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WILLIAM T FUJIOKA
Chief Executive Officer

May 27, 2011

To: Mayor Michael D. Antonovich
Supervisor Gloria Molina
Supervisor Mark Ridley-Thomas
Supervisor Zev Yaroslavsky
Supervisor Don Knabe

From: William T Fujioka
Chief Executive Officer

DEVELOPMENT OF A TSUNAMI EMERGENCY SIREN WARNING SYSTEM (ITEM 52-A, AGENDA OF MARCH 29, 2011)

On March 29, 2011, the Board instructed the Chief Executive Office, Office of Emergency Management (OEM) to report back on the advisability and feasibility of developing a Tsunami Emergency Siren Warning System. This report is in response to that instruction.

TSUNAMI EMERGENCY SIREN WARNING SYSTEM WORKGROUP

In order to provide an informed response, a Tsunami Emergency Siren Warning System Workgroup (Workgroup) was formed to develop recommendations on either a "tonal" or "voice" emergency siren warning system. The Workgroup consists of representation from OEM, Sheriff's Department (Sheriff), County Fire Department (Fire), Department of Beaches and Harbors (DBH), and the Department of Public Works (DPW).

The following is an overview of the Workgroup's recommendation on the use of siren warning systems, including the findings of a mass notification system test conducted by the Sheriff in 2007.

TSUNAMI EMERGENCY SIREN WARNING SYSTEMS

Siren Operations

A siren warning system consists of a series of sirens deployed in designated areas to provide for an audio signal (either tonal or voice) informing the public that a tsunami is approaching and to take appropriate emergency measures. The emergency preparedness measures are outlined and disseminated either as part of the warning measure, in the case of a voice system, or following emergency instructions outlined as part of a comprehensive tsunami emergency preparedness public information campaign for a tonal system. The siren warning system is triggered upon receiving a warning/watch message from either the National Oceanic and Atmospheric Administration (NOAA) or the California Emergency Management Agency (CalEMA) relaying the NOAA message.

The Los Angeles County Operational Area (operated by the Sheriff) is the local point of contact for relaying the tsunami warning messages to its cities and the unincorporated coastal areas. Each incorporated city has the responsibility of forwarding the tsunami warning message within its jurisdiction in accordance to its own tsunami warning plan, as outlined in the Tsunami Annex to the Los Angeles County Operational Area Emergency Response Plan. This includes the placement and operations of its own warning systems, including sirens or any other devices.

Siren Activation (Local versus Distant Tsunami Warnings)

Siren warning systems are effective in providing warnings for distant or far source tsunamis of the type generated by seismic activities in areas such as Japan or South America. Distant tsunamis can take hours to reach the California coastline and allow for sufficient time for public safety staff to trigger a siren activation either manually or by radio signals.

Locally generated tsunamis are produced with little or no warning and would require a sophisticated advanced automated siren warning system that could be automatically triggered by seismic sensors or ocean deployed sensor buoys. This type of advanced technology system is not available at this time. Current siren warning system technology's operational limitations do not provide warnings for near source or locally generated tsunamis. A siren evaluation study, as recommended herein, should take into account emerging advanced siren warning system technologies that may, in the future, allow for the use of sirens in near source or local tsunami events generated by a local earthquake or underwater landslide.

Sheriff's Department's Mass Notification System Test

A siren warning system test conducted by the Sheriff in Marina del Rey in June 2007 found operational limitations of both types (tonal and voice) of siren warning system's ability to deliver a tsunami warning message. The siren warning system's effective range is limited by local geographic features (hills, buildings, etc.); the type of siren deployed (tonal or voice); the number of sirens employed; and the overall background noise in an area (construction, freeway traffic, aircraft, etc). This, along with the inability to deliver warnings for near source or local tsunami events, should also be considered in the desirability of deploying current technology siren warning systems.

The detailed Sheriff's tsunami test report is attached for your review.

California Emergency Management Agency Siren Survey and Humboldt County Siren Usage

CalEMA is currently conducting a survey of all California coastal area Operational Areas on the use of siren warning systems. The tsunami siren survey information will be shared with the Los Angeles Operational Area and the rest of the coastal Operational Areas when it is completed in June. CalEMA has no plans at the present time to fund or deploy a siren warning system along the California coastline.

Humboldt County currently has a siren system for distant source tsunamis in place as part of a comprehensive alert and warning system. The Humboldt County siren system has been successfully used in tsunami warnings, including the recent March 11, 2011, Japanese earthquake triggered tsunami. It should be noted that Humboldt County has a history of tsunami events due to its geographic location, which has facilitated its grant funding and deployment of its tsunami warning system.

Additionally, it should be noted that Humboldt County's coastline deployment area is very small compared to the coastline of Los Angeles County. Therefore, the number of sirens used for the Humboldt County area is smaller than the number required for the Los Angeles County area.

RECOMMENDATIONS

1. The Workgroup recommends that the advisability and feasibility of the development of a Tsunami Emergency Siren Warning System requires an evaluation by subject matter experts (SME). SMEs in the fields of siren systems' acoustical requirements, environmental impact study requirements, and electronic warning systems operations (siren test sequencing, siren operation public service messages, and

instructions for siren announcements) can assess and determine the actual cost of planning, deploying, and maintaining the system.

This recommendation is based on the Workgroup's evaluation of the Sheriff's 2007 siren test, along with recent consultation and collaboration on the use of siren warning systems with CalEMA and Humboldt County.

2. The Workgroup has determined it would be desirable to add a siren warning system as an additional level to the current tsunami warning system of the Emergency Alert System, Alert Los Angeles County, Sheriff, and Fire public safety notification protocols; combined Federal, State, and local community outreach tsunami notification information websites; and DBH social media sites. It is also recommended that Marina del Rey be used as the test site for a Tsunami Emergency Siren Warning System.

3. The Workgroup recommends that the SMEs' siren warning system evaluation should include a cost breakdown and comparison for the deployment of the siren warning system for either the unincorporated County coastal areas or deploying along the entire Los Angeles County coastline. The source of funding for the siren warning system would have to be identified, as Federal and State grant funding previously available for the deployment of systems in other parts of the State have been curtailed due to the current fiscal crisis facing the State and Federal governments.

4. The Workgroup agrees that development of a siren warning system should be determined upon the findings of the SMEs' evaluation. Upon acceptance of the evaluation by the Board of Supervisors, a capital project can be undertaken to deploy the siren warning system. Funding will have to be identified for the capital project, as well as ongoing funding for the maintenance and operation of the siren warning system.

Support of Tsunami Siren Warning System Research and Development Efforts

NOAA and other agencies are in the process of seeking funding for advanced automated siren warning systems which should be able to warn of local or near source tsunamis. The Workgroup recommends that the Board of Supervisors' support for funding of NOAA sponsored advanced tsunami siren warning system research will encourage interagency cooperation on its deployment in tsunami inundation zones in Los Angeles County, California, and throughout the United States.

Should your Board decide to place these matters on a future Board agenda for discussion and possible implementation, our office will submit a formal recommendation for Board action. If you have any questions or require further information, please contact me or a member of your staff may contact Deputy Chief Executive Officer Jacqueline A. White, Public Safety, at (213) 893-2374 or Senior Manager John Fernandes, OEM, at (323) 980-2261.

WTF:JAW:JF
JT:llm

Attachments

c: Executive Office, Board of Supervisors
County Counsel
Sheriff
Beaches and Harbors
Fire
Public Works

OEM.Tsunami Emergency Siren Warning Sys.Item 52-A.Agenda 032911.bm.052711

TSUNAMI TALKING POINTS

WHAT IS A TSUNAMI ANNEX?

- Overall guidance document describing the threat represented by a tsunami.

- Description of Alert and Warning procedures provided by the Federal and State Government.

- Description of actions to be undertaken in response to a tsunami.

- Identification of agencies involved in the execution of the annex.

- Identify individual agencies and incorporated cities responsible for the development of their plans to support the Tsunami Annex.

- Identify Alert and Warning functions in the Operational Area designated to the Sheriff's Department (Operational Area Emergency Response Plan).

INFORMATION ON TSUNAMI WARNING SIRENS

- Tsunami Warning Sirens are not effective with a near source (locally generated) tsunamis; this is because there is insufficient time for warning system to be effective.

- Far-source or distant tsunami provides sufficient time (6-12 hours) for Warnings from the National Weather Service and the State of California's Warning Center. These warnings allow for the use of the standard alert and warning systems used by the County of Los Angeles Operational Area.

- Other methods of alert and warning such as Emergency Alert System and Alert LA County dial notification system, and warnings provided by law enforcement, fire, and lifeguard personnel are sufficient for our early warning needs.

- Tsunami Warning Sirens require deployment of multiple siren locations to cover designated warning areas.

- Tsunami Warning Sirens can be masked by modern portable wireless devices such as IPods, headphones, and automobile sound systems.

- Tsunami Warning Sirens notification range is limited by manmade and natural architectural terrain features, requiring additional siren placement, to provide required alert coverage.

- Tsunami Warning Sirens cost between $5,000-$50,000 per siren location. There are ongoing maintenance requirements which add annual operational costs to the initial procurement.

TSUNAMI EVACUATION ROUTE SIGN PROJECT (COMPLETED)
Available in Unincorporated Marina del Rey

In an ongoing effort to provide the Los Angeles County area residents with vital tsunami safety information, the Los Angeles County Office of Emergency Management and Department of Public Works have positioned tsunami evacuation route signs throughout the unincorporated areas of Marina del Rey.

In the event of a Tsunami Warning, residents and visitors will be able to follow these posted signs along a number of optimum evacuation routes to safety.

Marina del Rey is a highly populated County area that could be impacted by a tsunami. Accordingly, signs were placed that border the predicted tsunami inundation zones where the water would flow.

The following are some highlights of the Tsunami Evacuation Route Sign project:

- Funded by the State Homeland Security Grant Program.

- Funds for the Tsunami Evacuation Route Signs was from a one-time grant.

- Tsunami Evacuation Route sign locations designate the tsunami inundation area as identified in maps provided by the California Emergency Management Agency.

- Six cities have established their signage program based upon the same map.

- All coastal cities are responsible for their own tsunami response plans which includes placement of signs.

ADDITIONAL RESOURCE INFORMATION

The following is a list of Office of Emergency Management emergency preparedness materials that are available at http://lacounty.gov and http://www.espfocus.org:

- Emergency Survival Guide (ESG)
- Emergency Survival Program (ESP)
- Emergency Preparedness Checklists "10 Essential Items"
- Specific Needs Awareness Planning (SNAP)
- Alert LA County

The following is a list of additional resource website addresses:

- http://lacounty.gov
- http://lacoa.org
- http://snap.lacounty.gov
- http://www.espfocus.org
- www.calema.ca.gov
- West Coast and Alaska Tsunami Warning Center http://wcatwc.arh.noaa.gov

Marina del Rey Sheriff's Station
Mass Notification System Test

June 15, 2007

Overview

On Friday, June 15, 2007, at 1200 hours, the Los Angeles County Sheriff's Department, in cooperation with the L.A. County Office of Emergency Management, Department of Beaches and Harbors, and Fire Department Lifeguards, tested commercially available coastal mass notification warning systems (aka: tsunami warning loudspeakers) at Burton Chace Park in Marina del Rey, California. The test was in conjunction with LASD's homeland security grant request before the LA/LB UASI group, which was a regional request to outfit the most vulnerable L.A. County coastal areas with mass notification capabilities.

The systems were being considered as part of an early warning system for residents and visitors in Marina del Rey in the event of impending danger from either natural or human-made disasters or incidents. As there were very mixed reviews about the efficacy of these voice and siren systems from prior deployments in other jurisdictions with physical characteristics different from Marina del Rey, Marina del Rey Sheriff's Station Harbor Operations felt it would be prudent to test more contemporary equipment in real-world conditions.

Three of the biggest players in the mass notification warning system field (American Signal, Whelen, and Federal Signal) were invited bring their equipment to test head-to-head. The devices tested were FEMA compliant omni-directional high-power voice and siren systems, with models and contact information as follows:

American Signal Corporation
Model: iForce 2400
Contact: John Adler
jadler@americansignal.com

Federal Signal Corporation
Model: MOD3012
Contact person: Ron Seitz
procommnca@cs.com

Whelen Corporation
Model: WPS-2904
Contact person: Jim Bremer
jim.bremer@globalemergencysystems.com

(See Attachment A for literature on each model tested.) The three vendors projected that an effective voice-audible range of the devices would be an approximate 3,000 foot radius.

Preparation

To test the full range of capabilities of the systems, the following was undertaken: A site approximately central to the Marina del Rey Harbor was selected to test the equipment – the tip of Burton Chace Park (See Attachment B). The site had a number of advantages, including the fact that the area contained in a 3,000 foot radius from that location encompassed all the basins in the marina (see Attachment C), residences were not located on the park's peninsula, the location was operated by the Department of Beaches and Harbors, and it appeared it might make a suitable location for a permanent siren installation.

Each vendor was provided two digital recordings of carefully scripted messages, in both male and female voice (see script – Attachment D). The vendors were directed to configure their tests to broadcast the first and longer recording initially, followed by two siren tones (hi-low and wail), followed by a final voice recording. Each device would be tested separately for approximately 1.5 minutes. For optimal voice performance of the devices, very slow and deliberate speech was recommended by the vendors, and the scripted recordings mostly adhered to that recommendation, although we also included more rapid speech, as the devices were capable of live broadcasting and we wanted to see their performance under such conditions.

Notifications to numerous local and state entities, and a press release were made well in advance of the test. (See Attachment E.)

Listening post locations were pre-determined based on criticality, distance (between 2000 and 5000 feet from Burton Chace Park), population density, and/or ambient noise (i.e. public beach, shopping center, restaurant, and marina basins, and airport).

Test

Vendors arrived on June 15, 2007, beginning at 0730 hours to set up their equipment at the western tip of Burton Chace Park. Vendors advised optimal height for siren performance was 50'; however, due to the logistics of the mobile devices brought by two of the vendors, the test height was conducted at 30' to assure comparable parameters. There was a very large turnout from various governmental agencies and the press corp.

The five pre-determined listening posts were staffed as follows (see Attachment F):

13851 Fiji Way (2100 feet distant) – LASD Tech Crew and OCSD
4700 Admiralty Way (2500 feet distant) – LASD MDR Patrol Reserve
Bora Bora Way A3100 (3000 feet distant) – L.A. Co. FD Station 110
Mother's Beach (3400 feet distant) – LASD Tech Crew
Main Channel by Pacific Avenue Bridge (5000 feet distant) – L.A. Co. FD Baywatch

Two of the listening posts staffed by LASD Tech Crew personnel were equipped with boom microphones, digital recorders and decibel meters.

At about 1100 hours each vendor gave a brief presentation about their product technology and capability, and actual tests of the devices commenced at 1200 hours.

Results

The vendors performed their tests one-at-a-time, in alphabetical order (i.e.: American Signal, followed by Federal Signal and finally Whelen). See test data sheets, Attachment G, for listening post reports, and a performance chart synopsis, Attachment H.

Although Federal Signal was not the loudest, it proved to be the best overall performer, followed by Whelen. American Signal did not perform as well as the other two. Whelen proved to be the loudest by both decibel meter and human perception from the more distant listening posts; however, there was a problem with clarity due to an echo effect from surrounding buildings. Federal Signal was rated as the clearest of all three vendors. The female voice recording was also rated as more understandable than the male voice.

Another observation made by several listening posts was that the siren alert tones sounded indistinguishable from emergency vehicle sirens, and the listeners advised they would have difficulty differentiating the sirens from normal emergency vehicles if they had no prior knowledge of the test.

The effective range of the best unit used during this test for voice broadcasting was approximately 2100 feet. The ambient noises from Los Angeles International Airport and from public places such as markets, beaches and restaurants, and the configuration of buildings in Marina del Rey, adversely affected the clarity and comprehensibility of the voice messages and siren tones.

Conclusion

Recognizing that there would be some performance improvement from a more powerful siren configuration (each model tested had scalability options available) positioned at the recommended height of 50', it was still abundantly clear that to ensure useful voice capability, a single unit would not be sufficient to cover an area as large as Marina del Rey. Given the performance noted above, perhaps three to four unit of the type tested strategically placed throughout the area would provide sufficient coverage, and that number might be reduced with more powerful units. However, issues of reflection and echo, which did affect the audio clarity in this test, might be exacerbated by employing multiple sirens. The acoustic dynamics must be researched further, as well as the optimal placement of the sirens to provide coverage to the most vulnerable areas. Of course, "vulnerable areas" is a fluid concept; if a forty-two foot tsunami run-up is the benchmark,

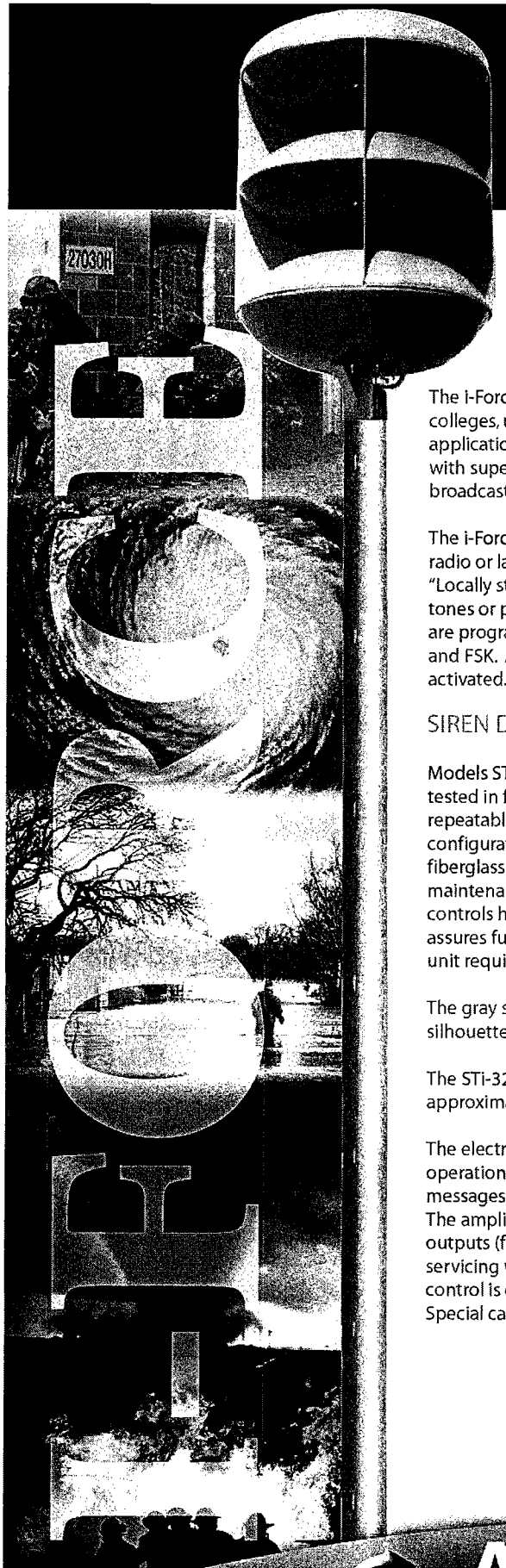
considerably more sirens, which would cover the entire run-up area (which includes Venice, Playa Vista and the Ballona Wetlands areas), might be considered. (See Attachment "I", Tsunami Maximum Run-up Map.)

Pre-recorded alert messages using a higher-pitched voice (the female voice) would be the optimal choice for comprehension. A traditional "air-raid" type siren sound, which all the devices are capable of producing, might be the best type of alert tone to use to prevent confusion.

Traditional notification procedures such as evacuation sweeps by ground personnel or even aerial loudspeakers take considerable time to execute, and not everyone will be tuned into a broadcast radio, television or cable channel to receive emergency alerts. Reverse-911, phone tree, or dockmaster/business/venue outreach would not provide the most direct notification to the tourist and boating population in the harbor area at any given time. So it appears the sirens could be an effective component in a layered approach to emergency notification of the public to immediate threats to the Marina del Rey area. But the technology and protocols must be examined carefully; a mass notification siren system which did not deliver a clear message and/or clear and correct instructions would cause panic and further complicate any evacuation or recovery effort.

Attachment “A”

I-Force



We challenge you to compare our sirens & control systems with any manufacturer's!

The i-Force by ASC is designed for community, DOD applications, colleges, universities, industrial, nuclear, petrochemical, or other applications that require high levels of sound pressure level output with superb acoustical performance and brilliant voice notification broadcasting.

The i-Force sirens can be activated locally or from a central point using radio or land line. Multiple sirens can be activated from a central point. "Locally stored" messages at the siren greatly enhance intelligibility tones or pre-recorded voice messages. The electronic control decoders are programmable for various tone out protocols, including TTS, DTMF, and FSK. Any of 10 standard or 6 optional customized tones can be activated.

SIREN DESIGN CHARACTERISTICS

Models STi-1600 & STi-3200 produce 118 and 126 decibels respectively, tested in free field non-reflective measurement environments with repeatable results. Applications include omni-directional or quadrant configurations for 90° - 360° coverage patterns. The color-impregnated fiberglass siren horns endure severe weather conditions, are maintenance free, and will not rust or require painting. The electronic controls have a self-contained, regulated battery charging system that assures full siren operation during AC outages. The control charging unit requires a normal 120 VAC 50/60 Hz power with 5 amp service.

The gray siren horn color remains aesthetically pleasing and the low silhouette siren design discourages vandalism.

The STi-3200 siren provides a sound pressure level of 70 dB for approximately 1 radial mile, subject to weather conditions.

The electronic controls include 6 push buttons for local, manual operation of the siren, to initiate a variety of tones or prerecorded messages. LEDs provide component or power service status information. The amplifiers are individually fused and switchable between hi and low outputs (from 100 watts to 6 watts per speaker driver), for testing and servicing without the necessity of hearing protection. The electronic control is encased in a lockable, outdoor-use-rated NEMA enclosure. Special cabinets rated for specific environments are available upon request.

FEATURES

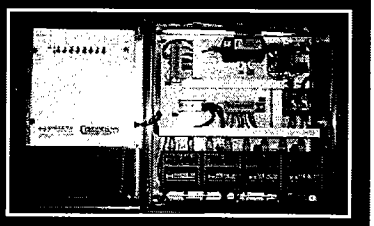
- Omni-directional siren with 360° sound coverage pattern.
- Unmatched Speech Intelligibility designed to target the Dept. of Defense requirements for Mass Notification Systems (UFC4-021-01)
- Quadrant Design
- Pre-recorded and live voice broadcasting / adjustable audio output.
- 10 Standard / 6 custom tone signals.
- Silent Testing
- Battery Operation
- Maintenance free siren head
- Modular component design.
- MACROs: Custom tones & preprecorded messages with repeat play.
- 5 year parts warranty.
- Over 25 years of excellence in community alerting and voice notification.

AMERICAN SIGNAL CORPORATION

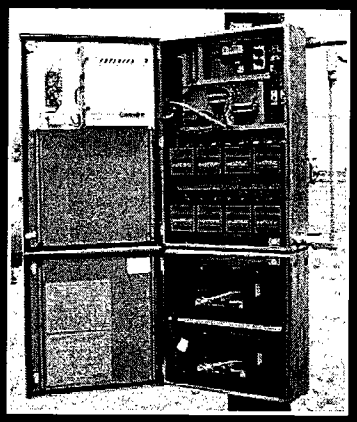
4801 W. Woolworth Ave • Milwaukee, WI 53218

TOLL FREE 1 (800) 243-2911 • PHONE 1 (414) 358-8000 • FAX 1 (414) 358-8008 • EMAIL: contactus@americansignal.com

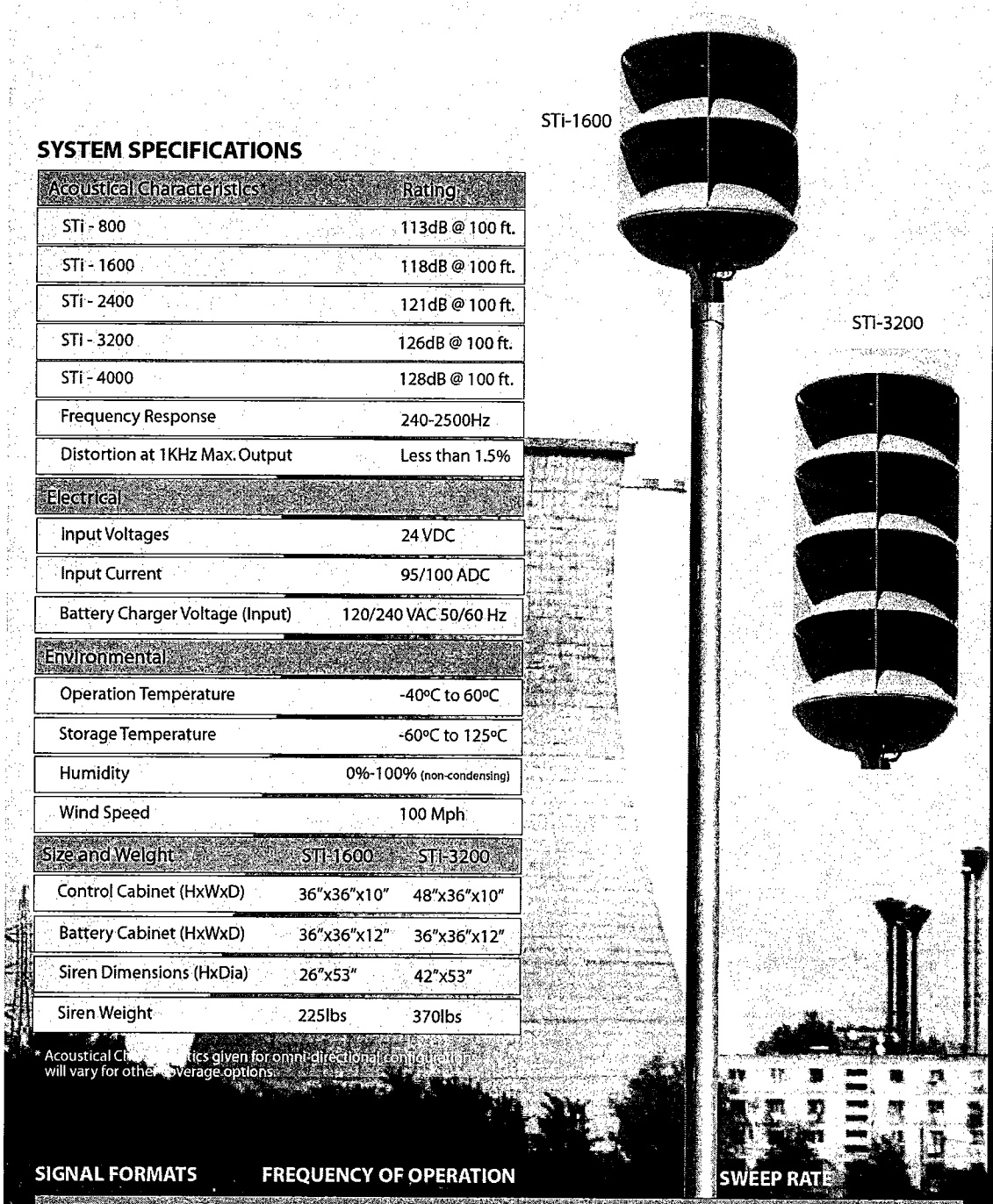
I-Force



i-Force 1600 Control System



i-Force 3200 Control System



SYSTEM SPECIFICATIONS

Acoustical Characteristics*	Rating
STi - 800	113dB @ 100 ft.
STi - 1600	118dB @ 100 ft.
STi - 2400	121dB @ 100 ft.
STi - 3200	126dB @ 100 ft.
STi - 4000	128dB @ 100 ft.
Frequency Response	240-2500Hz
Distortion at 1KHz Max. Output	Less than 1.5%
Electrical	
Input Voltages	24 VDC
Input Current	95/100 ADC
Battery Charger Voltage (Input)	120/240 VAC 50/60 Hz
Environmental	
Operation Temperature	-40°C to 60°C
Storage Temperature	-60°C to 125°C
Humidity	0%-100% (non-condensing)
Wind Speed	100 Mph

Size and Weight	STI-1600	STi-3200
Control Cabinet (HxWxD)	36"x36"x10"	48"x36"x10"
Battery Cabinet (HxWxD)	36"x36"x12"	36"x36"x12"
Siren Dimensions (HxDia)	26"x53"	42"x53"
Siren Weight	225lbs	370lbs

* Acoustical Ch[illegible]tics given for omni-directional configuration will vary for other [illegible]verage options.

SIGNAL FORMATS	FREQUENCY OF OPERATION	SWEEP RATE
ALERT	steady tone	3 minutes
ATTACK	tone ramping up & down, 06 up & 05 down	6 sec. up 5 sec. down for 3 min.
HI/LO	tone alternating with a 740 Hz tone	0.75 sec duration per tone for 3 min.
AIR-HORN	on/off tone	2 sec. on, 2 sec. off for 3 min.
FIRE	tone ramping up & down, minimum during down ramp	16 sec. up, 8 sec. down for 1.5 min.
GROWL	tone burst with fade up & down	0.5 sec. (for siren test)
HAZARD	tone ramping up	1 sec. repeating for 3 min.
CHIME	tone bursts	2 sec. intervals of 6 cycles
WAIL	tone ramping down, then back up	0.8 sec. down, 0.2 sec. up, for 3 min.

INSTALLATION

For maximum sound dispersion, sirens should be mounted 45' - 55' on a wooden, steel, or concrete pole. A pole mount is available for a standard wooden utility pole. The center mount, low silhouette siren design eliminates the need for support wires. The siren can also be mounted on proper structures such as roofs, towers, etc. Mounting brackets for these applications and additional installation accessories are available from American Signal.

FIELD PROGRAMMING

Each electronic control includes an RS-232 port for field programming of tones and time duration. The 6 custom programmable tones can be software programmed to generate almost any tone or tone sequence. MACROs, customized tones and pre-recorded messages in repeat play cycles, and new tones, can be field programmed as your needs change.

OPTIONAL SIREN EQUIPMENT

EC - 4 Electronic Control for STi-1600
EC - 8 Electronic Control for STi-3200
MSG1 Prerecorded Message Chip

CompuLert™ CSC960 programmable encoder & status monitor (two-way) with hot key radio or landline activation & system monitoring battery backup.

MODULATOR

Federal Signal's Modulator Siren Series is capable of producing intense warning signals over a large area. An efficient design enables the siren to produce a high sound level while making moderate demands on the battery power source.

The innovative omni-directional electronic Modulator Speaker Array consists of modules that each utilize four 100 watt drivers.

The Modulator Speaker Array provides a flat frequency response from 200 to 2000Hz for excellent voice reproduction and offers warning signals such as: Wail (Attack); Steady (Alert); Pulsed Steady; Fast Wail; Pulsed Steady; Pulsed Wail and Westminster Chime which are produced by the UltraVoice™ Electronic Controller. Custom tones can be purchased upon request.

An excellent alert and notification device, the Modulator Siren is ideal for locations where people congregate outdoors, or in industrial settings where immediate instruction is necessary.

PRODUCES HIGH INTENSITY WARNING SIGNALS

WARNING SIGNALS, VOICE COMMUNICATION AND CONTINUED EMERGENCY OPERATION REGARDLESS OF PRIMARY POWER OUTAGES

EXCELLENT FREQUENCY RESPONSE FOR CLEAR VOICE REPRODUCTION

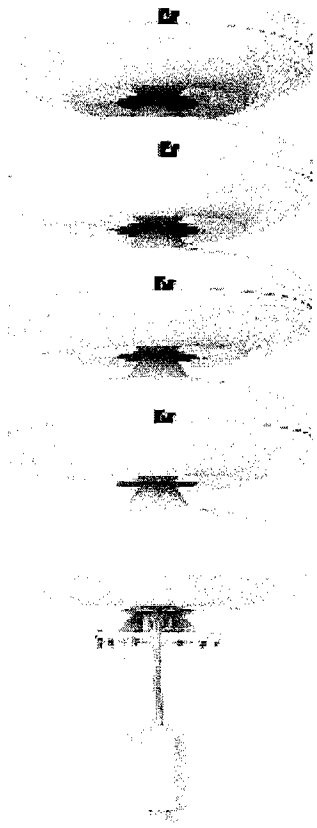
360° COVERAGE WITH NO SOUND VARIATION IN THE HORIZONTAL PLANE

INCREASED POWER DURING VOICE REPRODUCTION

EASY SERVICING THROUGH CONVENIENT ACCESS PANELS

AERODYNAMIC DESIGN REDUCES WIND LOADING CONCERNS

FULLY TESTED IN FEDERAL SIGNAL'S CERTIFIED ANECHOIC CHAMBER



FEDERAL SIGNAL CORPORATION
Federal Warning Systems

"ARE YOU PREPARED?"

MODULATOR SIREN SERIES SPECIFICATIONS

Color: Off White
Paint Type: TGIC-Polyester Powder Coat
Modulator Horn Type: Hyperbolic Flare
Frequency Response: 200-2000Hz
Horizontal Coverage: 360° +/- 1dB(C)
Diameter: 44-1/2"

Model Number	Active Modules*	Watts	dB(C) @ 100'**	Effective Range @ 70 dB(C) ***	Height in Inches	Shipping Weight Lbs.	Net Weight Lbs.
MOD1004	1	400	106	1200'	43.2	350	181
MOD2008	2	800	112	1800'	63.7	400	296
MOD3012	3	1200	115	2200'	84.3	600	411
MOD4016	4	1600	118	2800'	105	750	526
MOD5020	5	2000	120	3100'	125.5	1000	641
MOD6024	6	2400	121	3400'	146.1	1270	760
MOD6032	6	3200	123	4000'	146.1	1350	861
MOD6048	6	4800	125	4500'	146.1	1438	928

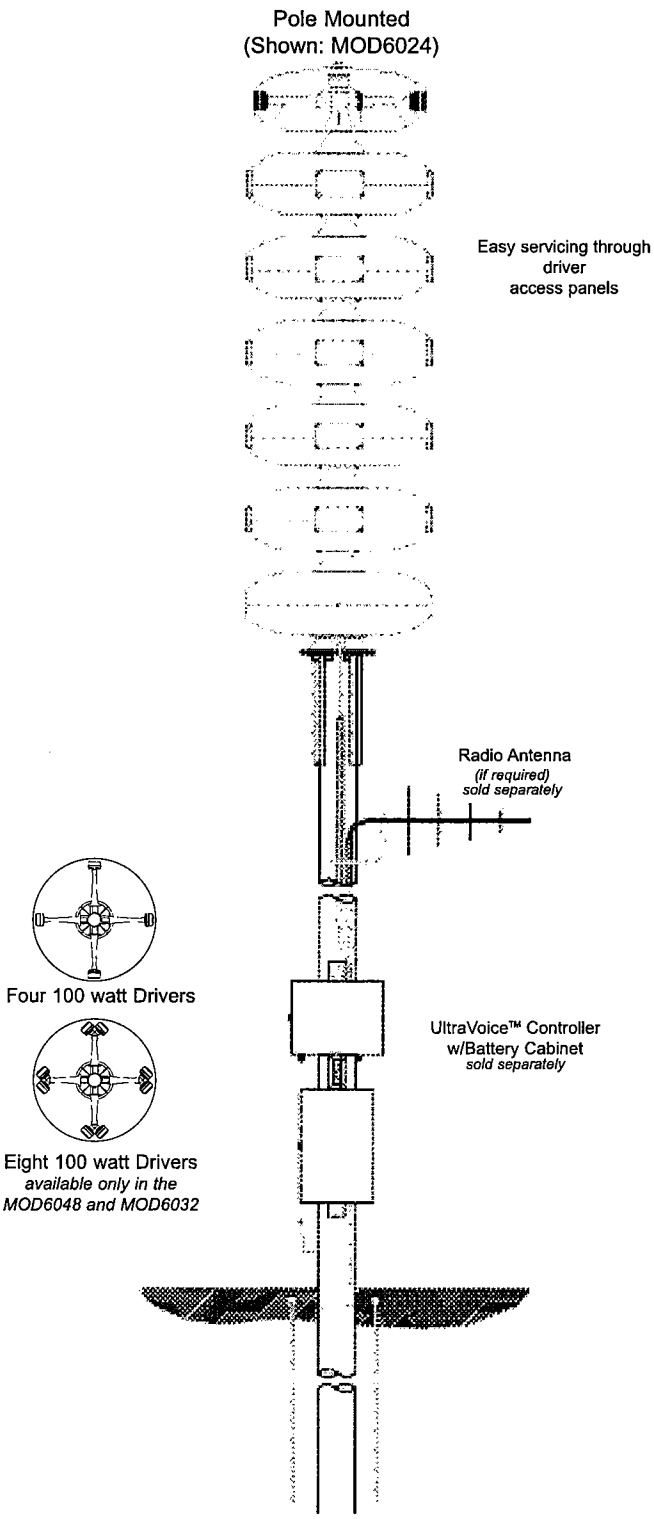
*The bottom module contains no active devices and is used simply as a reflective surface.
**Based on far field measurements.
***Coverage basedon 10dB per distance labeled loss factor

ORDER INFORMATION*
Electronic Speaker Arrays

ALUMINUM SERIES-*Includes 40' cable*

MOD1004	One module, Four Drivers per Module
MOD2008	Two modules, Four Drivers per Module
MOD3012	Three modules, Four Drivers per Module
MOD4016	Four modules, Four Drivers per Module
MOD5020	Five modules, Four Drivers per Module
MOD6024	Six modules, Four Drivers per Module
MOD6032	Six modules, Center cells with Eight Drivers .... per Module
MOD6048	Six modules, Eight Drivers per Module

See UltraVoice™ Controller product literature for specifications.



ISO 9001
DSP
DNV Certificate Inc.
Certificated Firm

4/06

FEDERAL SIGNAL CORPORATION
Federal Warning Systems
2645 Federal Signal Drive, University Park, IL 60466-3195
Sales: 800/548-7229 • Fax: 708/534-4855
Visit us at www.federalwarningsystems.com

WHELEN® 2904 4 Cell Siren

Mass Notification Warning System

Whelen's All-Hazard WPS2900 series omni-directional high-power voice and siren systems deliver clear, powerful voice and siren communication.

System Features

- **WPS2904** - Four Omni-Directional Speaker Cells Assembled in a Vertical Column
- Two Compartment (Type II) Natural Finish Aluminum Cabinet
- 118dBC @ 100'
- WPS2904 Speaker Cells Include Four High Efficiency 400 Watt **EZ-PULL™** Speaker Drivers
- 50' Cable Included
- Pole Top Mounting Bracket Included
- Public Address Capability
- Battery Powered, Minimum of 30 Minutes of Full Power Output with Batteries of our Recommendation
- AC Temperature Compensated 10 Amp Battery Charger
- Local Controls or Remote Controls
- Four Power Amplifiers
- Electronic Siren Controller
- Tone Generator
- Timer
- Local Control Push Buttons
- Battery Switch
- SI TEST®
- Battery Tray
- Lightning Arrestor
- Six Standard Public Warning Tones - Wail, Whoop, Attack, Hi-Lo, Alert, Airhorn

System Options

- **SBC280** - Solar Power [1]
- **WPSBATT** - Delco S2000 or Interstate Workaholic 31 MHD Batteries
- **WPSNCMIC** - Noise Canceling Microphone
- Alternate Tone Set
- **RDVM** - Digital Voice Message Capability [2]

NOTES:

1. Solar power option includes 2 - 80 watt panels, mounting bracket and regulator.
2. RDVM - 1-16 message capability with 240, 480 or 960 seconds available for recording.

Siren Activation Controls

Our VHF High and UHF Wide Band siren activation control packages include the following:

- Radio
- Radio Interface
- Tone Squelch
- 2-3dB Gain Omni-Directional Antenna With Bracket
- 35' of RG58 Antenna Cable
- Polyphaser
- SI TEST®
- Low Battery Alarm (Two-Way only)

Other features are dependant upon one or two way controls. Whelen equipment can be interfaced with many different types of two-way radio communications products and systems including 800Mhz trunking, Motorola's MOSCAD, FSK, Narrow-Band and VHF Low Band. The following is available as standard options. Contact factory for special applications.

One-Way Controls

- **AUXIN** - Auxiliary Board for Contact Closure Activation
- **D2020LL** - 10 Digit DTMF Landline Activation
- **D2020H** - 10 Digit DTMF VHF High Band / 150-170 Mhz
- **D2020U** - 10 Digit DTMF UHF / 450-470 Mhz
- **WPSTT** - Two-Tone Sequential Option

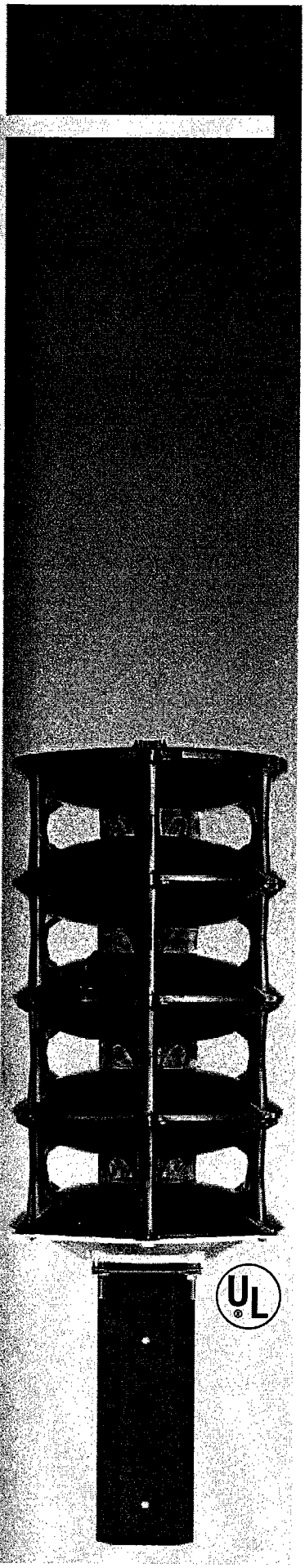
Two Way Controls

- **AUXCS** - Two-Way Contact Closure Activation and Status Board
- **C2020LL** - Two-Way Landline Activation
- **C2020H** - 10 Digit DTMF VHF High Band / 150-170 Mhz
- **C2020U** - 10 Digit DTMF UHF / 450-470 Mhz
- **C2020NH** - 10 Digit DTMF VHF High Band Narrow-Band
- **C2020NU** - 10 Digit DTMF UHF Narrow-Band

Options:

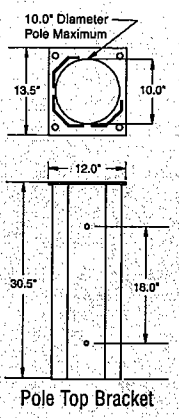
- **FSKXMOD** - Converts the Above Siren Activation Controls to FSK Format
- **STATUS** - Cabinet Window LED Status Indicator
- **PGINT** - Paging Interface to Interface Whelen Tones with Existing Paging Systems
- **INTRU** - Intrusion Alarm (available with two-way only)

Type II Electronic Cabinet



WHELEN® 2904 Specifications

Component	Height Inches (CM)	Width Inches (CM)	Depth Inches (CM)	Weight Lbs. (KG)
WPS2904 SPEAKER	56.0 (142)	32.5 (82.5)	—	240 (109)
ELECTRONICS CABINET TYPE II	40.7 (103)	30.0 (76)	10.0 (25.4)	138 (66)
POLE TOP BRACKET	30.5 (77)	12.0 (30.5)	10.0 (25.4)	71 (32)



Pole Top Bracket

WHELEN
ENGINEERING COMPANY, INC.
PUBLIC WARNING PRODUCTS
Route 145, Winthrop Road
Chester, Connecticut 06412-0684
(860) 526-9504
1-800-637-4736
Fax: (860) 526-4784
Internet: www.whelen.com
e-mail: lowsales@whelen.com

Printed in the U.S.A.
070105-11687A

Electrical

- **Battery Charger Input:** 120VAC, 60Hz, 7A Fuse (240 VAC 50/60 Hz available)
- **Battery Charger Output:** 28VDC, 10A (NOMINAL)
- **Batteries:** (2) 12V, 115AH Lead Calcium
- **Standby Current:** 135mA, 24VDC
- **Operating Current:** 89A, 24VDC
- **Power Amplifier Output Power:** **Siren:** 1600 Watts **Voice:** 2000 Watts

Environmental

- **Operating Temperature:** -35°C to +60°C
- **Storage Temperature:** -65°C to +125°C
- **Humidity, Non Condensing:** 0 to 95%

Ordering Information

BASIC SYSTEM INCLUDES ALL OF THE FOLLOWING:

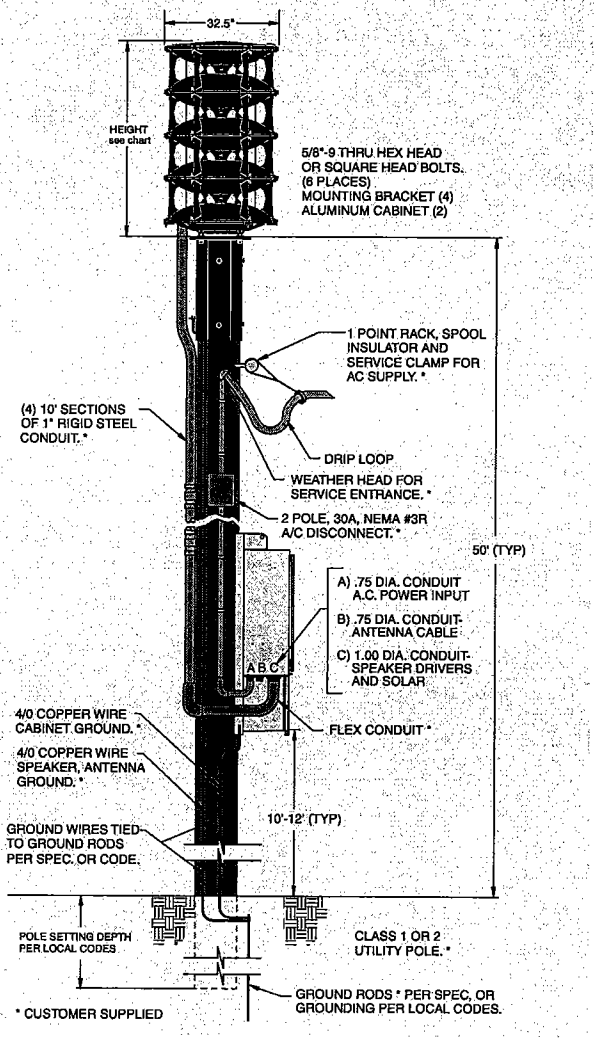
- **WPS2904** - Speaker Assembly & Electronics Cabinet

OPTIONS:

- **RDVM** - Remote Station Digital Voice [1]
- **AUXIN** - Auxiliary Board for Contact Closure Activation
- **AUXCS** - Auxiliary / Status Control Board for Contact Closure Activation and Status
- **D2020LL, D2020H, D2020U** - One-Way Radio Control [2]
- **C2020LL, C2020H, C2020U** - Two-Way Radio Control / Status Monitoring, COMM/STAT™ [2]
- **C2020NH, C2020NU** - Two-Way Radio Control / Status Monitoring, COMM/STAT™ [2]
- **WPSTT** - Two-Tone Sequential
- **FSKXMOD** - FSK Format
- **STATUS** - Cabinet Window LED Status Indicator
- **PGINT** - Paging Interface to Interface Whelen Tones with Existing Paging Systems
- **INTRU** - Intrusion Alarm
- **SBC280** - Solar Power [3]

NOTES

1 **RDVM** - 1-16 message capability with 240, 480 or 960 seconds available for recording
2 10 digit DTMF Controls • Landline • VHF High Band / 150-170 Mhz • UHF / 450-470 Mhz Our VHF High and UHF siren activation control packages include tone squelch, radio, radio interface, 2-3dB gain omni-directional antenna with bracket, 35' of RG58 antenna cable and polyphaser.
3 Solar power option includes 2 - 80 watt panels, mounting bracket and regulator



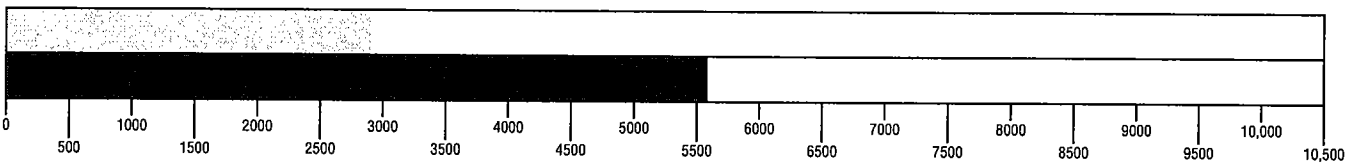
Acoustic Performance

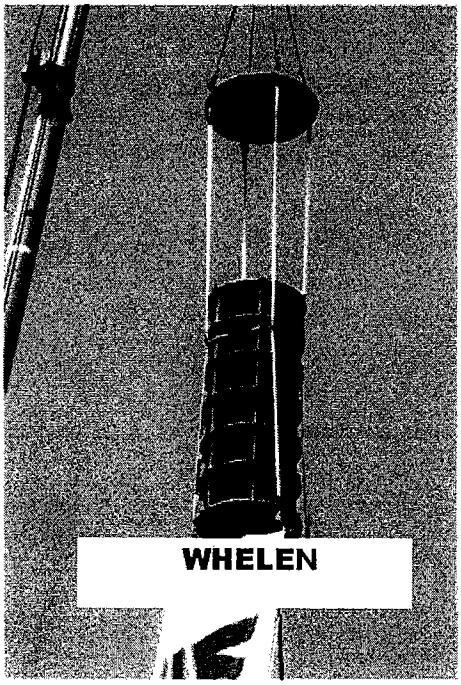
SPL @ 100': 118dBC

Estimated 70dB range: 2,800'

Estimated 60dB range: 5,600'

Note: 100' performance levels listed represent repeatable results within +/-2dB to stated levels.
Estimated 70dB perimeter is based on the Federal Emergency Management Agency's (FEMA) -10dB per distance doubled path model.





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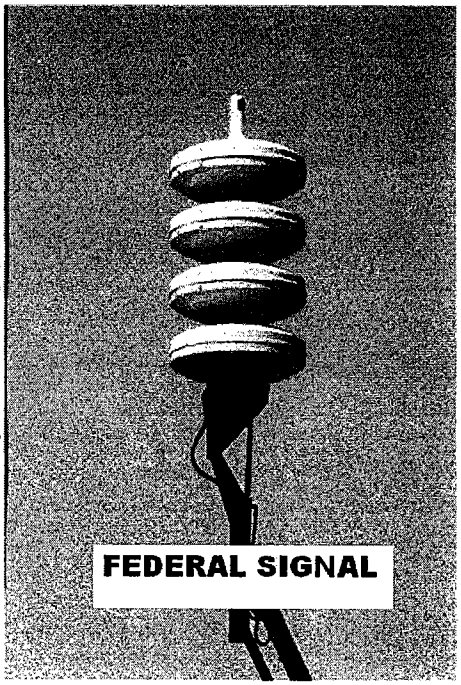

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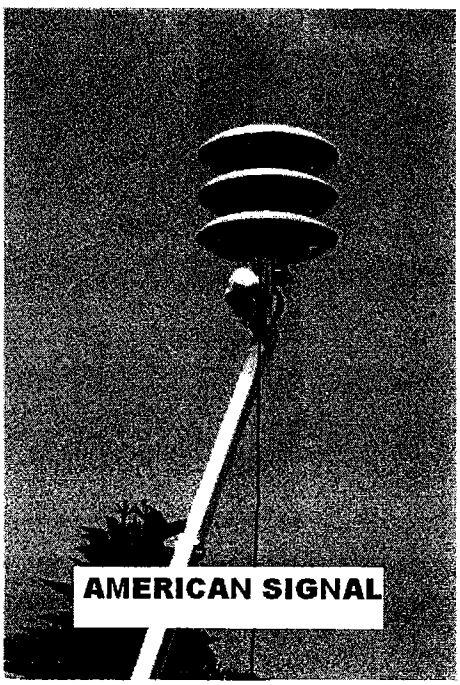


C:\Documents and Settings\wachumak\Local Settings\Temporary Internet Files\OLK1A8\ chaceobliquel1x17 (4845x3150x24b jpeg)

Attachment "B"


Attachment "C"
1000 ft
200 m

Attachment "D"

1st Recording

(Male Voice)

This is a test.

This is a test of the emergency warning system.

This is only a test.

The quick brown fox jumps over a lazy dog.

All questions asked by five watch experts amazed the people.

Bat, give, mat, live, sat, that, hat, shows, thumb, fill, juice, fish, give.

(Female Voice)

This is a test.

This is a test of the emergency warning system.

This is only a test.

The quick brown fox jumps over a lazy dog.

All questions asked by five watch experts amazed the people.

Bat, give, mat, live, sat, that, hat, shows, thumb, fill, juice, fish, give.

(Insert Siren Tones Here)

2nd Recording

(Male Voice)

This has been a test of the emergency warning system.

This was only a test.

Attachment "E"

May 16, 2007

To: Lt. Nelson

From: Wayne Schumaker

Subject: Early Warning Loud Speaker

I spoke with Kerry on your request to set up and test your proposed "Early Warning Loud Speaker" system at Chase Park on Friday, June 15, 2007 at noon. She approves your request but requires you to do the following prior to activating the system within the Park;

1. Notify all of the homeowners associations in the area that will be reached by the sound
2. Notify LAPD Pacific Division
3. Notify LAX Coastal Area Chamber (what use be called the Westchester/Lax Marina del Rey Chamber
4. Notify Daily Breeze, L.A. Times, Argonaut Newspapers
5. L.A. County/L.A. City Fire Departments and L.A. County's EOC
6. L.A. City Councilman's Office for this area and Supervisor Knabe and Zev Offices
7. Marina del Rey Lessee's Association
8. Make a small presentation to the Small Craft Harbor Commission
9. L.A. Film Inc. (previously known as One Stop Filming)
10. L.A. County Lifeguards and U.S Coast Guard
11. Local hospitals
12. State Fish and Game

These are just some of the organizations and governmental agencies that we are concerned with in being aware of the testing. We also ask that you contact anyone else that maybe highly sensitive to your testing.
Please let me know if you have any questions and thank you for contacting us in advance of your exercise.

Cc: Kerry Silverstrom
Dusty Crane
Ken Foreman
Files

Press Release

For Immediate Release: **05/22/07**
For Information Contact: **Sgt. Mike Carriles 310 482-6033**

Marina del Rey Sheriff Station will be testing mass notification systems.

Marina del Rey Sheriff's Station will be testing mass notification systems (aka: tsunami warning loudspeakers) at Burton Chace Park on Friday June 15, 2007, at 12:00 noon. This equipment is being considered as part of a warning system for residents and visitors in Marina del Rey in the event of impending danger from either natural or human-made disasters.

Three or four different devices will be tested; each device will be tested for approximately 30-45 seconds. The tests will include both siren tones (hi-low and wail) and voice broadcasts. For people in and around Burton Chace park the devices will be quite loud, but well within OSHA safety limits. The effective audible range of the devices will be an approximate 3000 foot radius. Deputies will be deployed in the park during the testing to maintain a distance between the devices and the public and to advise patrons.

If you have questions please call Marina del Rey's Sheriff's Station Harbor Operations, Sergeant Mike Carriles, at 310-482-6033.

Marina del Rey Harbor

Photo Date: May 2000

1000 0 1000 2000 Feet

N

Attachment "F"

Attachment "G"

Marina del Rey
Mass notification test

Location MOTHERS BEACH
Unit 2713 Department L.A.S.D Rater LAUGHON/COSGROVE

Please indicate if the voice messages are clear and easy to understand for each test. There will also be a Siren test, indicate which siren tone carried the best. There will be 3 separate tests conducted. We value your opinion, at the end of all test, please indicate which performed best if any stood out.

Please return this form to Sgt. Carriles.

Test 1 Comments AMERICAN SIGNAL

Voice	NO VOICE AUDIBLE HEARD
Siren	VERY FAINT AUDIBLE

Test 2 Comments FEDERAL SIGNAL

Voice	NO VOICE AUDIBLE HEARD
Siren	JUST SLIGHTLY BETTER THAN FAINT

Test 3 Comments WHELEN

Voice	HEARD SLIGHTLY VOICE, UNABLE TO COMPREHEND WHAT WAS SAID.
Siren	SLIGHTY BETTER THAN THE PREVIOUS TWO BUT STILL FAINT.

ALL INADEQUATE FOR THIS RANGE —
MEDIUM ACTIVITY ON BEACH & WATER, NO ONE SEEMS TO NOTICE AND UNAWARE OF SIRENS.

Marina del Rey
Mass notification test

Location # 4700 ADMIRALTY WAY
Unit 275 R Department LA50 Rater S/P MACE

Please indicate if the voice messages are clear and easy to understand for each test. There will also be a Siren test, indicate which siren tone carried the best. There will be 3 separate tests conducted. We value your opinion, at the end of all test, please indicate which performed best if any stood out.

Please return this form to Sgt. Carriles.

Test 1	Comments
Voice (1)	Not Understable - Could Not UNDERSTAND EITHER NO ON WOULD HEAR THIS SYSTEM
Siren (1)	Clear SIGNAL REASONABLE LOUD AND CLEAR
(2)	Loud and clear

Test 2	Comments DOUNT USE SIREN SAME AS EMERG. VEHICLE
Voice	AUDIBLE FEMALE VOICE CLEAR - MOD VOLUME MALE VOICE MUFFLED VOLUME LOW
Siren	Loud and Clear EMERGENCY SIGNAL NOT EFFECTIVE - SOUNDED LIKE A FIRE TRUCK Should HAVE SOUND FIRST BEFORE VOICE TO GET ATTENTION

Test 3	Comments
Voice	Clarity of FEMALE VOICE much Better Than MALE VOICE FAIR
Siren (1)	VERY LOUD - VERY Good Sound VERY Good/Loud Best of ALL

COAST GUARD DOCK

Marina del Rey
Mass notification test

Location LASD - MDR #27 Department OCSD Rater GIUDICE/VANRETBERG

Unit Harbor Ops

Please indicate if the voice messages are clear and easy to understand for each test. There will also be a Siren test, indicate which siren tone carried the best. There will be 3 separate tests conducted. We value your opinion, at the end of all test, please indicate which performed best if any stood out.

Please return this form to Sgt. Carriles.

SOUND LEVEL METER READING

Test 1	Comments	
Voice ~	Muffled at first hard to understand specific words	Norm 62.5
Siren ✓	① very audible ② " "	75.5 63.

Test 2	Comments	
Voice ✓	More clear than the Test #1 - could understand specific words	~~63.5~~
Siren ✓	① ② very audible " "	73.

Test 3	Comments	
Voice ✓	Muffled at first/but there was plane noise interference a lot more echo feedback	64.
Siren ✓	① very audible ② " "	65.6 73.3

Marina del Rey
Mass notification test

Location Pacific Ave Bridge Main channel MDR
Unit Baywatch 12 Department LACO FD Rater Butler

Please indicate if the voice messages are clear and easy to understand for each test. There will also be a Siren test, indicate which siren tone carried the best. There will be 3 separate tests conducted. We value your opinion, at the end of all test, please indicate which performed best if any stood out.

Please return this form to Sgt. Carriles.

Test 1	Comments
Voice	NOTHing heard
Siren	Not recomended for emergency notification

Test 2	Comments
Voice	NOTHing heard
Siren	NOTHing heard

Test 3	Comments
Voice	Nothing heard
Siren	faint allmost unoticed

Ambient Noise from Wind 240° at 10 KTS
AIRplanes boats and other city sounds

Marina del Rey
Mass notification test

Location Pacific Ave bridge Main Channel MDR
Unit Baywatch 12 Department L.A. C.O. FD Rater Moore

Please indicate if the voice messages are clear and easy to understand for each test. There will also be a Siren test, indicate which siren tone carried the best. There will be 3 separate tests conducted. We value your opinion, at the end of all test, please indicate which performed best if any stood out.

Please return this form to Sgt. Carriles.

Test 1	Comments
Voice	Ambient noises from wind, airplanes, vessels Nothing Heard wind 240° AT 10 KTS
Siren	barley heard

Test 2	Comments
Voice	barley audible
Siren	Same as above

Test 3	Comments
Voice	Nothing heard
Siren	barley audible

Marina del Rey
Mass notification test

Location MDR STATION DOCKS
Unit 271 DAYS Department LASD Rater SCHWABE

Please indicate if the voice messages are clear and easy to understand for each test. There will also be a Siren test, indicate which siren tone carried the best. There will be 3 separate tests conducted. We value your opinion, at the end of all test, please indicate which performed best if any stood out.

Please return this form to Sgt. Carriles.

Test 1	Comments
Voice	LOW VOLUME WITH VOICE COMMANDS. VERY HARD TO HEAR. WASHED OUT WITH VARIOUS SOUNDS IN THE SURROUNDING AREA.
Siren	GOOD LOUD AND CLEAR SIREN AS WELL AS HIGH + LOW TONES.

Test 2	Comments
Voice	BEST VOICE PROJECTION! VERY LOUD AND CLEAR! #1 AND #3 DIDNT COME CLOSE TO THIS CLARITY AND VOLUME.
Siren	VERY LOOD SIREN AND HIGH/LOW TONES. VERY CLEAR AND TRAVELED WELL OVER AREA NOISE.

Test 3	Comments
Voice	INAUDIBLE VOICE COMMANDS. VERY MUFFLED AND FUZZY SOUND. VERY POOR!
Siren	LOUDEST AND CLEAREST AUDIBLE SIREN + HIGH/LOW TONES. ALSO TRAVELED WELL OVER AREA NOISE.

Marina del Rey
Mass notification test

Location A 3100

Unit BAYWATCH SANTA MONICA Department LA COUNTY FIRE Rater CAPTAIN GREGER

Please indicate if the voice messages are clear and easy to understand for each test. There will also be a Siren test, indicate which siren tone carried the best. There will be 3 separate tests conducted. We value your opinion, at the end of all test, please indicate which performed best if any stood out.

Please return this form to Sgt. Carriles.

Test 1	Comments
Voice	NO VOICE MESSAGES UNDERSTOOD
Siren	OK. HILO OK

Test 2	Comments
Voice	BETTER VOICE COULD UNDERSTAND SOME WORDS
Siren	WAS OK 1ST WAS LOUDER.

Test 3	Comments
Voice	VOICE WAS NOT GOOD COULD UNDERSTAND SOME WORDS
Siren	WAS BEST SIREN

From: Alexander, Angus [mailto:AALEXAND@lacofd.org]
Sent: Monday, June 18, 2007 2:42 PM
To: Nelson, Gregory P. (LT.)
Subject: June 15, 2007 test response

Greg,
I though you did a great job with the test and the lifeguards appreciate you including us.
I wanted to get back to you with just some after thoughts.
When I was at the west end of A basin for the test. We could only hear the test if we shut down the boat engines. All test were faint and I would not have really noticed if I was not paying attention.
Many on board commented that they liked the siren that did not sound like a fire truck or squad car whale. The classic air raid siren is different than an every day siren so it might be better. The voices were all weak and hard to understand and the end of Basin A.
The main point is more sirens will be needed in the future and If we were truly underway with engines on we would not have heard the test.
Again,
Good job and good test.
Angus

=

From: Gregory P. (LT.) Nelson [mailto:GPNelson@lasd.org]
Sent: Friday, June 01, 2007 11:37 AM
To: Wayne Schumaker; Brad Davis; dhadley@ci.oceanside.ca.us; snapolitano@lacbos.org; Mark Grant; Jeffrey Terry; Topar, Phil; 23739@lapd.lacity.org; williamb@lapd.lacity.org; Debra J. Glafkides; Patrick B. Hunter; Paul M. Hanley; john_benedetti@longbeach.gov; ERIN L GIUDICE; David Malin; dan.madrigal@redondo.org; diane.amaya@redondo.org; paul-weinberg@santa-monica.org; Alexander, Angus; fawcett@usc.edu
Cc: John B. Powell; Michael L. Carriles; Roderick A. Kusch
Subject: RE: Test of Mass Notification Systems at Marina del Rey June 15, 2007

ps: regarding the "eardrum" comment, I'm told that all these devices, when deployed as recommended, are within OSHA safety guidelines for people who might be close to them when they go off.....

From: Nelson, Gregory P. (LT.)
Sent: Friday, June 01, 2007 11:21 AM
To: Glafkides, Debra J.; '23739@lapd.lacity.org'; 'williamb@lapd.lacity.org'; Terry , Jeffrey; Hanley, Paul M.; Davis, Brad; 'dan.madrigal@redondo.org'; 'diane.amaya@redondo.org'; 'David Malin'; 'john_benedetti@longbeach.gov'; 'fawcett@usc.edu'; Hunter, Patrick B.; 'paul-weinberg@santa-monica.org'; 'GIUDICE, ERIN L'; 'ptopar@lacofd.org'; 'Wayne Schumaker'; 'aalexand@lacofd.org'; 'dhandley@ci.oceanside.ca.us'; 'Mark Grant'; 'snapolitano@lacbos.org'
Cc: Carriles, Michael L.; Powell, John B.; Kusch, Roderick A.
Subject: Test of Mass Notification Systems at Marina del Rey June 15, 2007

Hello everyone:

We are going to be testing costal mass notification warning systems (for tsunami, toxic plumes, etc.) at Marina del Rey on **Friday, June 15, 2007.** These devices are FEMA compliant omni-directional high-power voice and siren systems. Three of the biggest players in the field (American Signal, Whelen, and Federal Signal) will be bringing their equipment to test head-to-head (see attachments).

Beginning at 1130 hours, each vendor will give a brief presentation, and actual tests of the devices will commence at **12:00 noon**. Tentatively, we plan on setting up the equipment and doing presentations at the western tip of Burton Chace Park, then loading the observers on board our new homeland security vessel (and perhaps LA Co FD's new fire boat or Baywatch, depending on the crowd) and motoring out to the other side of the marina for the test (don't want to blow anyone's eardrums out). **Burton Chace Park is located at 13650 Mindanao Way, Marina del Rey**. Of course, those who wish to stay on land can pick any location around the Marina (the devices being tested purportedly have a 3000' effective range).

LASD's Tech Crew will be recording the tests from a distance with boom mic, digital recorder and decibel meter, and we will gladly provide observers with a copy of the recording for comparison purposes after the event.

This test is in connection with LASD's homeland security grant request presently before the LA/LB UASI group. It is a regional request to outfit the most vulnerable L.A. County costal areas with mass notification capabilities. Along with voice capable siren systems, the project may include Reverse 911 technology, but the latter is not a complete solution in the Marina del Rey area, with its large tourist influx and high risk exposures (docks, boats, jetties and beaches), and I'm sure many of your jurisdictions have similar conditions.

We have heard mixed reviews regarding the voice & siren systems. Some jurisdictions who have deployed or tested them have complained that the performance of the voice feature was poor, leaving the broadcast messages unintelligible. The technology has improved since those jurisdictions' experiences, and we have an opportunity to see if the devices are effective, and if so, which one works best.

Feel free to call me or Sgt. Mike Carriles if you have any questions! An RSVP is not essential, but would be nice to give us an idea how many boats we'll need.

Lieutenant Greg Nelson: 323-526-5087
Sergeant Mike Carriles: 310-482-6030
Los Angeles County Sheriff's Department

Attachment "H"

13851 Fiji Way
2100 feet from system

	Male Voice		Female Voice		Siren		
	Volume	Clearity	Volume	Clearity	Volume	Clearity	
American Signal	low	poor	low	poor	loud	clear	db 62.5
Federal Signal	loud	clear	loud	clear	loud	clear	db 63.5
Wheelen	med	poor	med	poor	loud	clear	db 64.0

4700 Admiralty Way
2500 feet from system

	Male Voice		Female Voice		Siren	
	Volume	Clearity	Volume	Clearity	Volume	Clearity
American Signal	low	poor	low	poor	loud	clear
Federal Signal	low	fair	med	clear	loud	clear
Wheelen	med	fair	med	clear	loud	clear

Bora Bora Way A3100
3000 feet from system

	Male Voice		Female Voice		Siren	
	Volume	Clearity	Volume	Clearity	Volume	Clearity
American Signal	low	none	low	none	loud	clear
Federal Signal	med	fair	med	fair	loud	clear
Wheelen	med	poor	med	poor	loud	clear

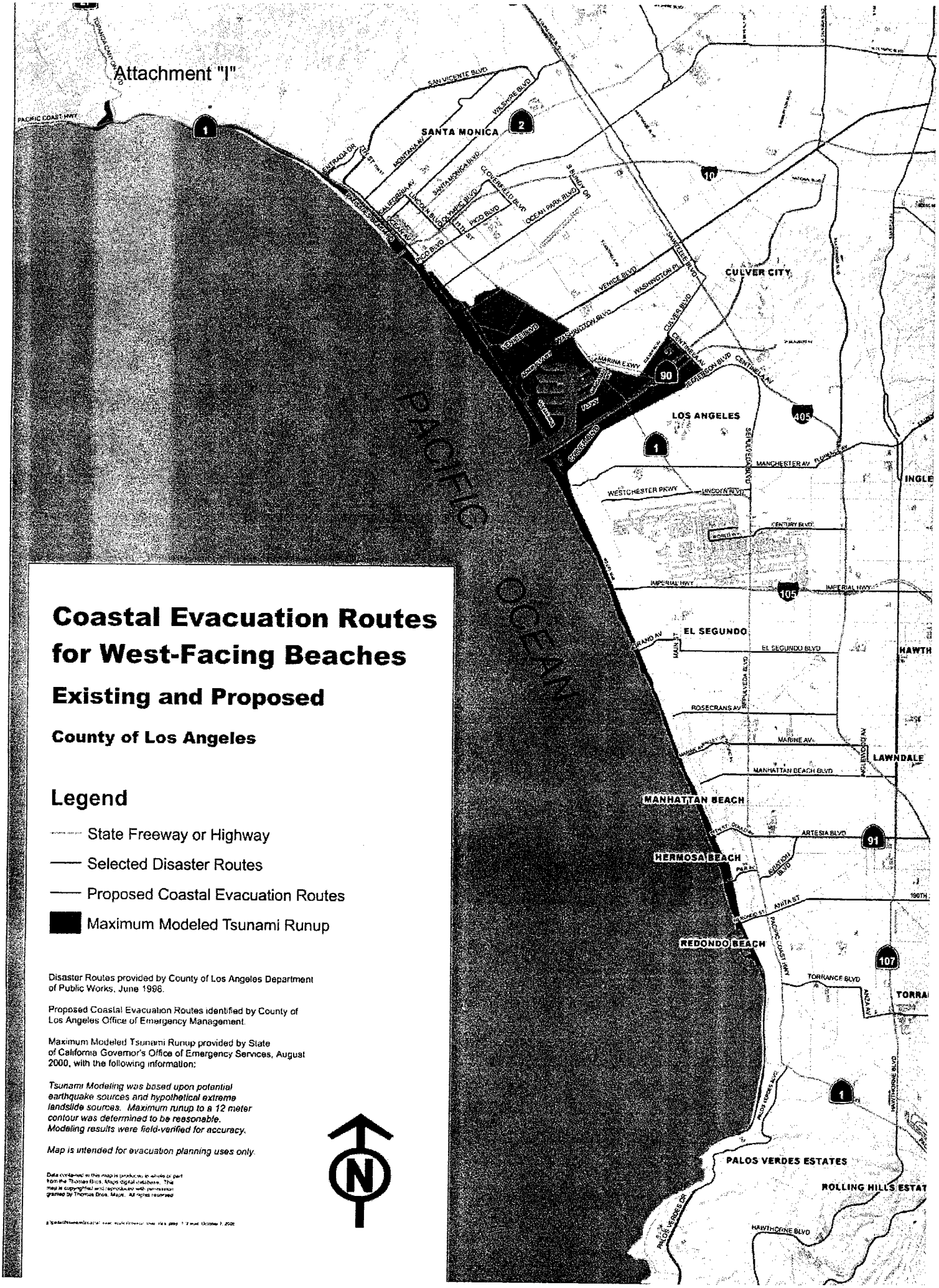
Mothers Beach D3000
3400 feet from system

	Male Voice		Female Voice		Siren	
	Volume	Clearity	Volume	Clearity	Volume	Clearity
American Signal	none	none	none	none	low	poor
Federal Signal	none	none	none	none	low	poor
Wheelen	low	none	low	none	low	poor

Pacific ave bridge
5000 feet from system

	Male Voice		Female Voice		Siren	
	Volume	Clearity	Volume	Clearity	Volume	Clearity
American Signal	none	none	none	none	low	poor
Federal Signal	low	none	low	poor	low	poor
Wheelen	none	none	none	none	low	poor

Attachment "I"



Coastal Evacuation Routes for West-Facing Beaches

Existing and Proposed

County of Los Angeles

Legend

- State Freeway or Highway
- Selected Disaster Routes
- Proposed Coastal Evacuation Routes
- Maximum Modeled Tsunami Runup

Disaster Routes provided by County of Los Angeles Department of Public Works, June 1996.

Proposed Coastal Evacuation Routes identified by County of Los Angeles Office of Emergency Management.

Maximum Modeled Tsunami Runup provided by State of California Governor's Office of Emergency Services, August 2000, with the following information:

Tsunami Modeling was based upon potential earthquake sources and hypothetical extreme landslide sources. Maximum runup to a 12 meter contour was determined to be reasonable. Modeling results were field-verified for accuracy.

Map is intended for evacuation planning uses only.