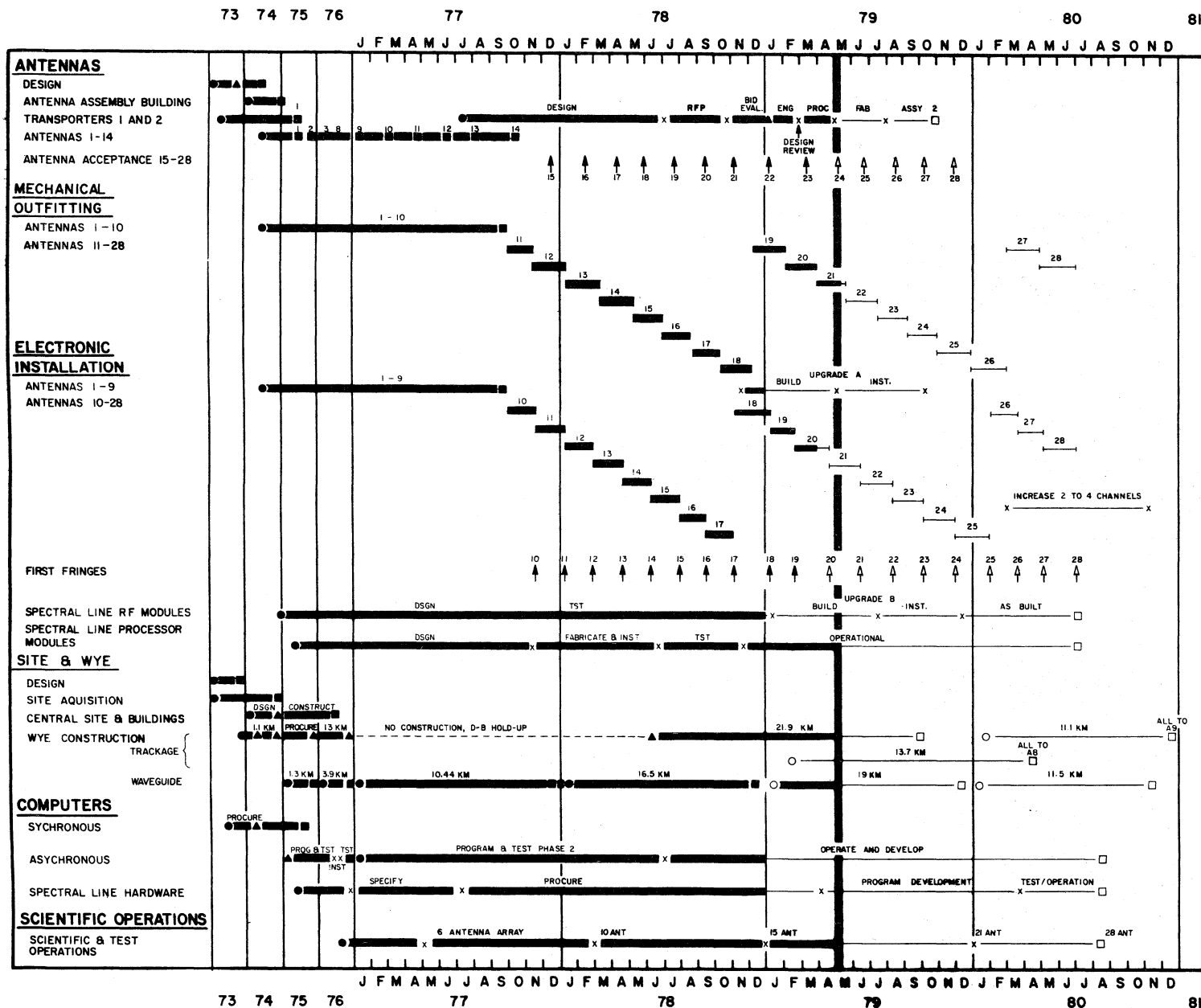
NOTES: (A) Includes \$293K for site acquisition, \$15.7K for ECAC Study, and \$17.1K for NSF Ad Hoc Advisory Panel. Allocated and Expended includes \$11K in assets which were retired in prior years.

(B) Estimate to complete is as of March 1979 and it excludes \$172K for airstrip. Escalation included for future years for Site/Wye work (8%); NRAO labor (6%); and certain electronic elements (8%). Antenna estimate is based upon the existing contract costs for fabrication of the antennas.

(C) Includes \$11,500K of CY-79 Funding.

NATIONAL RADIO ASTRONOMY OBSERVATORY VLA ACTIVITY SCHEDULE

UPDATE DATE: 5/1/79



REV. NO.	REV DATE	DESCRIPTION
1	12/1/78	UPDATE PROGRAM PLAN