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TO DSD

INFO

DEFNAV CANBERRA

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~~CONFIDENTIAL COMINT CHANNELS~~

IS1462 T518/2/3

FROM POIS

DEFNAV FOR DCPD INFO DNCD

SHOAL BAY

REF DSD 180738Z MAR 81.

1. THE INVESTIGATIONS TO BE UNDERTAKEN AT SHOAL BAY HAVE BEEN VARIOUSLY LABELLED AS AN EFFICIENCY, EFFECTIVENESS, EVALUATION OR VALIDATION STUDY. WE WOULD PREFER THE TERM VALIDATION BECAUSE WE SEE OUR INVOLVEMENT AS FOLLOWS.
2. THE NEED TO FIND A NEW SITE FOR [REDACTED] AROSE MANY YEARS AGO BECAUSE THE MAN MADE RADIO NOISE LEVEL AT COONWARRA WEST WAS BECOMING EXCESSIVE AND THE RHOMBIC ANTENNAS AT THE STATION DID NOT PROVIDE ADEQUATE PERFORMANCE AT LOW ELEVATION ANGLES AT THE LOW END OF THE HF BAND. AS A RESULT THE STATION WAS UNABLE TO INTERCEPT TRANSMISSION BELOW PERHAPS 7 TO 8 MHZ FOR SEVERAL HOURS EITHER SIDE OF MIDDAY AND THE SITUATION WAS REFERRED TO AS A LOW LEVEL INTERCEPT PROBLEM.
3. WE STRONGLY URGED THAT THE NEW STATION BE SITED AT SHOAL BAY BECAUSE THE MAN MADE RADIO NOISE LEVEL WAS EXTREMELY LOW AND BECAUSE THE USE OF VERTICALLY POLARIZED ANTENNAS INSTALLED ON THE HIGH CONDUCTIVITY DISUSED SALT PANS WOULD RESULT IN MAXIMUM GAIN DOWN TO LOW ELEVATION ANGLES. THESE FACTS TOGETHER WITH THE USE OF HIGH PERFORMANCE PREAMPS ETC LED US TO PREDICT THAT SHOAL BAY WOULD HAVE UNIQUE PERFORMANCE WHICH WOULD OVERCOME MANY OF THE DEFICIENCIES AT THE PREVIOUS SITE. WE HAVE ALWAYS UNDERSTOOD THE REQUIREMENT IS FOR US TO PROVE THE ABOVE STATEMENT AND HENCE OUR PREFERENCE FOR THE TERM VALIDATION STUDY.
4. THE PROBLEM IS LARGELY A STUDY OF THE LUF PERFORMANCE OF THE STATION. THIS MUST RELY HEAVILY ON PROPAGATION PREDICTIONS AND THUS THE JOB IS NOT SIMPLY A STRAIGHTFORWARD MEASUREMENT PROGRAMME. FURTHERMORE WE WISH TO ASSESS PERFORMANCE (SIGNAL STRENGTH, SIGNAL

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TO NOISE, ETC) ON THE DIRECT BEAM OUTPUTS WHERE SIGNALS ARE AT A HIGH LEVEL. WE CONSIDER THAT THE PERFORMANCE OF THE SPLITTING AND DISTRIBUTION SYSTEMS IS NOT OUR CONCERN AND THAT PLESSEY MAINTENANCE PROCEDURES SHOULD BE ADEQUATE TO COVER THOSE EQUIPMENTS. (?

5. A DETAILED PLAN FOR THE STUDY IS DIFFICULT TO FORMULATE FOR A STATION OF THE COMPLEXITY OF SHOAL BAY AS IT IS LIKELY THAT THE PROCEDURES WILL BE CHANGED AS THE WORK PROCEEDS. HOWEVER WE INTEND TO INVESTIGATE THE FOLLOWING:

- A. MEASUREMENT OF MAN MADE NOISE LEVELS FOR COMPARISON WITH RESULTS OBTAINED BEFORE STATION WAS CONSTRUCTED AND RESULTS FROM STATION MONITORING EQUIPMENT. PRELIMINARY INVESTIGATIONS SHOWED THE NOISE LEVEL IS STILL VERY LOW.
- B. EARTH CONDUCTIVITY SURVEY OVER SALT PAN AREA TO DETERMINE WHETHER SIGNS OF VEGETATION INDICATE THAT THE CONDUCTIVITY HAS DECREASED. THIS WAS REQUESTED BY DSD.
- C. MEASUREMENTS TO DETERMINE HORIZONTAL POLAR DIAGRAMS OF BEAMS. THESE WILL BE GROUND WAVE MEASUREMENTS USING A LOW POWER OSCILLATOR (RADIATING ON SEVERAL HARMONICALLY RELATED FREQUENCIES) SITED SUCCESSIVELY AT A NUMBER OF SURVEYED LOCATIONS AROUND THE PERIMETER OF THE SALT PANS. THERE HAVE BEEN SUGGESTIONS THAT THERE ARE ASYMMETRIES IN THE BEAMS AND PRELIMINARY MEASUREMENTS ON A FEW BEAMS INDICATED THAT THIS MAY BE SO.
- D. INVESTIGATION OF [REDACTED] ACCURACY ALTHOUGH THIS IS LARGELY A MATTER OF A CHECK TARGET PROGRAMME FOR THE STATION. DURING THE PRELIMINARY INVESTIGATIONS WITH AN OSCILLATOR RADIATING FROM THE PERIMETER OF THE SALT PANS, THE [REDACTED] TOOK BEARINGS ON THIS SOURCE. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED] STATION STAFF WERE AWARE OF THIS ERROR AND IT NEEDS INVESTIGATION.

- E. AN IMPORTANT SERIES OF MEASUREMENTS TO BE UNDERTAKEN WILL BE TO COMPARE SIGNAL TO NOISE RATIOS OBTAINED USING BEAMS TO THOSE OBTAINED USING THE REFERENCE MONOPOLES - USING SELECTED SKYWAVE TRANSMISSIONS. THIS IS REALLY AN ULTIMATE CHECK THAT BEAMFORMING IS CORRECT. WE PLAN TO USE A MODERN HP SPECTRUM ANALYSER MODEL 8568A FOR THIS JOB BUT IT IS NOT AN EASY TASK. THE AZIMUTHAL DISTRIBUTION OF EXTERNAL SOURCES OF NOISE WILL BE A COMPLICATION. AN INVESTIGATION INTO THE DISTRIBUTION OF EXTERNAL NOISE USING THE CDAA BEAMS WOULD BE AN INTERESTING STUDY ON ITS OWN BUT IT WOULD NEED TO BE LONG TERM.
- F. TO DEMONSTRATE THAT THE HIGH CONDUCTIVITY SALT PANS DO RESULT IN THE PREDICTED ANTENNA PERFORMANCE REQUIRES MEASUREMENT OF THE ELEVATION POLAR DIAGRAM. MEASUREMENT ON A SINGLE MONOPOLE IS

ADEQUATE. A KITE WAS USED TO CARRY AN OSCILLATOR ALOFT [REDACTED] AND MEASUREMENTS OBTAINED WITH DIFFICULTY. THE SAME OPERATION WILL BE ATTEMPTED AT SHOAL BAY. AN ALTERNATIVE DEMONSTRATION OF THE EFFECTIVENESS OF THE SALT PANS WOULD BE TO COMPARE THE RELATIVE RECEIVED SIGNAL STRENGTHS OF LOW ANGLE SKYWAVE SIGNALS USING IDENTICAL ANTENNAS SITUATED ON AND OFF THE SALT PANS. THIS MAY BE ATTEMPTED.

6. AT THIS STAGE WE DO NOT CONTEMPLATE MAINTENANCE AIDS OR AUTOMATIC TEST EQUIPMENT FOR CONTINUOUS MONITORING OF PERFORMANCE AS ENVISAGED BY AMR. IF THE ABOVE PROGRAMME OF WORK CAN BE SUCCESSFULLY CARRIED OUT AND RESULTS ARE SATISFACTORY WE WOULD EXPECT THE PLESSEY ROUTINE MAINTENANCE CHECKS TO DETECT ANY VARIATIONS IN THE FUTURE. HOWEVER WE APPRECIATE THAT A REGULAR ASSESSMENT OF THE OVERALL PERFORMANCE OF A STATION SUCH AS SHOAL BAY WOULD BE VALUABLE AND WE EXPECT THAT PROPOSALS AS TO HOW THAT MAY BE DONE WILL RESULT FROM THE WORK.
7. AS MENTIONED ABOVE MEASUREMENTS NEED TO BE TAKEN ON THE BEAM OUTPUTS AHEAD OF THE FOLLOWING SPLITTING/DISTRIBUTION SYSTEMS. THIS IS A PROBLEM AS THERE IS ONLY ONE HIGH LEVEL OUTPUT FROM EACH BEAM. FOR THE TYPE OF MEASUREMENT PROGRAMME ENVISAGED (AND INDEED FOR ANY CONTINUOUS MONITORING IN THE FUTURE) IT WOULD HAVE BEEN MOST DESIRABLE FOR THE CDAA SYSTEM TO HAVE INCORPORATED HIGH LEVEL AUXILIARY BEAM OUTPUTS. ON PREVIOUS VISIT BEAMS WERE ONLY TAKEN OFF AIR FOR SHORT PERIODS OF LESS THAN 10 SEC, BUT WILL BE USED FOR LONGER PERIODS IN FUTURE MEASUREMENTS.
8. ANOTHER PROBLEM IS THAT COMPLETE SYSTEM IS 75 OHM. ALL MODERN TEST EQUIPMENT IS 50 OHM AND THUS ADAPTORS MUST BE USED. CERTAINLY PLESSEY BEAM FORMING UNITS ARE 75 OHM BUT OUTPUTS COULD HAVE BEEN AT 50 OHM AND CARRIED ON.
9. ASSISTANCE FROM NAVY IS REQUIRED TO PROVIDE SURVEYED MARKER PEGS AROUND AS MUCH OF PERIMETER OF SALT PAN AS IS ACCESSIBLE. PEGS NEED TO BE ALL AT SAME DISTANCE (WITHIN 10 PERCENT) FROM CENTRE OF CDAA. MAXIMUM DISTANCE IS DESIRABLE - HOPEFULLY NOT LESS THAN 400 METRES. LIKE TO HAVE PEGS SPACED AT THREE DEG INTERVALS IF POSSIBLE. WOULD ALSO REQUIRE ASSISTANCE OF ONE SAILOR FOR A FEW DAYS (BUT NOT NECESSARILY FOR FULL DAYS) FOR FIELD MEASUREMENTS.
10. HOPEFUL THAT [REDACTED] WILL VISIT DARWIN IN ABOUT ONE WEEK TO COMMENCE THIS WORK BUT WILL NOT BE ABLE TO CARRY ALL MEASUREMENTS ON THIS OCCASION. HE COULD ALSO ADVISE/ASSIST ON YAGI ASSEMBLY AND INSTALLATION.

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