

BRANDON EMERGENCY ALERTING PROJECT

EXECUTIVE SUMMARY

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### **INTRODUCTION**

In 2003, the City of Brandon, Manitoba along with community partners tested a wireless siren system designed for use in community emergency alerting. The City of Brandon, the Brandon Emergency Support Team (B.E.S.T.), the Community Advisory Committee for Emergency Preparedness, Acoustic Technology Inc., Probe Research Inc., Manitoba Hydro, Brandon Regional Health Centre, Brandon School Division, Riding Mountain Broadcasting, Craig Broadcasting, Standard Radio, The Brandon Sun, and The Wheat City Journal are pleased to have taken part in this demonstration and evaluation of new public alerting technologies and products. The Brandon Emergency Alerting Project (BEAP) was successfully completed thanks in large part to the outstanding support of volunteers. Even the weather cooperated by providing a variety of conditions during the test periods.

The hazard assessment for the City of Brandon identifies a variety of natural and human made hazards that may require rapid notification of large numbers of people. Our long term vision for public alerting sees a community that has the technological resources to notify each and every one of its citizens through a variety of means. We envision our citizens as being educated to the point where they understand what an alerting message is telling them and they are motivated to take the actions necessary to help themselves and their neighbours.

An alerting system must be part of a complete program so that people are not surprised by the alert. In fact they should be expecting to be alerted every time the need arises and they should be expecting to be alerted in a variety of ways.

### **BEAP OBJECTIVES**

The goal of the project was to determine if a siren alerting system is effective and acceptable to the citizens of Brandon.

Feedback was obtained through various community meetings and forums to help determine the style of siren sound that the community might find acceptable. BEAP was seen as a project for the people of Brandon and as such B.E.S.T. would ensure that the citizens had input. This became a major focus of the project and Probe Research was hired to survey the public to determine what people really thought of the idea and the technology. This information would then become part of the data used to determine the merits of a siren system for the community.

BEAP was made up of two parts: the demonstration and evaluation of the wireless siren technology and the implementation and assessment of a public education campaign. A detailed Demonstration and Evaluation Project Plan was developed to ensure the project was on schedule.

### **BEAP TEAM**

BEAP had the commitment of numerous people and organizations to make this project work. A BEAP team was established and coordinated by the City's Emergency Coordinator. Technical assistance was provided by Acoustic Technology Inc. Research assistance was provided by Probe Research Inc. Clarification of community issues came from the Community Advisory Committee for Emergency Preparedness. Clarification of business, health care, and school issues was provided by B.E.S.T.. Additional assistance came from City staff and Departments helping with equipment. The Brandon Regional Health Authority permitted BEAP to use their

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VHF radio system. Manitoba Emergency Measures Organization provided advisory support. Manitoba Hydro assisted with the pole installation and the electrical supply. Imperial Radio assisted with the two-way radios. The Brandon Amateur Radio Club installed the antenna. Local media from Standard Radio, Craig Broadcasting, and Riding Mountain Broadcasting formed a Media Team.

### **BEAP EQUIPMENT**

The equipment B.E.S.T. decided to test was a wireless system comprised of:

- One Central Control Station - REACT 4000 Central Control Unit Model 4000CCU with microphone for live PA, radio, antenna, antenna surge suppressor.
- One High-Power Speaker Station - Model HPSS16 with integrated RC for UHF/VHF radio communications with Control Station, antenna and antenna surge suppressor; custom configured speaker; provides various tone signals and live voice broadcasts; 120V power feed and battery back-up; NEMA - 4 painted metal enclosure.
- One strobe light mounted at the top of the siren.
- One wireless interface to key facilities.
- One Tone Alert Receiver.

### **System Design**

The wireless siren system uses two-way radios operating on VHF to communicate between two computer controlled points. The Central Control Unit (CCU) is located where it can be activated by authorized staff on a 24/7 basis. The CCU can be controlled by software through a PC or a touch pad on the front of the unit. When activated the radio signal travels to the siren speaker station where it is interpreted by the computer in the siren station and the appropriate activity is performed, such as activating a tone or polling the radios.

### **BEAP TESTING**

#### Location

The tests took place in an area of the City of Brandon that has a mix of occupancies including single family dwellings, row housing, apartment blocks, seniors housing complex, commercial, and light and heavy industrial operations. This area measures approximately 5,500 feet east and west, and 7,500 feet north and south. The area was chosen as the geographic boundaries are easy to define and all residents in this area have the sense that they are living in an area with potential to be impacted by industrial activities. It takes in portions of two City Wards.

#### Tests

BEAP conducted three tests in the early summer and three in the late fall. Each of the six tests involved the activation of the siren and strobe light for a period of at least 3 continuous minutes followed by a public address announcement. Several days before the event the parameters of the upcoming test were set. Based on input from various members of BEAP this included the day and time, tone to be used, length of activation, location of volunteers, location of the tone alert receiver, and the contents of the P.A. announcements and radio messages.

Prior to the planned activation, 12 to 15 community volunteers were provided with equipment and instructions for that day's test. They then pre-located at specific points in the test area. They recorded sound pressure levels, noted background noise and things that may interfere with

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results, and noted the effectiveness of the strobe. One person monitored the tone alert receiver. During the test the Project Coordinator activated the system at the prescribed time, notified the radio stations, communicated by two-way radio with staff and volunteers, and made the P.A. announcements. When the test was completed the volunteers provided their results and equipment to the Project Coordinator.

### Speaker Station

The speaker station is made up of computerized components that interface with a VHF radio that receives a signal from the Central Control Unit and in turn sends an amplified tone to four 400 watt speaker horns. The speakers are mounted on a wooden pole and face in four directions. Functions controlled from the speaker station include activating alerts and equipment tests.

### Sound Quality and Pattern

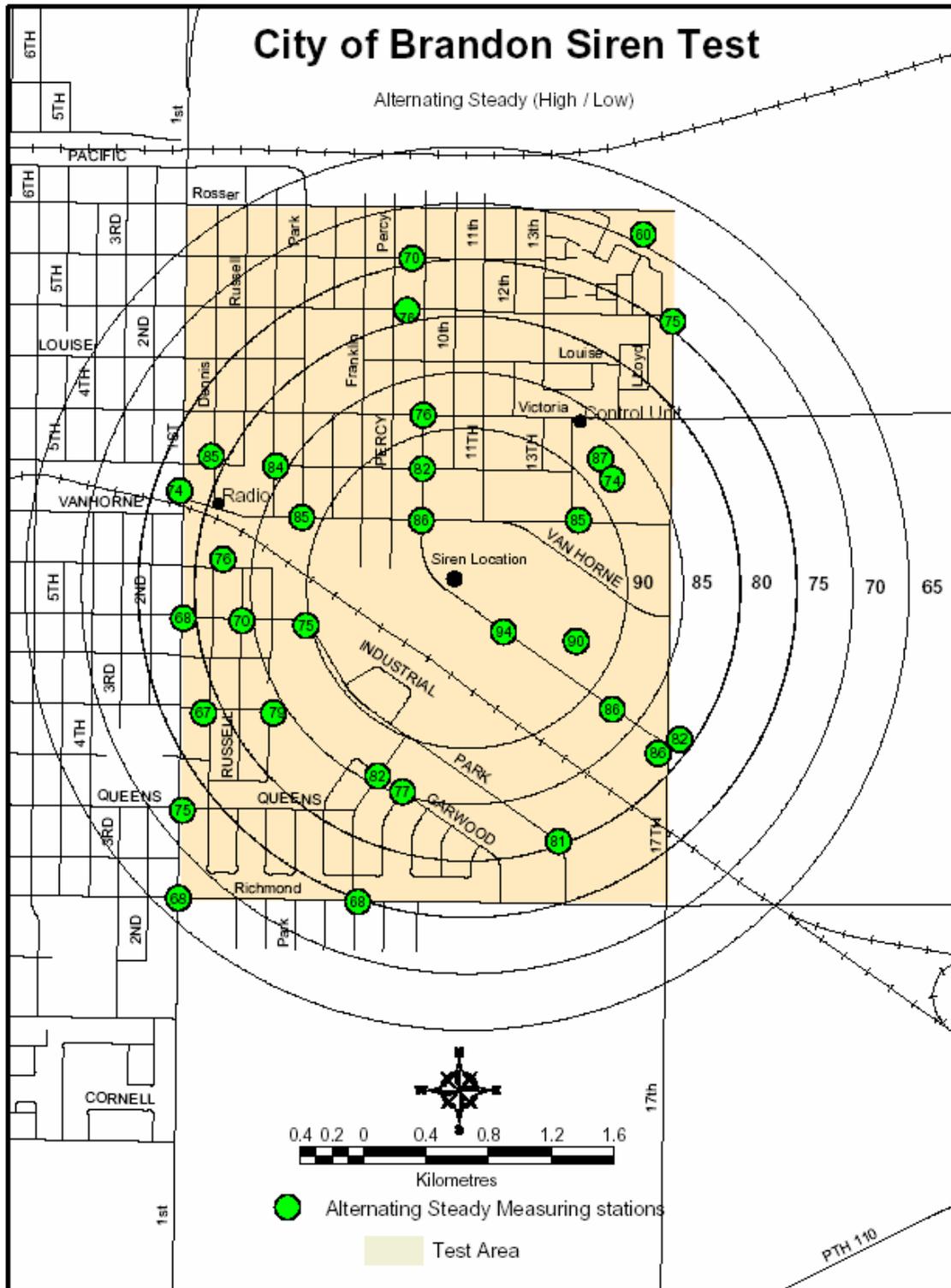
The quality of the various tones played by the siren was consistently crisp and clear. The alarm tone radiated out from the central location until it was impeded by foliage or buildings. Some locations noted a 10 decibel increase in the fall when there were no leaves on the trees.

### Alarm Tones Tested

- Alternating Steady. Referred to as the high/low tone. This sounds similar to European emergency response vehicle sirens. This was the most effective tone. The alternating sound was identified as an emergency signal but some people confused it as an ambulance. The alternating tone was preferred by the test team as most likely to get their attention. Probe found 84% of respondents said this tone was the clearest.
- Red Alert. This sounds like an air raid siren. Test members reported that this was effective when located close enough to hear the entire cycle. Those at a distance experienced a burst of sound for a few seconds and then silence as they heard the peak of the wailing. In the public survey 71% of respondents said this tone was recognized as an emergency.
- High Pitched Steady. This sounds similar to what is played on TV during a test pattern. This was the least effective tone tested. A single frequency tone has the potential to travel a great distance but anyone with hearing loss in this frequency will not hear it. BEAP found this tone did not catch people's attention even though they heard it. It was not clearly identified as an emergency tone.
- Westminster Chime. This is the chime heard on many tower and mantle clocks. It is most often used in alerting to send an "all clear" message.

The following diagram shows the location of the speaker station, CCU and the radio system antenna that was used in the testing of BEAP. The decibel readings that are located on the diagram correspond to those recorded by BEAP during the testing of the alternating steady (High low) tone. These were the best results that were obtained and this tone was also subjectively judged by the test team as the one that was best at getting their attention.

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### Live Public Address

The degree to which people heard the live voice PA broadcasts depended on their specific location. The main controlling factors were temperature and the amount of foliage. Broadcasts were very susceptible to distortion by bouncing off and around buildings. Some broadcasts were hampered by wind. Colder temperatures seem to improve transmission. The announcer was careful to speak slowly and very clearly.

### Control Station

The Central Control Unit (CCU) is made up of computerized components that control the speaker station activities by selecting actions from a keypad controlled menu on the front of the unit or through a PC. These actions are communicated by radio to the siren station.

### Performance

The CCU functioned properly during all pre-tests and during actual testing. The siren could be activated and deactivated as required. This was tested successfully both through the software and the CCU control pad. The CCU, through the software program, is able to perform a series of self-diagnostic tests that indicate potential problems. The system can be started and stopped through the computer program and will print reports on the activation history, system status, and communication history.

### Software

The software was custom designed using an electronic map supplied by the City of Brandon and operates best with Windows 2000. The software was very easy to load and worked flawlessly during the testing.

### Radio link

The system that BEAP used was based on a VHF radio link that was a frequency used by the Brandon Regional Health Centre. An 800MHz link is another option. The VHF link was chosen as the system was presently established. The siren system did not interfere in any way with the BRHC base station or any of the radio transmissions made the BRHC.

### Tone Alert Receiver

Alerting indoor facilities was tested using the Tone Alert Receiver which is essentially a one way radio receiver. It receives the public address announcements made over the siren system but does not play the siren tones. The Tone Alert Receiver was confusing to understand and operate. The tone alert receiver functioned properly in all but one of the siren tests. In equipment testing the results were mixed. Six of fifteen locations tested reported some transmission problems.

### Strobe

The high powered strobe provided by ATI was rated at more than 1000 candela efficiency. It is a white double flashing light that operates on 24 volts through the siren system. The strobe light was activated during each of the tests. It did not prove effective at alerting people until the sun had completely set, however once set and when in a direct line of sight, the strobe was very noticeable. There was no reflection of light off of any surfaces that was significant enough to attract attention so the strobe is not likely to be effective at waking people up or attracting their attention while indoors. Probe reported that 2% of respondents saw the strobe.

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### Security

Unauthorized access and activation of the siren is prevented through password protection of the software but the CCU has no security safeguards and can be activated from the front scroll panel. For this reason the CCU must be kept in a secure area that is accessible only to authorized people. The cabinet at the speaker station is locked but once opened the siren can be activated by pressing an identified button. The software records every time the speaker cabinet door has been opened but does not activate an intrusion alarm.

### **BEAP PUBLIC EDUCATION**

The Public Education Campaign for the Brandon Emergency Alerting Project (BEAP) was extremely successful. The campaign included radio, television, newspapers, direct mailings, street signs, internet, public postings, and community meetings. When people were interviewed in telephone surveys it was found that more than 90% were aware of BEAP.

The Community Advisory Committee for Emergency Preparedness provided the main volunteer base both in focusing the campaign direction and in preparing some of the educational materials. The Brandon Emergency Support Team has also provided guidance and volunteer assistance. Radio, TV, and the print media have been instrumental in assisting BEAP produce a well rounded campaign. The public readily participated in the telephone interviews conducted by Probe Research.

The Public Education Campaign has been successful in providing several types of information:

- an overview of the project so that people would understand the who, what, where, when , and why of BEAP
- identifying the east part of Brandon as the test area
- instructing people on what they should do when they hear the siren or see the strobe
- requesting that people cooperate with the surveyors so that we can learn
- identifying the BEAP supporting sponsors

Probe Research's data shows that people have a good understanding of the project through the public education campaign. Of the 90% who were aware of the project, everyone could recall where they had heard about it. Many could recall several sources. There is also good support for an emergency alerting system with more than 90% endorsing the idea to some degree. Of those who heard the siren, nearly 53% followed the instructions provided by the campaign. For those who did not hear the siren, 66% indicated that they knew the instructions to follow.

A Media Team was established and developed a Media Plan. The team was made up of representatives from Radio, TV, and the Project Coordinator. The Media Team worked very well at keeping the four radio stations and one television station on the same page and developed a cooperative advertising/PSA schedule. Print media never became involved in the planning.

### Matching the Campaign to the Public

It is necessary to identify the diverse make-up of that population according to their culture, language, and education level. It is also necessary to be aware of people's different learning styles and for that reason a variety of educational methods should be utilized. The more variety in delivering a message the more successful the campaign will be.

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### BEAP Communication

Twenty-one different public education methods were considered for BEAP of which nineteen were used. According to Probe the two most reported communication vehicles were brochures in the mail and radio advertising both reported by 30% of respondents. Newspaper advertising and newspaper stories were both mentioned by approximately 25% of respondents.

### STEPS IN A PUBLIC EDUCATION PLAN FOR EMERGENCY ALERTING

- 1) Determine that you want to initiate a public education campaign
- 2) Determine the membership of your project team
- 3) Select a team leader who will manage the project.
- 4) Determine the scope of the program
- 5) Determine the type and level of information and knowledge to be disseminated
- 6) Determine the level of awareness and knowledge of the public desired as a result of campaign
- 7) Identify potential public education campaign partners
- 8) Develop a detailed Public Education Campaign Plan
- 9) Determine appropriate public education methods
- 10) Hold media launch at a significant installation
- 11) Determine project partner involvement
- 12) Measuring the effectiveness of your public education campaign

### KEY POINTS ABOUT PUBLIC EDUCATION

- The public's interest in issues waxes and wanes with the events of the day, so having an issue that captures their imagination even for a short period of time is very helpful.
- You cannot rely totally on PSA's. You need a budget, without one any public education campaign will be weak.
- Keep your message as simple as possible. These are complicated programs but they must be broken down to their simplest form. The public is concerned about the practical things that affect them. What does the alert sound like? What am I supposed to do when I hear it? Keep it simple. Know your message. Stay in control.
- Remember it is your idea. Sell it so the media can appreciate what it is you want.
- Use public surveys and get professional help doing it. Educate your public so they will take part in your research.
- Public alerting systems should belong to the public. They are intended to provide the citizens with information so they will take action to protect themselves and others. It is critical that these people have a sense of ownership in the alerting process.
- The community gets behind projects they understand and can believe in.
- Develop a unified program that involves several different media. Brand your program.

### COST OF A SIREN SYSTEM

To establish a central control unit with software and computer costs approximately \$25,000. Each speaker station could cost up to \$30,000 depending on wattage required at a particular location, installation costs such as on a building versus installing a pole, and the value of the United States dollar. The number of speaker stations depends on the size and topographical layout of the area. The system's scalability is dependent on the software and the number of speaker stations that it will accept. BEAP has capability for up to 20 speaker stations. It is

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estimated that the topography and spatial arrangement of building within the City of Brandon would require up to 14 speaker stations to provide adequate coverage of occupied areas.

### **ADVANTAGES OF SIREN SYSTEMS**

A siren system has some advantages over other alerting methods. Primarily the sound of a siren has a good opportunity to get people's attention so that they can then take some action to become more fully informed. It can quickly notify the population that something is happening. A siren has the ability to alert people who are some distance from a building such as at outdoor sporting events. With proper public education those hearing the tone will know they should seek shelter while accessing a local radio station for further instructions. The siren does not rely on people being able to understand a particular language or message other than what the tone means.

Overall the siren was able to notify approximately 40% of people in the test area within a very short period of time. Of the people notified approximately 60% were indoors. Compared to emergency personnel going door to door or relying on people to already be tuned into a given radio station, the siren is significantly more efficient at alerting a large number of people very quickly.

A siren is intrusive and cannot be shut off by the end user. In fact it is controlled by trained professionals located in a secure area. Devices located in people's homes or businesses are subject to tampering much like the batteries in many household smoke alarms.

The wireless system used by ATI provides the advantage that in installation and maintenance there are no wires to worry about. In multiple siren installations, the radio link and software allows the system to easily configure a variety of siren activation locations. While possible with a hard wired system it is highly impractical to hard wire every possible combination of siren activation that may be required. The radio link also allows for any number of remote devices to be located in key facilities to ensure that those inside are aware of the alert. This may be especially useful for those with special needs. Hardwiring such devices while possible may not be practical.

Having remote wireless access to the activation/deactivation process means that personnel such as police dispatchers who are on duty 24/7 can operate the system as part of their regular duties without leaving their work area. This becomes more of an advantage when there are several speaker stations locations that need to be controlled.

The siren can be used to alert the public for anything the operator decides providing they have sufficient warning to activate the system. In Brandon this is likely to include a sudden change in spring flood conditions, tornado warning, hazardous material release, large fire where widespread warning is required, water utility concerns, biological/chemical/radiological terrorism, dam failure, or notification to stay out of a designated area.

This siren system is able to accommodate a variety of tones playing in a variety of frequencies which may increase the likelihood that people with some hearing loss may still be alerted. It enhances existing alerting in the community. The desired effect of the siren is to get people to

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tune in to local media for up-to-date information about what action they should or should not be taking.

There needs to be a diversified alerting system so there is no one single point of failure. If we rely on one radio station to provide the detailed information and a tornado removes that station the system fails. There needs to be a variety of media involved. This includes all radio and TV and internet sources that make sense in the local area. The siren technology is one part of the puzzle and may be one of several means to initially alert the public that there is a problem. The siren system enhances what is available but it alone will not adequately alert the entire population so they are able to react to the specific situation.

### **PROCEDURAL GUIDE FOR ESTABLISHING A SIREN SYSTEM**

The key to developing a siren alerting system is to get the community involved. More than anything else alerting the public is a social act. One that recognizes the risks associated with living in a modern urban area and that acknowledges that the community itself has a role to play in appropriately responding to any hazardous situation. You need a champion for the idea of community emergency alerting who can spark the desire and interest in numerous people.

Brandon has a partnership with business and industry to develop and provide emergency preparedness information. Relationships like this are the foundation upon which community support is established. Community input is further enhanced by the formation of community based focus groups that are willing and able to provide input. BEAP made good use of both groups who provided information and volunteer human power to conduct the field testing of the siren.

Once the idea has taken root you need to develop an implementation plan.

1. Set a goal and the objectives that will have to be met to reach the goal
2. Install the siren system and radio links
  - Determine equipment needs
  - Determine desired locations for the sirens
  - Consult property owner(s) regarding installation of equipment
  - Consult Hydro regarding installation
  - Notify installation team of equipment readiness
  - Install and adjust siren
  - Hold Media event at installation
  - Coordinate siren system training for key personnel
3. Introduce the project to the community
4. Seek guidance from focus group
  - Solicit feedback and support for the concept
5. Conduct siren tests
  - Determine duration of test
  - Determine sound pressure level (SPL) sampling locations
  - Select Testing Team volunteers.
  - Provide equipment for gathering data
  - Assess tones for performance
  - Assess control unit for performance

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6. Evaluate siren tests
  - Research company to conduct surveys to gather public response to tests
  - Evaluate with project manager
7. Conduct equipment tests
8. Evaluate equipment testing
9. Prepare reports
  - Technical, operational and policy issues
  - Solutions
  - Lessons learned
10. Assess public education campaign
  - Public reaction to the project
  - Input from focus group
  - Input from partner groups
  - Assess level of awareness and knowledge of the public as a result of this campaign.

### **PLANNED FUTURE ACTION BY THE CITY OF BRANDON**

BEAP has been a community oriented project and any decision on an alerting system in Brandon will be made with community input. As a result of BEAP there are now many community volunteers who have some hands on experience with this siren system and will be well positioned to assist in making an informed decision. With that in mind a committee made up of interested citizens, B.E.S.T. members and City staff has been formed to determine the future of emergency alerting in Brandon. The committee will review the findings of BEAP. They will consider the cost and benefits of a siren alerting system for the City and provide a recommendation to B.E.S.T. and the City. A process to establish a partnership for funding will be included in the recommendations of the committee.