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Emergalert Testing

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TECHNICAL REPORT

NOTE: Further information about this report can be obtained by calling the CPRC information number (613) 998-6342

SUMMARY

This report describes the urban evaluation of **Emergalert™®**, a device conceived and developed by the National Research Council of Canada (NRC) to aid the public by providing in-vehicle warning of the presence of emergency vehicles. In the present tested configuration the device is used to warn of the presence of emergency vehicles, such as fire, ambulance and police vehicles as well as the presence of trains encountered at level railway crossings. The system could easily be extended to provide other preprogrammed priority messages for the presence of snow plows, school buses ahead, traffic tie ups. etc.

Every emergency vehicle would have a transmitter that would, on light and siren activation, be turned on to signal or warn any vehicle(s) (driven by the public) in the emergency vehicles path. A receiver, tuned to the emergency vehile's frequency, in cars and trucks in the emergency vehicles' path would receive the signal which would indicate to the driver of the vehicle (by turning on an indicator light and sound) the presence of the emergency vehicle. The "alerted" driver would look around to see if he was in the way, and if so would be able to get out of the way allowing the emergency vehicle to get to the emergency faster.

The present feasibility phase was based on prototype units formulated on a proof of concept. As such, the devices tested did not incorporate manufacturing or aesthetic concepts which would be added as part of normal acceptable product development.

The devices were designed to test:

a. Feasibility of the concept
b. Robustness of electronics
c. Sensitivity of receivers in urban and semi rural settings
d. Resistance to false alarms

Three locations were selected for the feasability field trials -
open highway, urban residential and urban high density (tall buildings).
In a open highway setting the device provided from 1.5 to 2 kilometres of advance warning corresponding to a lead time of 30 seconds to one minute at approaching highway speeds of 200 kilometres per hour. In the urban residential and high density high rise environments the device provided 3-4 city block advance warning from the transmitter sites.

There were no false alarms from the device.

The "emergalert" concept is described in the report's appendix.

Emergalert Testing

This report describes the testing of the prototype devices built to NRC specifications by an Ottawa company. The object of these tests was to delineate the effective range of the transmitter/receiver combinations when used in the field under a variety of conditions both urban and rural. All distance measurements are in kilometres (km).

Test Conditions:

The transmitter was mounted in a van or in a passenger vehicle and used the external magnet- mount omnidirectional antenna. The vehicle surface acted as the ground plane.

The receivers were mounted in a Mercury Grand Marquis behind the windshield on the dash and had the option of internal antenna configuration or the external antenna configuration with the magnet mount omnidirectional antenna on the roof of the vehicle. In both the transmitting and receiving mode , the units were powered from the vehicles 13.8 V. D.C. supply via a cigarette lighter plug.

Rural Highway Testing

Test 1 - Figure 1 : Test on NRC grounds (north side of Montreal Road) in Ottawa.

Location: The testing was performed on the grounds of the NRC campus on Montreal road. The receiver vehicle was stationary facing South on the parking area on the Western wall of Building M-50. The transmitter was placed at the extreme south roadway of the campus next to Ogilvy Road. In this situation the vehicles were in 'line of sight'.

Results: Depending upon the alignment of the van, reception was complete at this distance of just over 1 km on low power output (0.2 Watts). The transmitter vehicle was then left at this locale and the receiving vehicle placed at the southern aspect of building M-55. This was approximately 1.5 km from the transmitter and reception was complete.

Conclusion: The transmitter/ receiver configuration is valid for at least 1.5 km in line of sight .

Rural Highway Testing.. continued

Test 2 - Figure 2 : Test on NRC grounds (southside of Montreal Road) Ottawa.

Location: The test was performed on NRC campus on Montreal road.The object was to test the **emergalert devices** as above where the receiver in the vehicle was placed facing east on the north side of building M1 and the transmitter was moved slowly on the main NRC road (running North - South),then north - east and returning south between the Eastern buildings on the campus. **(See Figure 2).**

Results: The reception was complete except where the roadway dipped low and there was extensive shielding by metal buildings. The higher power output(2 Watts) did not influence the reception capture but the external antenna assisted the reception.

Conclusion: Out of 'line of sight' Transmitter /Receiver combinations could cause temporary decreases in Reception.The areas were minimal.

Test 3 - Figure 3 : Simulation of Highway situation - NCC Parkway, Ottawa

Location: This test was performed on the Eastern NCC Parkway to simulate a highway situation. The road pattern consisted of gentle rolling roadway with some turns. The landscape consisted of cleared parkland with tree cover. The receiving vehicle was stationary on the right shoulder of the road.

The transmitting vehicle drove west along the parkway with the transmitter on low power (0.2 Watts). The point at which reception was lost was noted as the road distance in km. The transmitter was then changed to high power(2 Watts) and the distance at which reception was lost was noted. The transmitting vehicle then proceeded further and the test was repeated with the transmitting vehicle proceeding East towards the receiving site. **(See Figure 3).**

Results: At low power reception effectiveness was between 1.9- 2.2 km. At high power (2 Watts) reception effectiveness was between 2 and 2.5 km.

Conclusion: In a highway environment with relatively straight locale , with no urban buildings, the range of the device on low transmitting power and internal antenna would be 1.5-2 km.

Rural Highway Testing Summary

At 100 km /hr a vehicle will cover 1.66 km. in one minute. Therefore, it will afford at least 1-1.5 minutes warning in a highway travel situation . If the vehicles is travelling towards each other , the pre- alarm time will be 0.5 to 1.0 minutes which is more than sufficient. The dead time is 30 seconds before the unit turns off at the loss of a recognizable signal.

Urban Centre Testing

A series of tests were performed in downtown Ottawa on a summer evening in order to assess the device operation in an urban setting with tall buildings , multipath possibilities and reflections simulating patterns representing a standard city locale.

Test 4 - Urban test downtown Ottawa Elgin and Laurier

Location: The receiving vehicle was parked facing east on Laurier Ave. about 200 feet from the corner of Elgin. The transmitting vehicle performed a circuit in order to determine the positions where the transmitter would activate the receiver. **Figures 4-5** indicate the active and nonactive sites.

Results: The receiver was activated at greater than 1.1 km when the transmitter was on **high** power in a straight line from the rear of the receiver as shown in **Figure 4**. At low power(0.2 Watts) the receiver activated at .5 km from the transmitter corresponding to 4 city blocks (**Figure 5**). Under the same conditions, the receiver activated at .64 km. under high power (**Figure 4**), and .32 km under low power (**Figure 5**) when the transmitter was almost at right angles to the receiver. This corresponds to an activation at 6-8 blocks under high power and 3 blocks under low power.

Test 5 - Urban test downtown Ottawa, Laurier east of Bank street

Location : The test was performed with the receiving vehicle parked facing west on Laurier just east of Bank Street. **Figure 6** delineates the active sites . This test simulated an emergency vehicle at right angles to an intersection with the receiver within 3 car lengths of the intersection in a canyoned environment offering multipath RF possibilities.

Results: This test indicated that at low transmit power (0.2 Watts), the receiver activated consistently within six city blocks to the left and right of the intersection corresponding to a distance of .25 miles (0.4 km).

Urban Centre Testing.. continued

Test 6 - Urban test downtown Ottawa (Queen Street west of Kent)

Location : Testing was performed with the receiving vehicle parked facing East on Queen street just west of Kent on the South side of the street. **Figure 7** indicates the active and inactive sites for reception.

Results : This test indicated a low power receptive area in a deep urban canyonized setting to be radius of .32 km. corresponding to a 5-7 block coverage.

While the preceding three tests were designed to emulate a high rise urban building situation, the following test was performed in an environment of low urban buildings (less than 8 storeys high).

Test 7 - Urban test downtown Ottawa (parking lot of furniture store)

Location: The receiving vehicle was placed in the customer parking lot behind a furniture store (see Figure 8). The radio receptive area is indicated.

Results: In this location, the transmitter/receiver presented a working radius of .48 km. corresponding to 7-8 city blocks . Several temporary absenses of the transmitted signal were detected in the area that matched with high buildings.

Summary-Urban Use

The low power output and the inboard antenna on the receiver gave sufficient sensitivity to assure that the receiver activated within at least 3-4 blocks (0.3 - 0.5 km) of the transmitting vehicle. This sensitivity was more than adequate to give primary warning of the presence of the emergency vehicle . There were no false positive warnings indicating the high reliability of the encoding/decoding circuitry. Nor did the device activate spontaneously during the two hours of continuous testing. The device receiver remained signal specific and only activated on the emergency vehicle warning as expected.

It was noted that the visual signal often latched without the accompanying audio warning. The audio warning often did reappear after a non-specified interval. The circuit should be checked. This occurred in the two receivers that were tested. Voluntary audio blanking was not attempted.

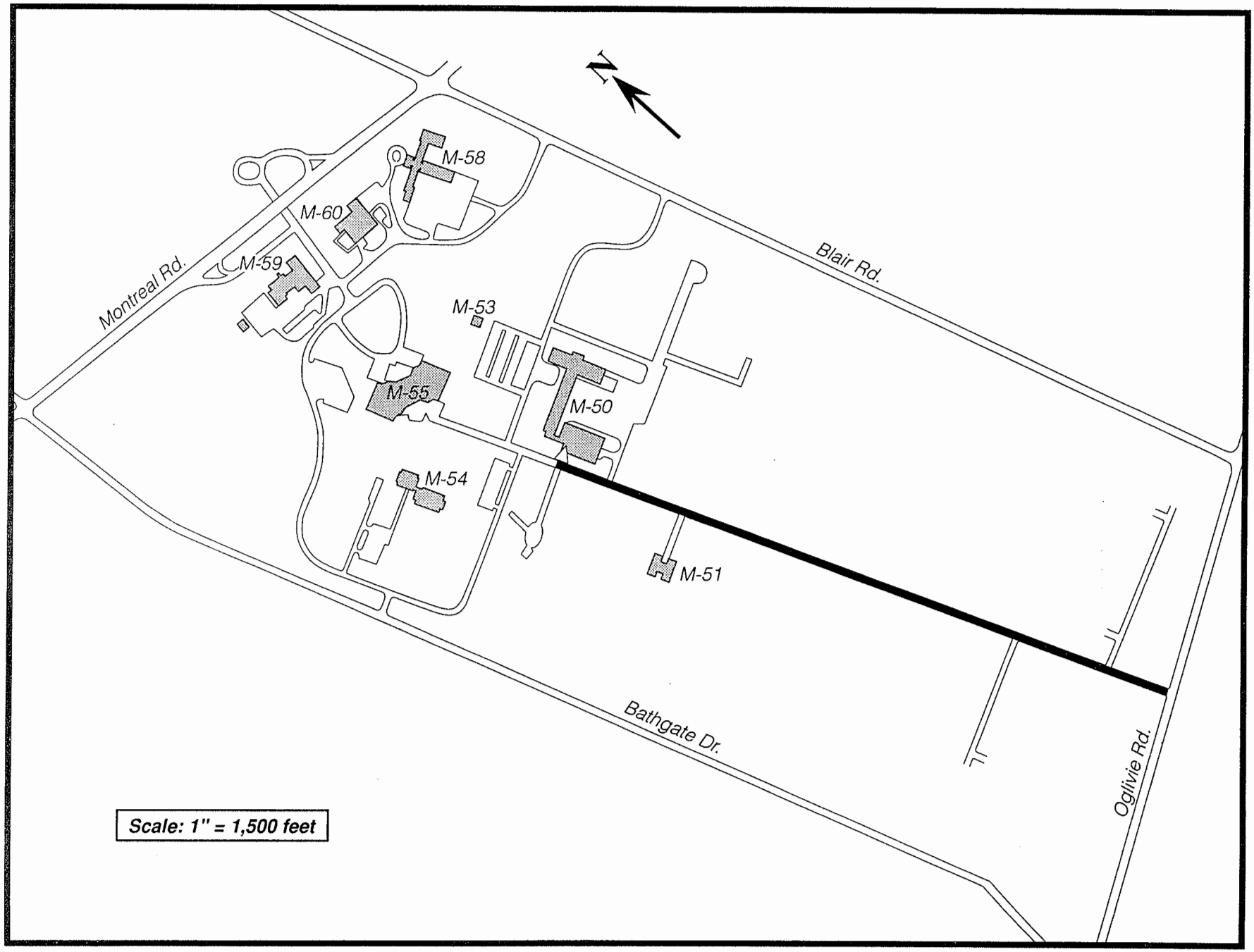

Figure 1,Test 1
Location: *The testing was performed on the grounds of the NRC campus on Montreal road. The receiver vehicle was stationary facing South on the parking area on the Western wall of Building M-50. The transmitter was placed at the extreme south roadway of the campus next to Oglivy Road. In this situation the vehicles were in 'line of sight'.*

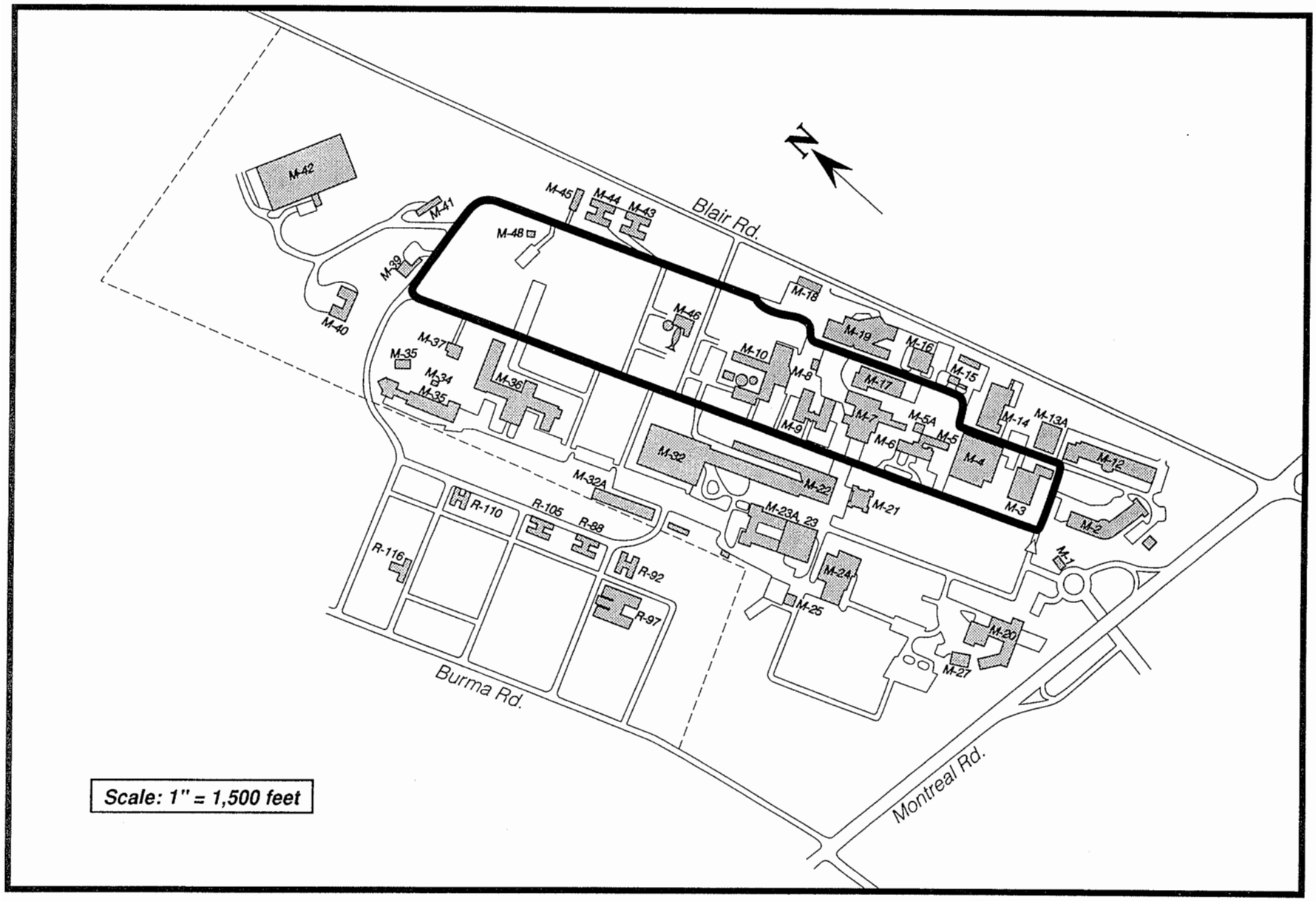

Figure 2, Test 2

Location: *The test was performed on NRC campus on Montreal road. The object was to test the* ***emergalert devices*** *as above where the receiver in the vehicle was placed facing east on the north side of the building M-1 and the transmitter was moved slowly on the main NRC road (running north-south), then north-east and returning south between the eastern buildings on the campus.*

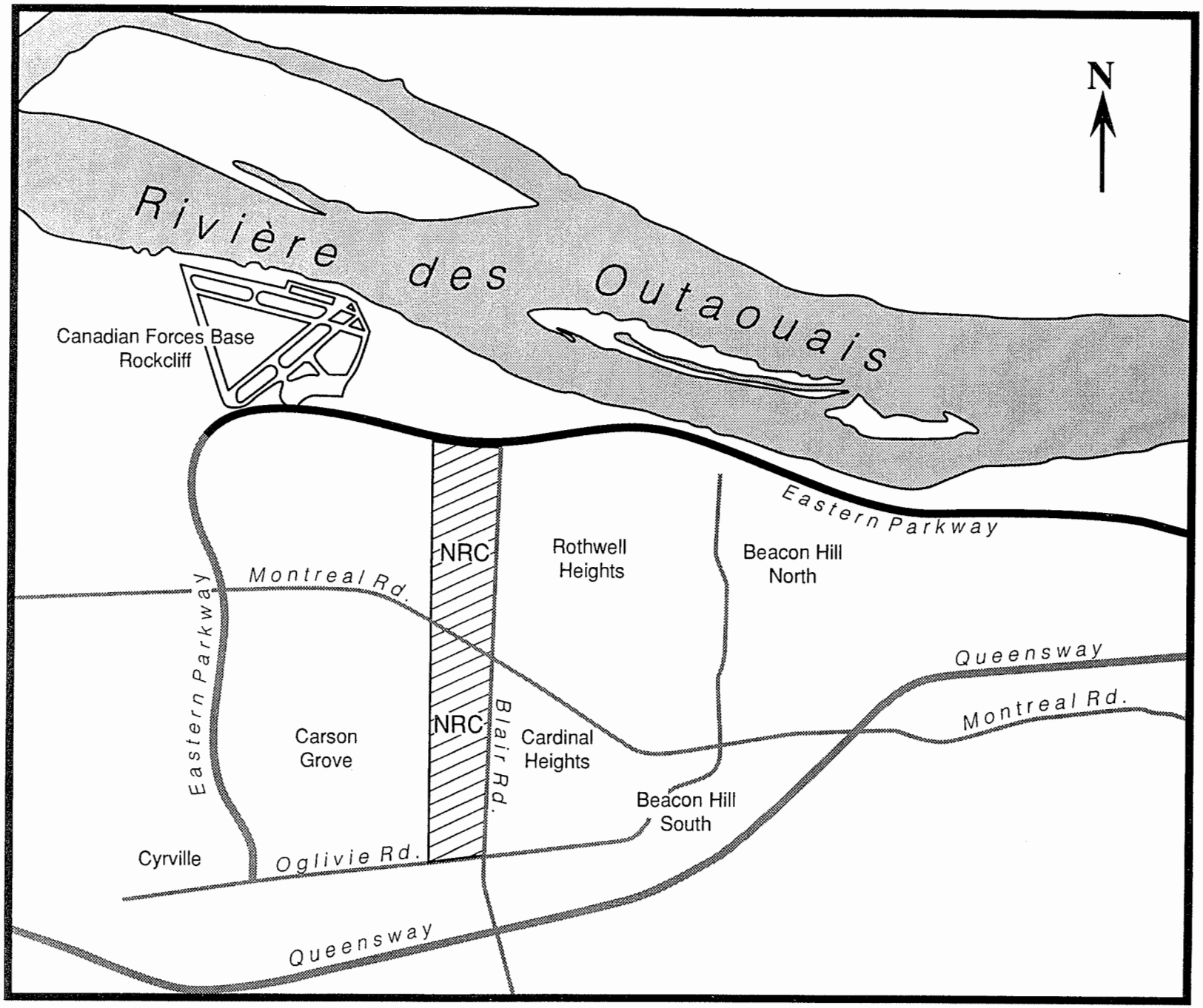

Fig. 3: *Eastern NCC Parkway to simulate a highway situation*

Figure 4

Receiver location: *The receiving vehicle was parked facing east on Laurier Ave., about 200 feet from the corner of Elgin. The transmitter vehicle performed a circuit in order to determine the positions where the transmitter would activate the receiver.*

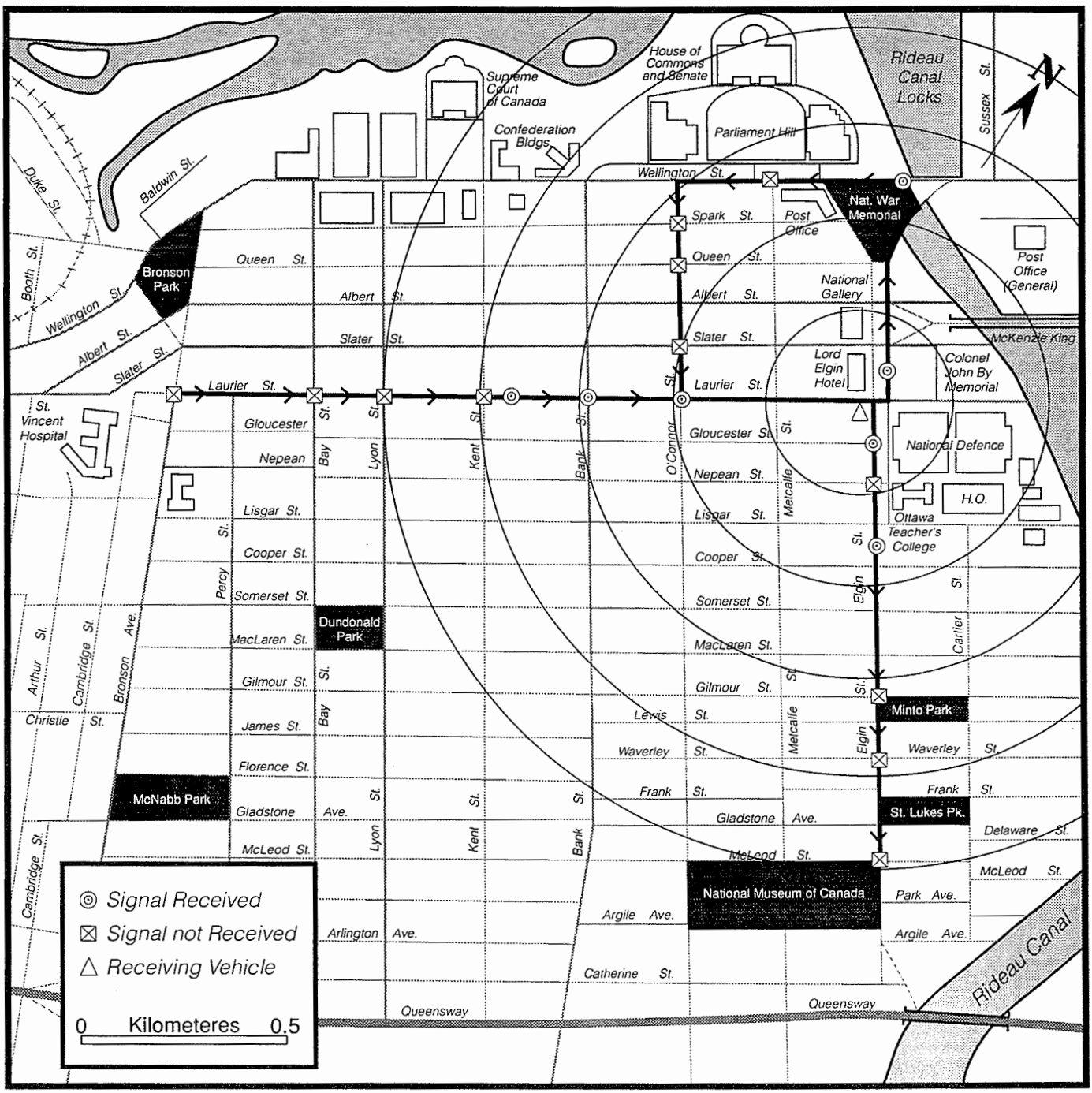

Figure 5

Receiver location: *The receiving vehicle was parked facing east on Laurier Ave., about 200 feet from the corner of Elgin. The transmitter vehicle performed a circuit in order to determine the positions where the transmitter would activate the receiver.*

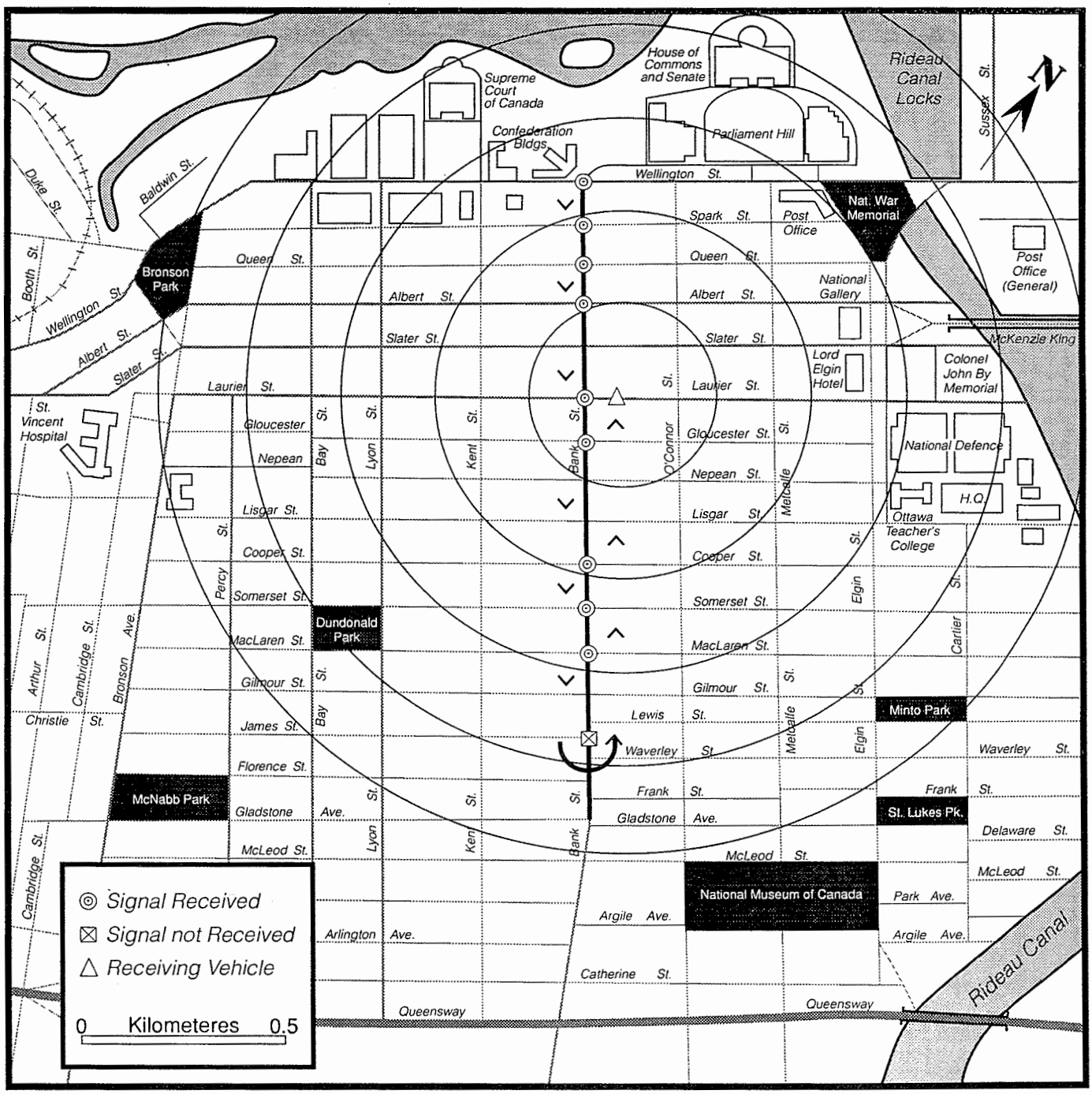

Figure 6
Location: *The test was performed with the receiving vehicle parked facing west on Laurier just east of Bank Street.*

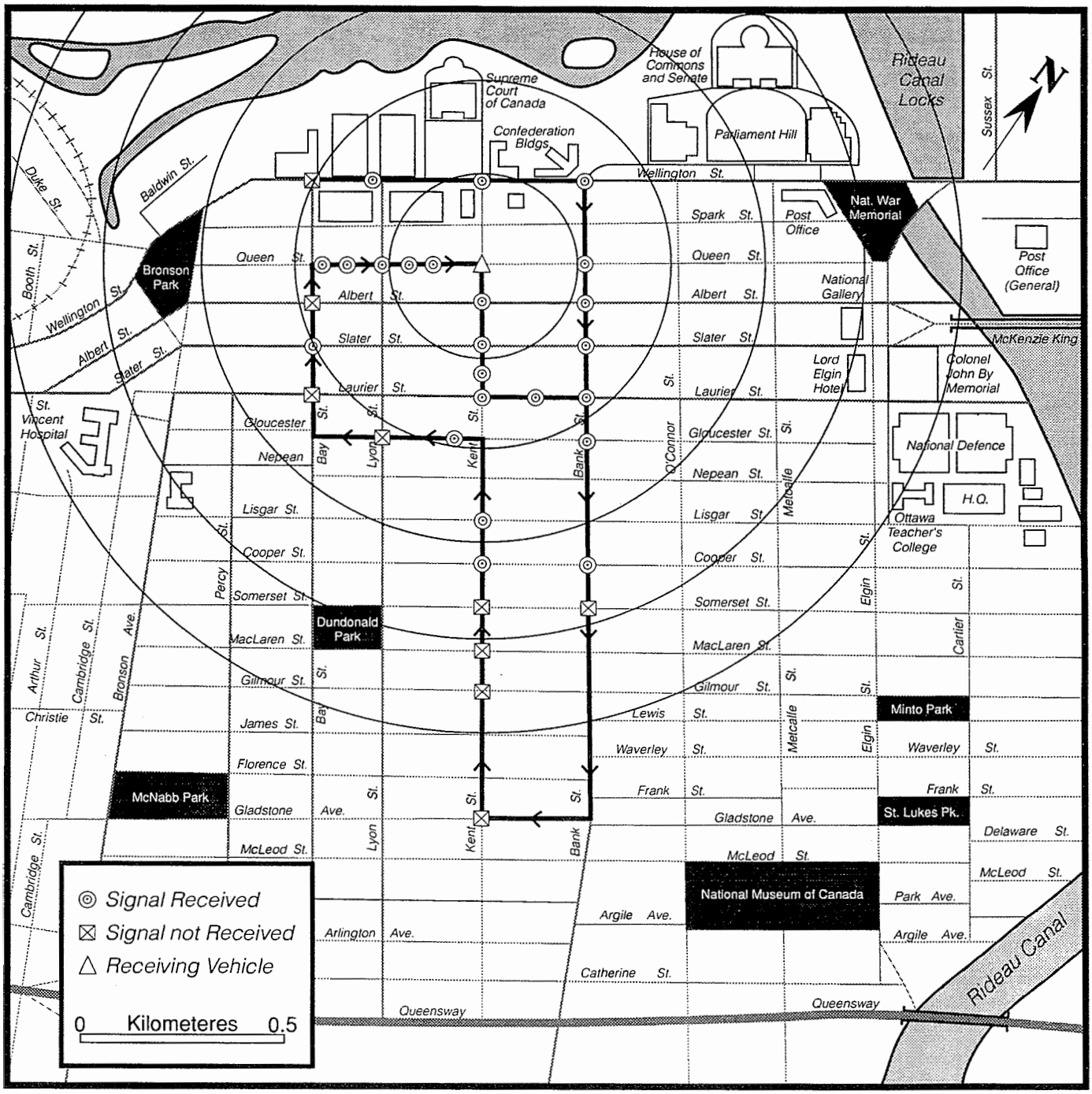

Figure 7
Location: *Receiving vehicle parked facing east on Queen Street, west of Kent on south side.*

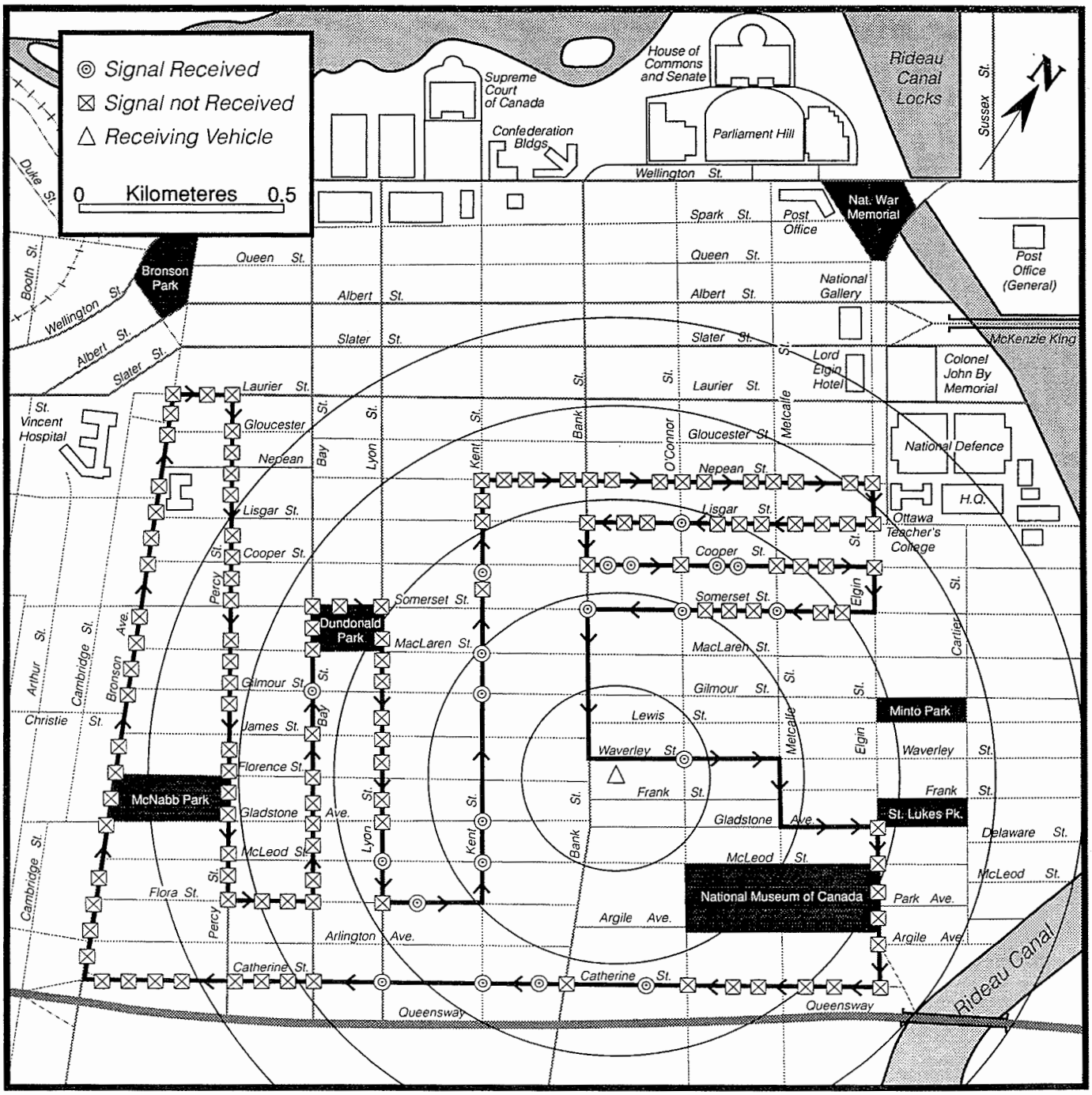

Figure 8
Location: *The receiving vehicle was placed in the customer parking lot behind Colonial Furniture.*

Emergalert Testing

A Report on testing of the Emergalert device in Urban and Rural Settings

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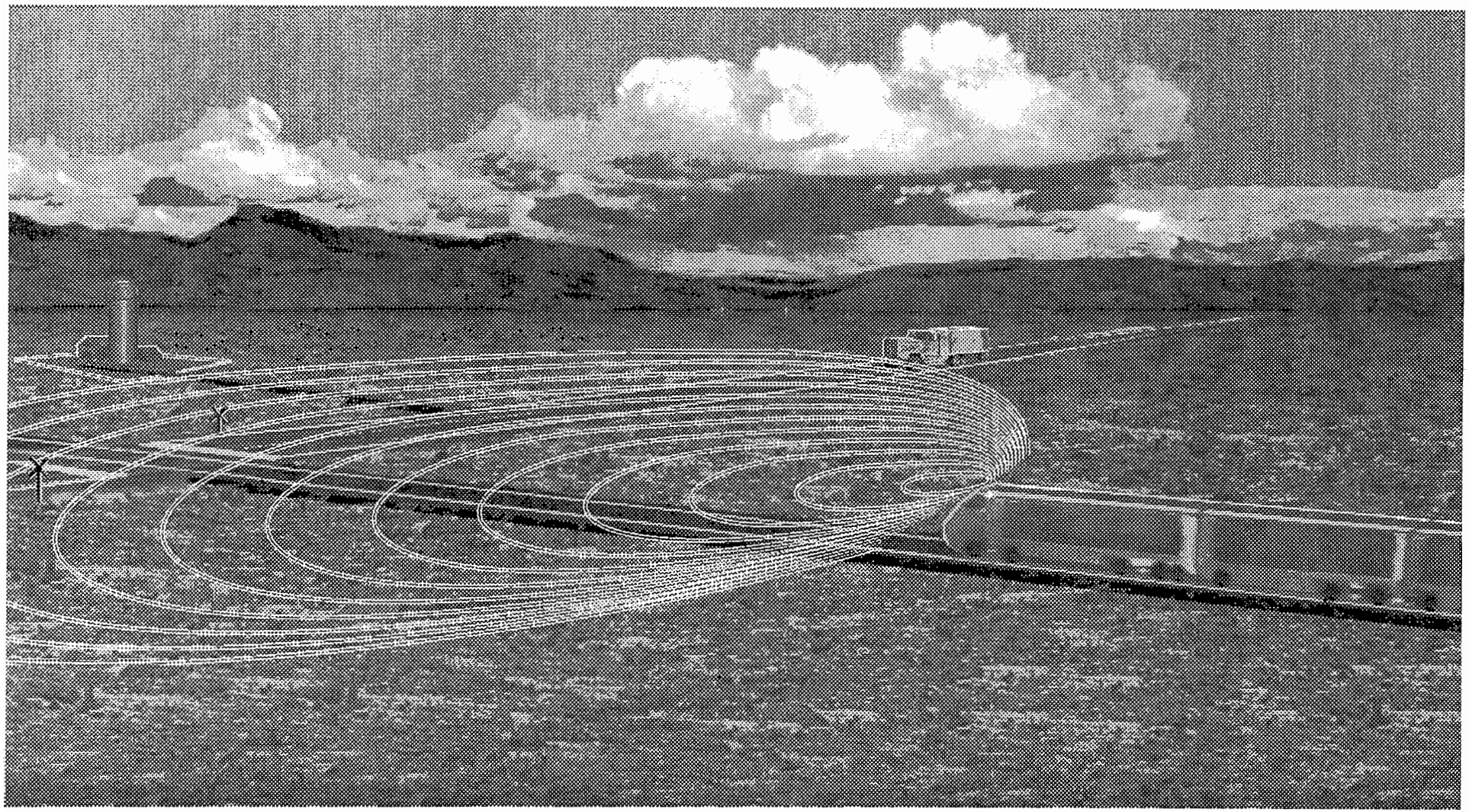

Picture 1
Emergalert system warning approaching vehicle in the level crossing situation.

APPENDIX - EMERGENCY ALERT

"A DEVICE FOR WARNING A DRIVER OF THE PRESENCE OF EMERGENCY VEHICLES AND TRAINS"

INTRODUCTION -

The EMERGENCY ALERT device, "emergalert" described in the following pages was first thought of as an aid to emergency vehicles assisting them in getting to the emergency scene quickly and without danger to vehicles in their path. This device could also be extended to similiarly warn all road vehicles of the approaching train at a level crossing (see picture 1). As well the "emergalert" system could be used for school buses and snowplows. For the sake of clarity the police car scenario will be descibed.

Every police car would have a transmitter that would, on light and siren activation, be turned on to signal any vehicle(s) in the patrol cars path. A receiver in cars and trucks in the police cars' path would receive the signal which would indicate to the driver of the vehicle (by turning on an indicator light and sound) the presence of an emergency vehicle. The driver would look around to see if he was in the way, and if so would be able to get out of the police cars way.

The following text describes how such a device would perform. As well some of the problems of introducing this approach will be described. If it were possible to get the emergency community (police, fire and ambulance) and the railways together then the idea of an emergency warning device in every vehicle could become a very beneficial addition to public safety in Canada. These benefits would include savings in terms of reduced property losses (the fire trucks would get to fires quicker) and fewer injuries and loss of life (the ambulances will get to the hospitals faster).

Safety ideas such as the rear window brake light has gained wide acceptance in the community. "Emergalert" as described here could possibly be minimal as is the case of the rear window brake light. Think about it... if you tell someone that they are in the path of a police car they just might get out of the way.

BACKGROUND -

One of the daily dangers encountered by trains and emergency vehicles (police cars, fire trucks and ambulances) is alerting vehicles in their path of their presence and also trying to avoid collisions with them. Current warning systems of flashing lights and electronic sirens depend on catching the drivers visual and acoustic attention. Many cars today are sound-proofed making it difficult in hearing approaching emergency vehicles. This along with the noise of their air conditioners in the summer, heaters in the winter and the sound levels of today's high quality vehicle stereo systems makes it very difficult to hear sirens and whistles.

There have been devices proposed, in the past, that would interrupt the radio and broadcast an emergency message to the car driver alerting him of an approaching emergency vehicle.

What we have not seen is a simple system which will ALERT the driver of a train or emergency vehicle in his vicinity.

EMERGENCY ALERT DEVICE - "Emergalert"

An on-board, in vehicle warning system would correct this situation. The Emergalert system is comprised two elements; a limited-range radio frequency (RF) transmitter (operating on a designated frequency) that would be standard equipment in every emergency vehicle and a frequency-matched receiver in every other road vehicle. The receiver would on actuation emit an unique sound for 15 seconds as well as initiate a flashing light for 30 seconds that would hopefully get the attention of the driver who would then look for the train or emergency vehicle and if in its' path would take the necessary action. The concept could be introduced to the community through the proper regulatory bodies much in the same manner as the rear window brake light was introduced.

It is important to note that all emergency vehicles would be on the same frequency as it is unimportant to the driver what type of emergency vehicle is in his area (for trains there would be separately identified light indicator and sound). The response would be the same no matter what type of emergency vehicle it was. Its' operation would be automatic as soon as the emergency lights and siren were turned on in the emergency vehicle. All other vehicles would have an installed receiver that would alert the driver of the presence of an emergency vehicle in the local area. As stated earlier the receiver would initiate an unique sound and flashing to alert the driver of the emergency situation is in his/her vicinity.

FEASIBILITY -

With the technology that is on the market today the implementation of Emergalert is feasible. What has to be looked into, is the cost benefit along with the system design that would make the total system cost effective. As stated earlier, such a system could be introduced much in the same way as the rear window brake light, where the device could be introduced on the retrofit market with new vehicles being obligated to have such a device at time of manufacture.

No development is without its problems. In the case of Emergalert there are technical, administrative and social aspects to the introduction of this simple but effective approach.

TECHNICAL PROBLEMS -

- Antenna design for both the transmitter and receiver that will designate radius of operation for safe operation.
- Packaging of receiver that will fit simply in both cars and trucks.
- Packaging of the transmitter that will integrate it with current emergency light and siren configurations.
- Operational specifications that will dictate the common frequency and standard mode of operation.
- Other requirements that will undoubtedly be raised.

Administrative Problems -

- Convincing the regulatory authorities of its value.
- Convincing the emergency community of its value.
- Introducing the concept into the automobile manufacturing community.
- Convincing the public that such a device will save lives not only by reducing response time but by alerting people of an emergency situation.

In summary, the Emergalert concept appears to be valid solution to a real problem. It should save lives, save property and make the servicing of calls for help much more easier than ever before.

For further information on Emergalert contact:

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