May 2015

Emergency and Public Service Radio Station Upgrade

Mile High Radio Club

Idyllwild, California

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Mile High Radio Club
Idyllwild, California

Mile High Radio Club
(dba: WNKI 578 – 1610 AM)

Board of Directors

Professional Affiliations

President – Bill Tell KD6KTV – Sales Engineer, South Bay Cable, Member of the Marine Technology Society, American Radio Relay League, Riverside County OES – RACES / ARES, California Disaster Corp Volunteer – CERT

Vice President – Tom Pierce K8EBR – Retired JPL / Mars Rover Lead EMC Engineer. Retired Boeing Space Station Lead EMC Engineer. Member Mountain Community Patrol. American Radio Relay League. Certified Red Cross; US Army Medical Corpsman. Licensed Amateur since 1957.

Treasurer – BJ Brix KJ6IPX – Retired Raytheon Communications Engineer, Member of Mountain Disaster Preparedness – Communications Director, Riverside County OES – RACES / ARES, California Disaster Corp Volunteer – CERT

Secretary – Dave Schaefer KJ6ZYK – Member of Mountain Disaster Preparedness, Riverside County OES – RACES / ARES, California Disaster Corp Volunteer – CERT/Radio Operator, Skywarn Weather Spotter RIV552, Served US Army, and Information Systems Programmer Analyst - retired

Membership – Rick Foster KG6TIJ – Retired, US Marine, President – Rotary Club of Idyllwild, Member of Mountain Disaster Preparedness, Red Cross

Director – Tom Unwin WA6SSS – Self Employed, Member of American Radio Relay League, Riverside County OES – RACES / ARES, California Disaster Corp Volunteer

Director – Annie Larson KJ6QWC – Retired, State Park Camp Host, Member of Riverside County OES – RACES / ARES, California Disaster Corp Volunteer

Emergency Coordinator, RACES – Paul Miglin KG6TIL – Cal Trans Heavy Equipment Operator, Member of Riverside County OES – RACES / ARES, California Disaster Corp Volunteer – CERT, Skywarn Spotter

Abstract:

WNKI-578, an AM Public Service/Public Safety radio station in Idyllwild California is in immediate need for major upgrading for the benefit of the area's residents. Idyllwild is accessed by three mountain roads. The radio station represents the primary method of communicating emergency instruction and information during declared emergency or evacuation primarily to motorists.

Idyllwild is located at approximately the 5400 foot level in the San Jacinto Mountains in Southern California and has become a popular destination for tourists from all over the world. It is also a key host for many music and art festivals, drawing large numbers of visitors to the mountain communities. The greater Idyllwild community has evolved to include Pine Cove, Fern Valley, and Mountain Center which collectively span an elevation of over 2000 feet.

The combined effect of summertime tourism and seasonal part-time residents bring about a large annual population change. At present, WNKI signal coverage falls short of covering this entire region. Thus, not all of the population can hear WNKI at any given time or at any given place. The concern is, the entire mountain area is now in a long term drought condition. Fire season is now 365 days a year. Also, being geographically close to the San Andreas and San Jacinto faults makes this rocky mountainous area especially vulnerable to earthquakes. Flash flooding is another threat. It is not uncommon to have large boulders wash loose and come down and block roadways. There are only two paved roads into and out of Idyllwild.

By agreement, the management and technical resources of the Mile High Radio Club (MHRC) have been exclusively entrusted to the care and operation of radio station WNKI-578, (referred to as "Winky"). Therefore, the MHRC is actively seeking grant funding, matching funds and donations to facilitate and begin the critical upgrades necessary to provide improved radio service and expanded broadcast coverage.

Table of Contents **Paragraph**

1 Introduction:

The Mile High Radio Club (MHRC) is a non-profit 501 c 3 corporation 100% volunteer based organization, dba (doing business as) WNKI 578-1610 AM through an agreement with the Idyllwild Fire Protection District (IFPD). Our membership includes both individuals who are licensed by the Federal Communications Commission ("**FCC**") as amateur radio operators, and who are members of the Radio Amateur Civil Emergency Service ("**RACES**") and the Amateur Radio Emergency Service ("**ARES**"). Both are nationally and internationally recognized organizations that further serve the communities in which they operate during times of natural or man-made disasters.

When the Mountain Communities Fire Safe Council (FSC) of Idyllwild (a 501 c 3 corporation) approached the MHRC to review and work together in revising their Communities Wildfire Protection Plan (CWPP), and specifically the EMERGENCY COMMUNICATIONS component across our mountain range, we accepted the challenge and acknowledged the need for improved emergency communication coverage.

During our review of the CWPP, it became apparent from citizen survey comments, that the neighboring communities of Idyllwild, both north and east have a critical need for emergency broadcast communications. This potential life saving information must be heard in all of the community's remote locations.

The CWPP covers several areas outside the scope of IFPD's jurisdiction. The IFPD is the current WNKI 578 licensee, and broadcast site. Basically the CWPP boundaries take in from the north of Idyllwild on highway 243 beginning with Twin Pines, Poppet Flats, on through Pine Cove, Idyllwild, and then eastward out through Garner Valley and Pinyon Pines along highway 74.

Therefore, MHRC is seeking required funding, as well as partnering with federal, state, county and local agencies, to develop new techniques that improve broadcast coverage that will reach a wider population. Both for local residents and the traveling public in times of emergency.

2 Purpose and History of WNKI:

The WNKI AM radio station has been operating continuously by volunteers to serve the upper elevation communities of Mt. San Jacinto. Idyllwild and surrounding communities are both blessed and cursed by being located in a high elevation and heavily forested region. This community is blessed by its pleasant weather and incredible beauty, while at the same time cursed with relative isolation, rugged rocky mountainous terrain that is earthquake and forest fire vulnerable. WNKI has demonstrated its function as a public emergency information source for large scale forest fire evacuation several times throughout its history. The last major fire events, the Mountain and Silver fires, occurring during the summer of 2013.

3 FCC License and Limitations:

WNKI-578 has been FCC licensed since 1988**.** Recent changes in FCC broadcast regulations provide for new highway "ribbon networks". A ribbon network is a series of limited range low power radio transmitters strategically positioned along a highway as well as remote residential locations to provide public service broadcasts to motorists. Most large airports already use AM radio ribbon networks.

The present antenna height is limited by the FCC to 50 feet. Transmit power is also limited by the FCC to 10 watts. Thus, signal range is limited. It is easy to imagine that the FCC regulations were originally drafted with a perfectly flat terrain in mind. The communities in and surrounding Idyllwild have a much more complicated radio signal propagation situation to deal with.

4 The WNKI Station and its Present Range Limitations:

The present WNKI station has an antenna upgrade planned as a future technical improvement. The existing FCC station license power and antenna height restrictions limit upgrades to the extent that full geographical coverage is not possible from a single broadcast site. Idyllwild's considerable charm is largely derived from its location on Mt. San Jacinto but is contrasted by its rugged terrain that complicates WNKI radio propagation. The population or traveling public intended to receive the WNKI broadcasts may be expected to be using their automobile receivers during an emergency evacuation event. The ability of automobile receivers to capture the relatively weak WNKI signal varies widely. Further, the rugged terrain found on the mountain creates an on-and-off signal capturing phenomenon caused by terrain shadowing or, simply put, any given car continually drives behind hills and signal obstructions while moving along any given road.

5 Upgrading the Station Coverage:

The FCC now allows licensees to create "ribbon" networks which broadcast the same information through multiple transmitters positioned in a string. This allows a licensee that operates a number of transmitters to produce some information only once. The FCC made clear, though, that all content broadcast from a given transmitter still must be relevant to travelers within the coverage area of that transmitter.

The proposed ribbon network shall consist of 4 to 7 separate transmitters placed at strategic points along the Idyllwild highway routes. The transmitters shall each be signal linked to the present primary station so that all are transmitting precisely the same message as you travel throughout our mountain range.

6 Objective of Upgrades and Test Procedure:

The objective of the WNKI radio station upgrade will expand the radio station coverage to include both motorists and residents in the entire mountain community. The upgrade includes the design and installation of a highway ribbon radio station network coupled with an existing radio station antenna technical improvement. The initial upgrade shall be performed in three phases each of which represents a workable task that is entirely manageable using MHRC membership volunteers. Should funding support, the entire upgrade is anticipated to easily fit into a schedule of less than one year.

The Station Upgrade will be accomplished in a documented and detailed three phase procedure:

- **Phase – 1, System Design and Test Procedure:** Define the ribbon network properties. This may be accomplished by first acquiring a single portable ribbon transmitter to measure its signal propagation performance. By transmitting a signal and measuring its signal intensity at a distance, a field strength map may be drawn showing its propagation characteristic. By moving this transmitter to various locations, the minimum number of transmitters necessary to blanket the entire desired range will be established. See limits and procedures below.

- **Phase – 2, Primary Station Upgrade:** The primary station, now in operation, is technically advanced. It is both computer operated as well as remotely controlled through telephone link. Its transmitting antenna has been performing well for years. However, like any computer, its software has become obsolete and is in need of an update. While still operational, the WNKI primary antenna could use an upgrade that is expected to provide a modest range increase by way of improved transmitted signal efficiency. This upgrade phase is in no way dependent on the completion phase one and may even be performed simultaneously.

- **Phase – 3, Ribbon System Installation:** Following phase – 1, defining the transmitter positions and technical details and the demonstration of phase – 2's successful upgrades, the full ribbon network shall be acquired in subsequent phases and installed as funding permits, with priorities being north from Idyllwild on Highway 243 sense the northern locations are most prone to fires and Santa Ana winds. Each transmitter shall be made operational and tested using an input signal originating in the present operating WNKI station.

7 Schedule:

The schedule outlined below takes us out through phase – 6 and assumes that we have funding to support our entire plan. The budget will show that each phase of the project will cost TBD depending on individual site conditions. We are making every effort to secure additional funding to further our ability in meeting our goals.

Proposed Schedule **March 30, 2015**

WNKI 578 - Ribbon Network Expansion

Emergency and Public Service Radio Station Upgrade

	TASK	Completed	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	TBD
1	Preliminary Ribbon Network Proposal - "CWPP"	03/18/14										
2	Primary Site Antenna Study - Proposal	07/07/14										
3	Complete Agreement between MHRC / IFPD	12/11/14										
4	Establish MHRC dba "WNKI 578 - 1610 AM"	02/17/15										
5	Transmitter Site Locations - Riverside County Fire	03/20/15										
6	Grant Funding Approval				●							
	Phase - 1 (w- Grant Funding)											
7	FCC Ribbon Network License (WNKI-578) Modification					●						
8	Proposed Transmitter Site(s) Testing / Evaluation						●					
	Phase - 2 - Primary Site (w-Grant Funding)											
9	Primary Site Antenna Upgrades					●						
10	Test / Evaluate Primary Site Improvements						●					
11	Hi Point Repeater - Marion Ridge - Pine Cove						●					
12	Primary Site Computer / Software Upgrades						●					
	Phase - 3 - Ranger Peak - Highway 243 (w-Matching Funds and Donations)											
13	Ribbon Site 1 Transmitter Install - Ranger Peak								●			
14	Test / Evaluate Ribbon Site 1 - Ranger Peak								●			
	Phase - 4 - Pine Cove - Highway 243 (w-Matching Funds and Donations)											
15	Ribbon Site 2 Transmitter Install - Station 23										●	
16	Test / Evaluate Ribbon Site 2 - Station 23										●	
	Phase - 5 - Garner Valley - Highway 74 (Need to Solicit these Funds)											
17	Ribbon Site 3 Transmitter Install - Station 53											●
18	Test / Evaluate Ribbon Site 3 - Station 53											●
	Phase - 6 - Pinyon Pines - Highway 74 (Need to Solicit these Funds)											
19	Ribbon Site 4 Transmitter Install - Station 30											●
20	Test / Evaluate Ribbon Site 4 - Station 30											●

8 Assumptions:

The FCC has recently been awarding permits for ribbon networks but this is an application and licensing process. To alleviate any uncertainty, the FCC paperwork process shall be submitted and license confirmed as a first step in the WNKI upgrade procedure.

9 Limits and Procedures:

FCC (Federal Communication Commission) regulations do not permit the sort of experimentation defined by the testing procedure, but it is important to characterize the signal range and propagation of each of the ribbon network's antennas before putting them into service. A promising technique under consideration is to test each separate antenna pattern by temporarily replacing each ribbon transmitter with a signal source test instrument. This test instrument will be tuned to a frequency within the neighboring amateur radio band. Using this technique the MHRC will demonstrate the ribbon system's antenna characterization using a frequency in the amateur radio band for which every MHRC member is licensed. Antenna pattern optimization in our local mountainous terrain is certain to require careful tuning (see photos in Appendix-1).

10 Success Criteria:

Any automobile AM receiver may be tuned to WNKI, 1610 kHz, to clearly hear the broadcast from any location on the mountain. A fair test shall be to drive an automobile equipped with an average performance radio receiver along every highway leading from Idyllwild to any point off the mountain. The success criteria will be based on seamless and consistent WNKI reception along the entire route.

11 Financial Practices:

The MHRC has established a record of strong financial practices. The MHRC club maintains two bank accounts; one for the MHRC club treasury and one for the WNKI-578 operating and maintenance account. Funds for the two accounts are never comingled. The WNKI operation is headed by MHRC board members who maintain a separation between activities for WNKI and activities for MHRC. Even when financial considerations are not involved.

12 Organizational Capacity:

MHRC functionally operates, as well as technically manages, the WNKI station The MHRC has formally committed to continue in this role. The MHRC has 60 members who represent an impressive cross section of talents and experience. The MHRC talent mix includes several veteran electronic and communications engineers as well as several experienced management and Information Systems veterans.

13 Organizational Objectives:

The purpose of the MHRC is to further the exchange of information and cooperation between members, promote radio knowledge, fraternalism, individual operating efficiency, and to conduct club programs and activities that advance the general interest and welfare of radio communications within our local communities. Further, the Club has and will continue to enhance the emergency broadcast communication services of the San Jacinto Mountain region and support the R.A.C.E.S. (Radio Amateur Civil Emergency Services) program through alignment with Riverside County and Local District First (emergency) Responders.

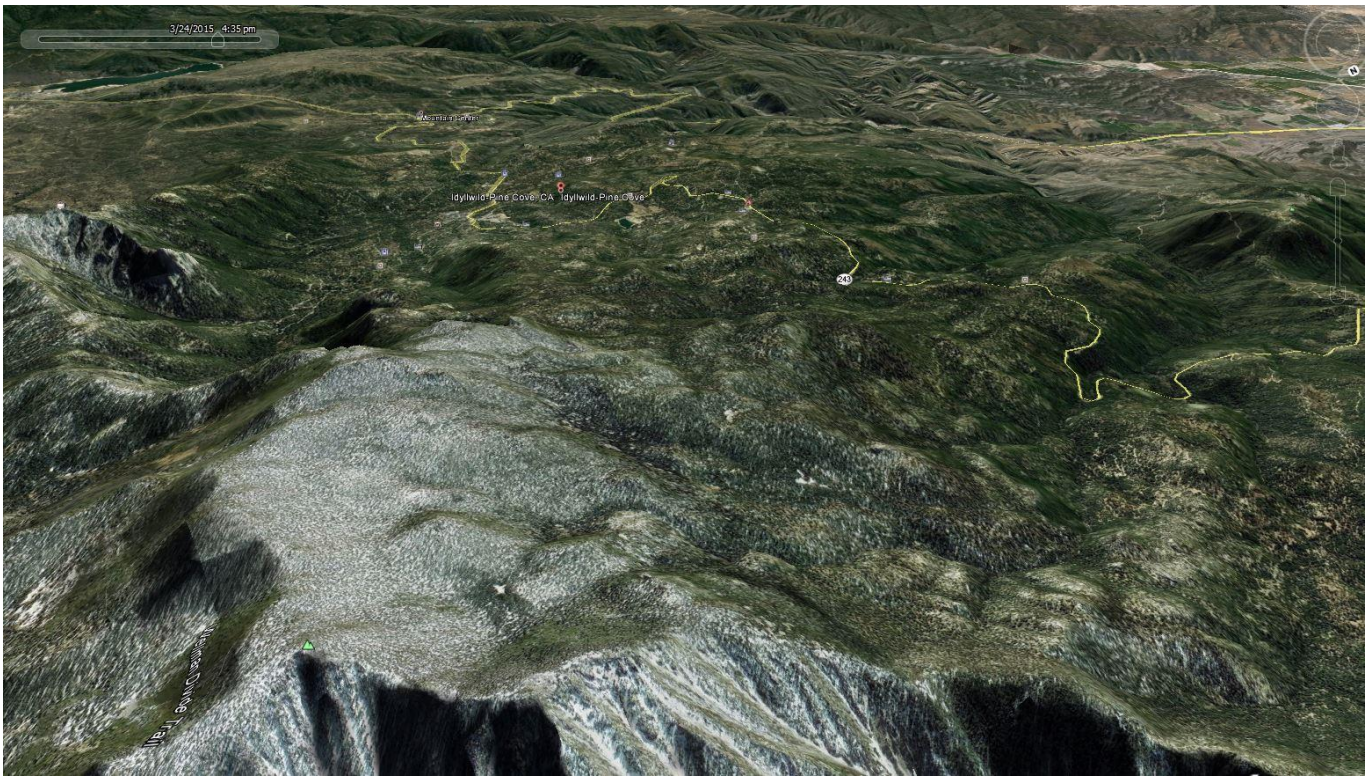
14 Organizational Accomplishments:

The MHRC secured funding for the succession and operations of the Mountain Radio Network this past year. This vital network further secures two way amateur radio communications between Eastern and Western Riverside Counties. This added a much needed back-up communication system, which tripled the communication range, added support to the Riverside County Office of Emergency Services (OES), and expanded Radio Amateur Civil Emergency Services for the San Jacinto Mountain District. By working with Cal Fire Chief Hawkins and his Communications Team we have been able to make this program a reality.

15 Personnel

- Bill Tell , MHRC President, WNKI Director
- Tom Pierce, MHRC Vice President, WNKI Project Manager, Antenna and Communications Engineer
- Tom Unwin , MHRC KD6OI Repeater Trustee, WNKI Station Engineer
- BJ Brix, MHRC Treasurer, WNKI Treasurer
- Rick Foster, MHRC Membership, WNKI Volunteer Coordinator
- Paul Miglin, MHRC Mountain District RACES, Emergency Coordinator
- Dave Schaefer , MHRC Secretary, WNKI Secretary
- Roland Gaebert, MHRC member and WNKI technical staff member

A view of Idyllwild's Mt. San Jacinto looking south from the Coachella Valley



A Google Earth view from atop Mt. San Jacinto. Note the rugged terrain. Highways shown.

Idyllwild regional maps and proposed area of radio coverage

Whose property will the proposed ribbon station sites be located on?

- *The stations will be located on either Federal, State, County or local private agency property. Priority for site selection, was given to locations that are secure, and for which Insurance is obtainable.*

How is the equipment going to be powered?

- *Power is already present and available for all of the currently proposed sites.*

During an emergency, will there be a power backup? Is solar an option?

- *Yes, we expect there will be back up power as the proposed sites currently support some form of emergency communications. Some sites currently use generators and or have backup generators on site. Solar may be an option, but not currently included in the budget. Future upgrades may include solar power backup to specific sites.*

What about Insurance and acts of vandalism?

- *MHRC dba; "WNKI-578" through an annual budget could cover the cost of insurance against theft, vandalism, fire, lightning strikes, and the like.*

What are the long term maintenance plans?

- *This falls under 'project future and sustainability'. Routine site visits, along with preventive maintenance and such, will be developed in a forth coming operations manual.*

How long can we hold a remote site without broadcasting from that location?

- *The remote station must be verified within 12 months as being "built" per the rules. Part of rule compliance is declaring that it has happened. It is a "soft" 12 month period that may be extended.*

The IP76 Digital Message Repeater runs the station, is that correct?

- *Right. It runs the audio "loop".*

What is the "900 MHz Studio to Transmitter Link" for? Does it provide the signal to the Hi-Point Repeater from the main studio or is this link to radio in a message from the field?

- *The former. It is the STL or Studio to Transmitter Link to the High Point for distribution across the 72 MHz platform to the AM repeater stations.*

What are the timelines for obtaining FCC approval or extensions to a current license such as WNKI-578?

- *FCC takes about 6 weeks on regular licensing grants and just a few days for testing license grants.*

The “AT VHF Transmit Site (Hi-Point Repeater…)” is the unit located high in order to reach the outlying AM sites, is that correct?

- *Yes, the 72 MHz is installed at a high location for good line of sight to the AM repeater locations.*