Kavouras INC

RADAR ENGINEERING DEPT.

11400 RUPP DRIVE
BURNSVILLE, MN 55337
PH: 612-882-4512
FAX: 612-882-4500

EXHIBIT # 001
PART OF FORM 442

The radar system will be used for meteorological purposes only.
The radar system will use one of three available fixed frequencies to transmit a variable pulse width signal.

The PRF and Pulse width configuration can be changed through software control to a **maximum duty** cycle of (0.006). Typical operation will be below this value.

The PRF can be expressed as:	$250\text{Hz} \leq \text{PRF} \leq 4{,}000\ \text{Hz}$
and	
The Pulse Width can be expressed as:	$0.05\ \mu\text{s} \leq \text{Pulse Width} \leq 20\mu\text{s}$
Where as:	$\text{PRF} \times \text{Pulse Width} \leq 0.006$

The maximum average power is limited to 1500 Watts for each frequency.
The maximum peak power from the transmitter is limited to 250 kW.
The antenna is of a off-set feed horn design which has a conical pencil beam of 1°x 1° and a first sidelobe at (-32 dB) down from the main beam. This offset feed arrangement was chosen to minimize ground illumination and provide clutter rejection. The antenna is environmentally protected by an "A" sandwich radome. Access to the antenna is controlled and secure.
The gain of the antenna is 42 dBi.
The resultant calculated ERP is 131 dBm Peak.
The antenna is at AGL 107 feet with an un-obstructed azimuth about the axis for 360° rotation. The radar system can not radiate below zero degrees in elevation. A radiation hazard Field Study has determined this azimuth axis as a clear zone with no potential exposure to the main beam as a result of topographical obstructions.
The FAA has reviewed our installation and has approved our aviation obstruction lighting system.

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EXHIBIT # 002
PART OF FORM 442

The general purpose of this research project is to improve the resolution and accuracy of Pulse Doppler meteorological radar techniques through the enhancement of system hardware and computer software algorithms.

Present commercial Doppler radar technology is typically magnetron based and subject to Doppler errors as a result of the pulse to pulse frequency stability of the magnetron. Our research will be centered around a coherent master frequency source and amplified by a klystron. The output of the klystron will be filtered through a bandpass filter and a harmonic filter to insure the emissions of the radar are within the band of operation. This klystron will be modulated with a solid state high voltage linear modulator under software control. The software has the capability to on-line monitor all parameters of the transmitter assembly to insure the coherency and stability of the output signal.

The transmitter has the capability of any mixture of PRF and Pulse Width combinations (reference exhibit 001), resulting in a duty cycle of less than (0.006). This concept will allow the operator to optimize the radar's' performance dependent on the precipitational volume under study. (i.e. storm clouds, shear winds, squall fronts, ect.)

EXHIBIT # 002 cont.
PART OF FORM 442

The antenna system is designed to minimize ground clutter. The position of the antenna is measured with absolute encoders and is controlled by software. The azimuth axis can be rotated 360° and the elevation axis can be rotated 360° . The transmitter will be inhibited when the antenna is directed below zero degrees. As a secondary fail safe, a fiber optic sensor is mounted on the elevation axis to prevent transmitter operation below zero degrees. The controlling software has the capability to sector or window blank the output of the transmitter for any azmuith or elevation combination. The antenna is at AGL 107 feet with an un-obstructed azimuth about the axis for 360° rotation.

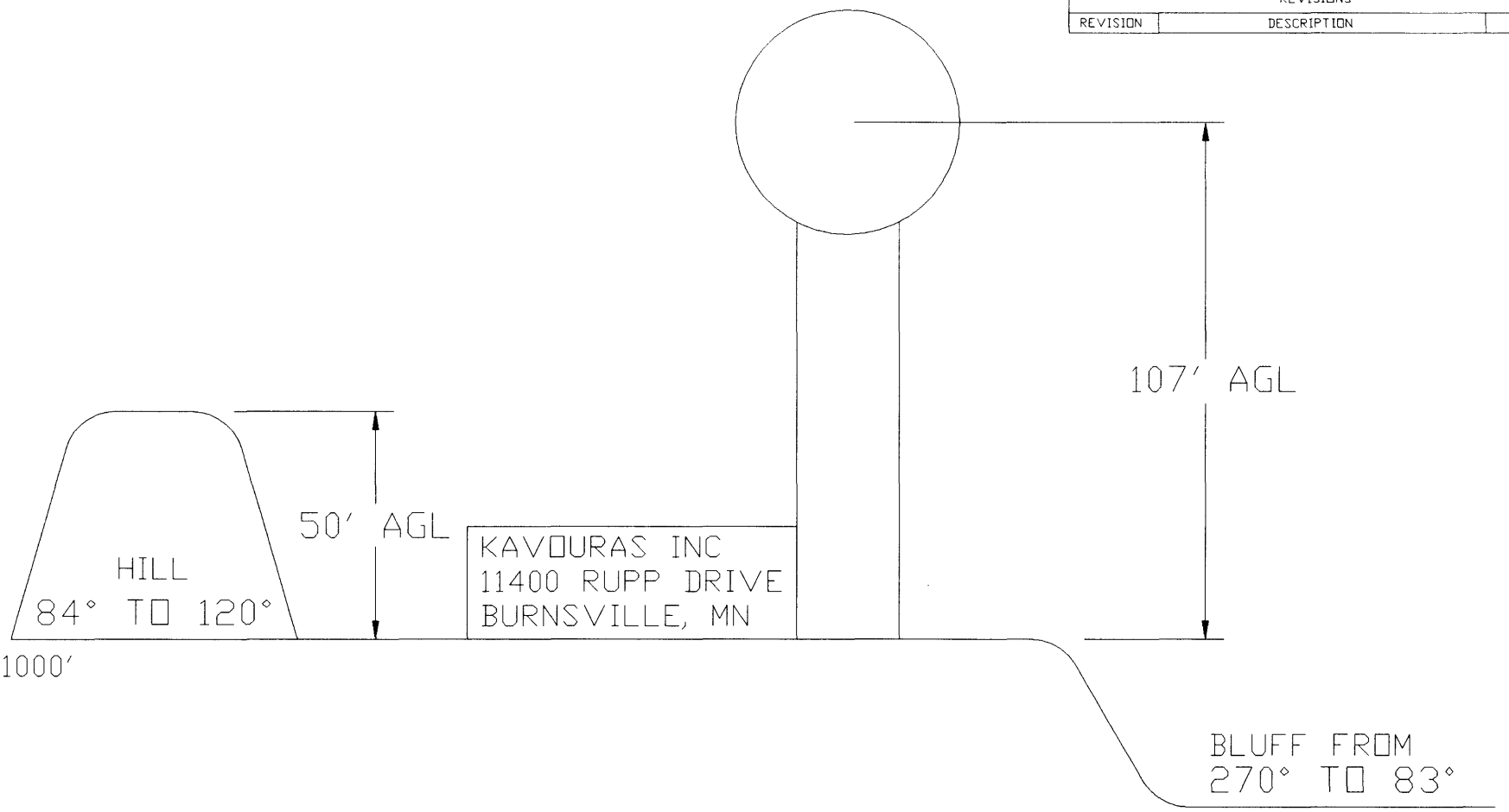
The antenna is environmentally protected by an "A" sandwich low loss radome. Access to the antenna is controlled and secure.

The FAA has reviewed our installation and has approved our aviation obstruction lighting system.

This research is dependent on the ability to radiate and receive the precipitational volume which is contained within the radial perimeter of the coordinates specified on Form 442 line 5(c).

The resulting contribution of this research will directly benefit the world wide meteorological forecasters and indirectly supply improved weather information to the general population of the world.

REVISIONS		
REVISION	DESCRIPTION	DATE



	JOB NO.	KAVOURAS INC.	
	PROJECT NAME	TITLE EXHIBIT 003	
	DRAWN G BILY	DATE 1-95	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	DESIGN WRP	DATE 1-95	
DECIMAL .XX ± .XXX ±	CHECKED BY	DATE	SIZE B / UNIT NO. / DWG NO. / REV.
ANGULAR ± 1°-0'	CUSTOMER	SCALE	RELEASE DATE 01-12-95 / SHEET 1 OF 1

Map to new building. 11400 Rupp Drive.