

## **Exhibit 1 Woodward-Clyde Federal Services**

### **4. Particulars of Operation (continued)**

| Frequency   | Power       |        |      | Emission | Modulating Signal | Necessary Bandwidth |
|-------------|-------------|--------|------|----------|-------------------|---------------------|
| (A)         | (B)         | (C)    | (D)  | (E)      | (F)               | (G)                 |
| 159.720 MHz | 0.250 Watts | 9.0 dB | Mean | 10F2     | 2720 Hz           | ± 5 kHz             |
| 159.820 MHz | 0.250 Watts | 9.0 dB | Mean | 10F2     | 2720 Hz           | ± 5 kHz             |
| 159.920 MHz | 0.250 Watts | 9.0 dB | Mean | 10F2     | 2720 Hz           | ± 5 kHz             |
| 160.020 MHz | 0.250 Watts | 9.0 dB | Mean | 10F2     | 2720 Hz           | ± 5 kHz             |
| 160.120 MHz | 0.250 Watts | 9.0 dB | Mean | 10F2     | 2720 Hz           | ± 5 kHz             |
| 160.220 MHz | 0.250 Watts | 9.0 dB | Mean | 10F2     | 2720 Hz           | ± 5 kHz             |
| 216.500 MHz | 0.250 Watts | 9.0 dB | Mean | 10F2     | 2720 Hz           | ± 5 kHz             |
| 217.700 MHz | 0.250 Watts | 9.0 dB | Mean | 10F2     | 2720 Hz           | ± 5 kHz             |
| 217.800 MHz | 0.250 Watts | 9.0 dB | Mean | 10F2     | 2720 Hz           | ± 5 kHz             |

4G. Describe how the necessary bandwidth was determined.

The manufacturer of the radio, Monitron Corp. (Tulsa, Oklahoma) lists modulation type 20F3 and a bandwidth of  $\pm 5$  kHz for 100 percent at 1kHz modulation. Modulation limiting at 5 kHz deviation.

## **Exhibit 2 Woodward-Clyde Federal Services**

### **9. Description of Research Project**

Woodward-Clyde Federal Services (WCFS) is one of the nation's largest consulting firms practicing in the fields of seismic hazard assessment and geotechnical engineering. This application is being filed in support of WCFS seismological investigations in the western United States. These investigations focus on analyzing the hazard posed by earthquakes to critical facilities such as dams, bridges, power plants, etc. The basic data gathering tasks in these investigations involves recording ground motions induced by earthquakes by deploying arrays of seismometers in areas that are often very remote. The seismograph stations in the arrays are usually spaced one to twenty kilometers apart and transmit a continuous stream of information. The monitoring can be on a short-term basis (a few weeks) or long-term basis (several years) and may be conducted on behalf of federal or state agencies, universities, public utilities, or private companies. Because these studies are often conducted in remote locations where terrain makes regular ground access difficult or impossible, radio communications are required to transmit the data from the seismometers to a central facility where the data are analyzed. Such transmission requires only low power radios and relatively short path lengths. WCFS is often called upon to conduct these seismological investigations immediately after large earthquakes in order to record significant aftershocks and their effects on engineered structures. The ability to deploy a seismic array within 24 hours is crucial to successfully accomplish this task. At the time of this application, WCFS has funding for a project to monitor any possible reservoir-induced seismicity related to the construction and filling of a reservoir in California east of the San Francisco area, a region of very high seismic risk. Funding for several other projects in the western U.S. is pending.