



07 January, 2009

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**Subject: *Explosives Safety Siting Consulting
Explosive Storage Magazine Q-D for Rail***

Dear Sir:

This letter summarizes the results of our evaluation of the Explosives Quantity Distance separation requirements for the proposed passenger rail line relative to the General Dynamics explosive storage magazines.

ABS Consulting has reviewed the proposed rail line location, estimated passenger load and explosive storage quantity-distance (Q-D) arcs to determine whether the proposed passenger rail as sited meets NRCAN criteria^[1]. As currently sited the proposed rail line does not meet D7 separation requirements for Heavy Traffic Routes.

1. Background

General Dynamics (GD) operates a site with explosive storage magazines (ESMs) used in the process of manufacturing ammunition. According to GD, the storage magazines are currently sited properly in accordance with NRCAN regulations and quantity-distance (Q-D) criteria. However, a passenger commuter rail line has been proposed that crosses into the required Q-D explosive safety arcs. There are sixteen donor magazines of varying construction and a Safe Marshalling Area (SMA) where explosives laden semi-trailers are parked.

Heenan Blaikie has requested ABSG Consulting Inc. (ABS Consulting) provide explosive safety and quantity distance consulting services pertaining to the proposed commuter rail relative to nine of the sixteen ESMs.

¹ NRCAN, "Quantity Distance Principles", Explosives Branch Natural Resources Canada, 1995.

2. Passenger Train Data

According to GD, sixteen trains per day will pass on the General Dynamics site. The train car configuration will be similar to that shown below in Figure 1. Each train will have ten railcars which can carry 142 passengers each. Based on Agence Metropolitaine de Transport (AMT) publicly released information, 6,575 passengers per day will eventually travel through the General Dynamics site. The number of passengers expected to travel through GD property is based on a posted number of 2,300 parking spaces to be established in Terrebonne and Mascouche (the 2 train stations beyond the site on the train path). AMT has specified that parking space shall represent 70% of the passenger load which equates to the 6,575 passenger estimate.

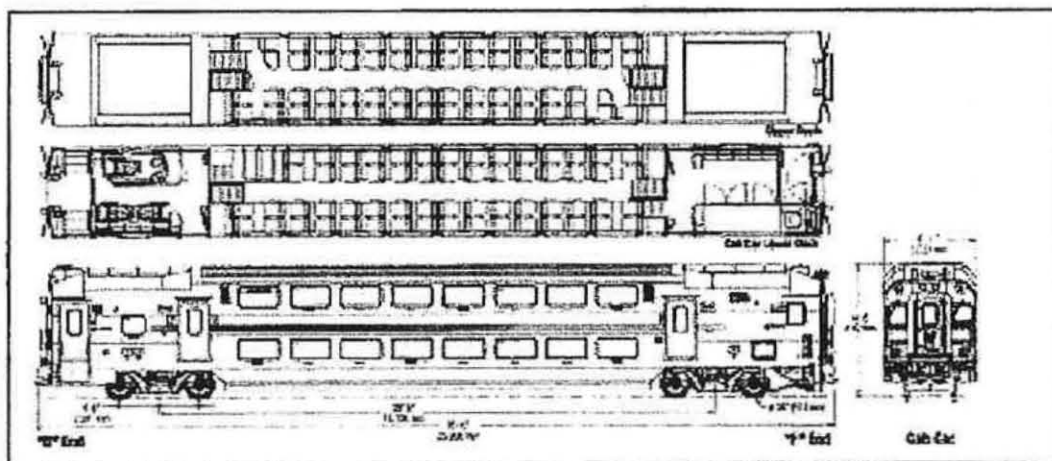


Figure 1. Typical Passenger Rail Car




3. Q-D Assessment of Proposed Rail Line

The separation requirement between the explosive storage magazines and the off-site rail line is Public Traffic Route (PTR) separation. PTR is defined by Part 2 of the NRCAN Q-D principles as:

A road used for general public traffic; a railway outside the explosives area which is used for public passenger traffic; a navigable waterway.

PTR distances are the minimum permissible distances between a donor site and a public traffic route (road, railway and navigable waterway) that is used by a significant number of people. Since the exposure to roads is so diverse, three basic alternatives are provided by the NRCAN Q-D Principles, which are provided in Table 1.

Table 1. PTR Traffic Definitions^[1]

| Vehicles* | Class | Symbol |
|--------------------------------------|----------------|--|
| Sparse traffic- Hardly measurable | Light traffic |  |
| Up to 5,000 | Medium traffic |  |
| More than 5,000 | Heavy traffic |  |

* number of vehicles in a 24 hour period (peak season during explosive storage)

If each vehicle in the PTR traffic definition is presumed to have one passenger and is equated to a rail passenger for purposes of classifying the rail traffic, then the Heavy Traffic Route classification should be utilized based upon the 6,575 person projected daily passenger load of the rail line. In addition, Appendix C of the NRCAN Q-D principles defines the group classification of susceptible sites. Section C.2.4 defines Group 4 as buildings and facilities which require Heavy Traffic Route distances and states examples as including:

- a) main railway line
- b) highways and major roads
- c) major navigable waterways; and
- d) non-vital stocks of fuel

Therefore, based upon the 6,575 project daily passenger load of the rail line and classifying the rail as a “main rail line”, Heavy Traffic Route distances are required by the NRCAN principles. Section 5.4 of the NRCAN Principles requires D7 separation for Heavy Traffic Routes. D7 is based on $5.5 Q^{1/2}$ for $Q < 4,500$ and factor $22.2 Q^{1/3}$ for $Q > 4,500$, where Q is the quantity of explosives in kg.

ABS Consulting was provided the explosive quantities of HD 1.1 for nine explosive storage magazines in the proximity of the rail line. These are not all the magazines on the GD site, just those provided to ABS Consulting. These represent the only magazines with Q-D arcs encumbering on the rail as identified by NRCAN. The required D7 separation distance for each magazine is presented in Table 2.

The required PTR contours for these magazines are presented in Figure 3 through Figure 11. Figure 2 shows the resultant composite contour for the magazines considered in Table 2.

Table 2. Required D7 Separation Distances

| Magazine | NEW (kg 1.1) | D7 (m) | Contour Figure |
|----------|-----------------|-----------|-------------------|
| 406A | | 854.4 | Figure 3 |
| 410 | | 929.9 | Figure 4 |
| 411 | | 994.9 | Figure 5 |
| 412 | | 948.5 | Figure 6 |
| 412A | | 806.8 | Figure 7 |
| 412B | | 664.4 | Figure 8 |
| 416 | | 649.1 | Figure 9 |
| 417 | | 649.1 | Figure 10 |
| 417A | | 854.4 | Figure 11 |

4. Closure

The ESM PTR contours exceed the available separation to the rail line by approximately 370 m. Compliance with Q-D principles would require additional separation distance, reduction in explosive quantity, or providing equivalent separation through the use of hardening to protect the train inside of Q-D separation arcs.

In the experience of ABS Consulting, we know of no other passenger rail line that travels inside of required explosive safety Q-D arcs.

Sincerely,



Ben F. Harrison, P.E.
Technical Manager
ABSG Consulting Inc.

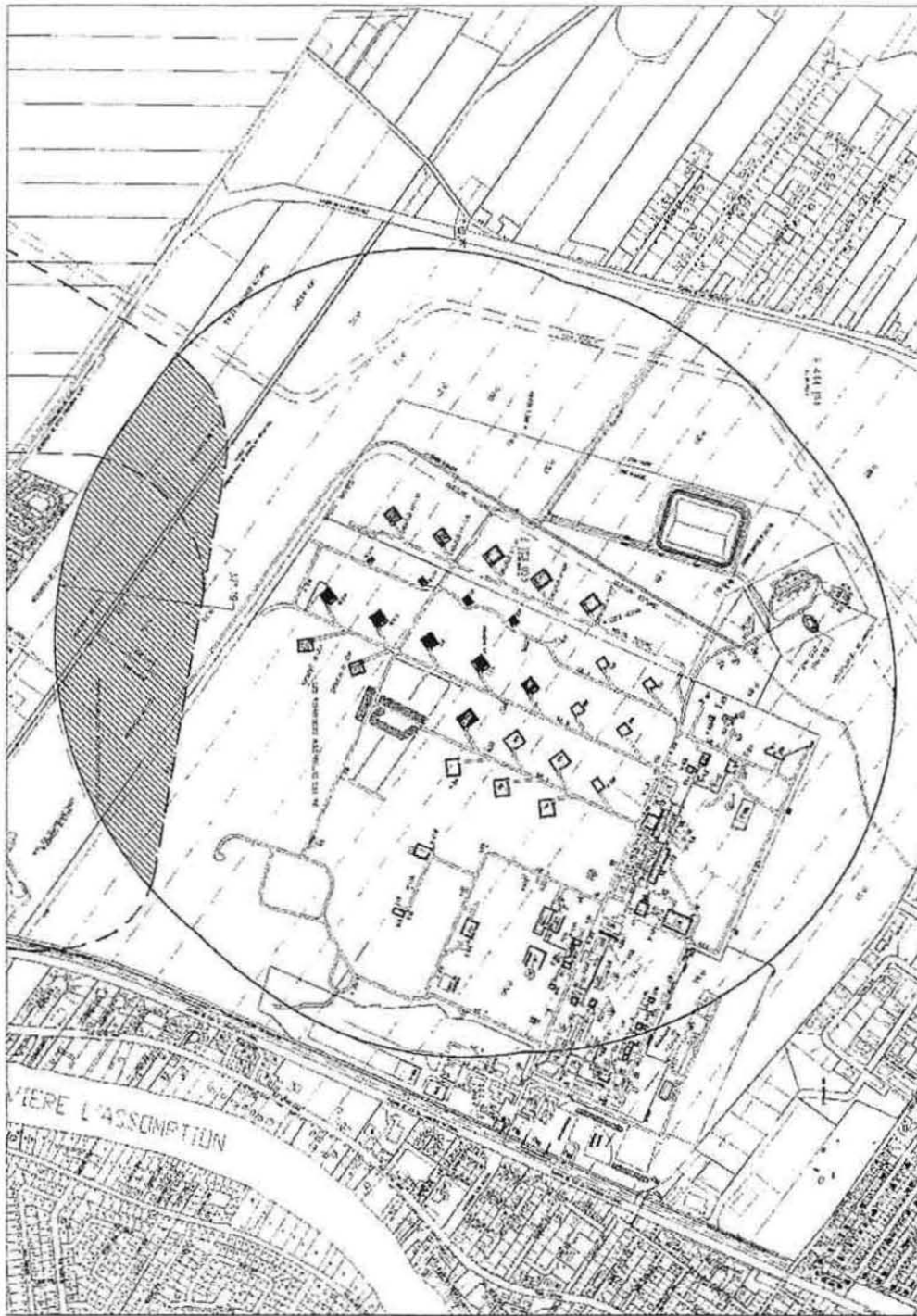


Figure 2. Composite D7 Heavy Traffic PTR Separation Contour for Evaluated Magazines

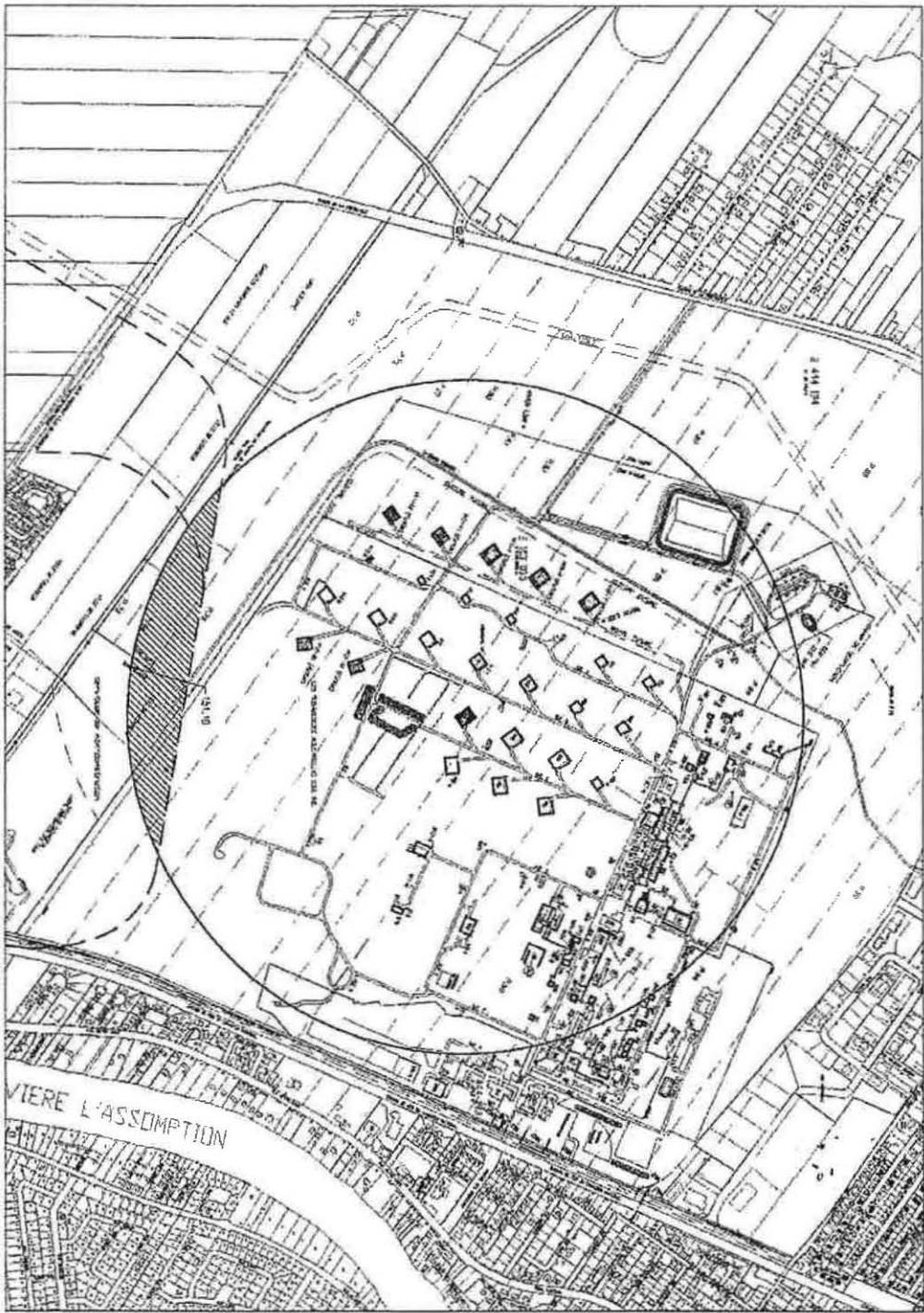


Figure 3. D7 Heavy Traffic PTR Separation Contour for Magazine 406A

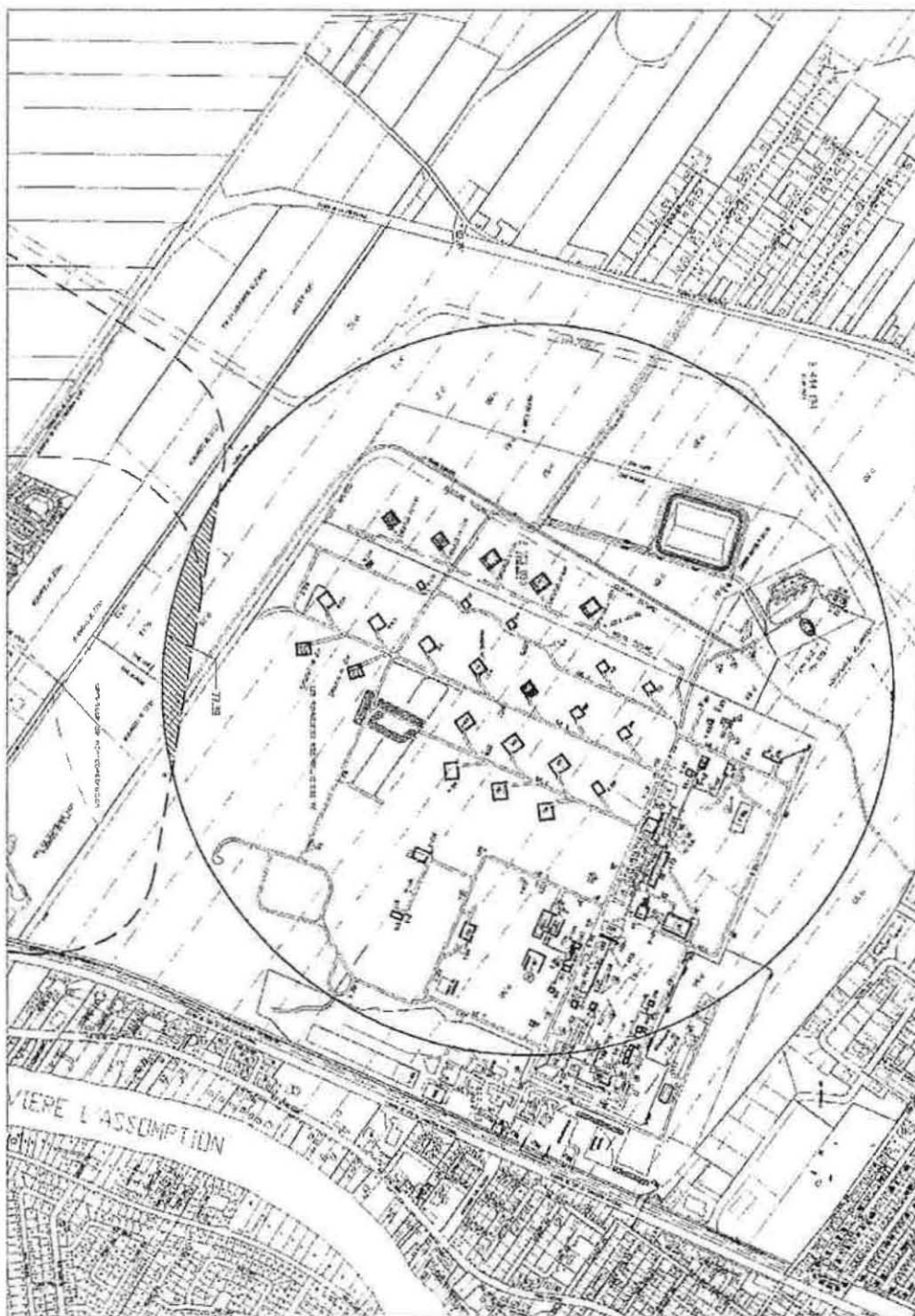


Figure 4. D7 Heavy Traffic PTR Separation Contour for Magazine 410

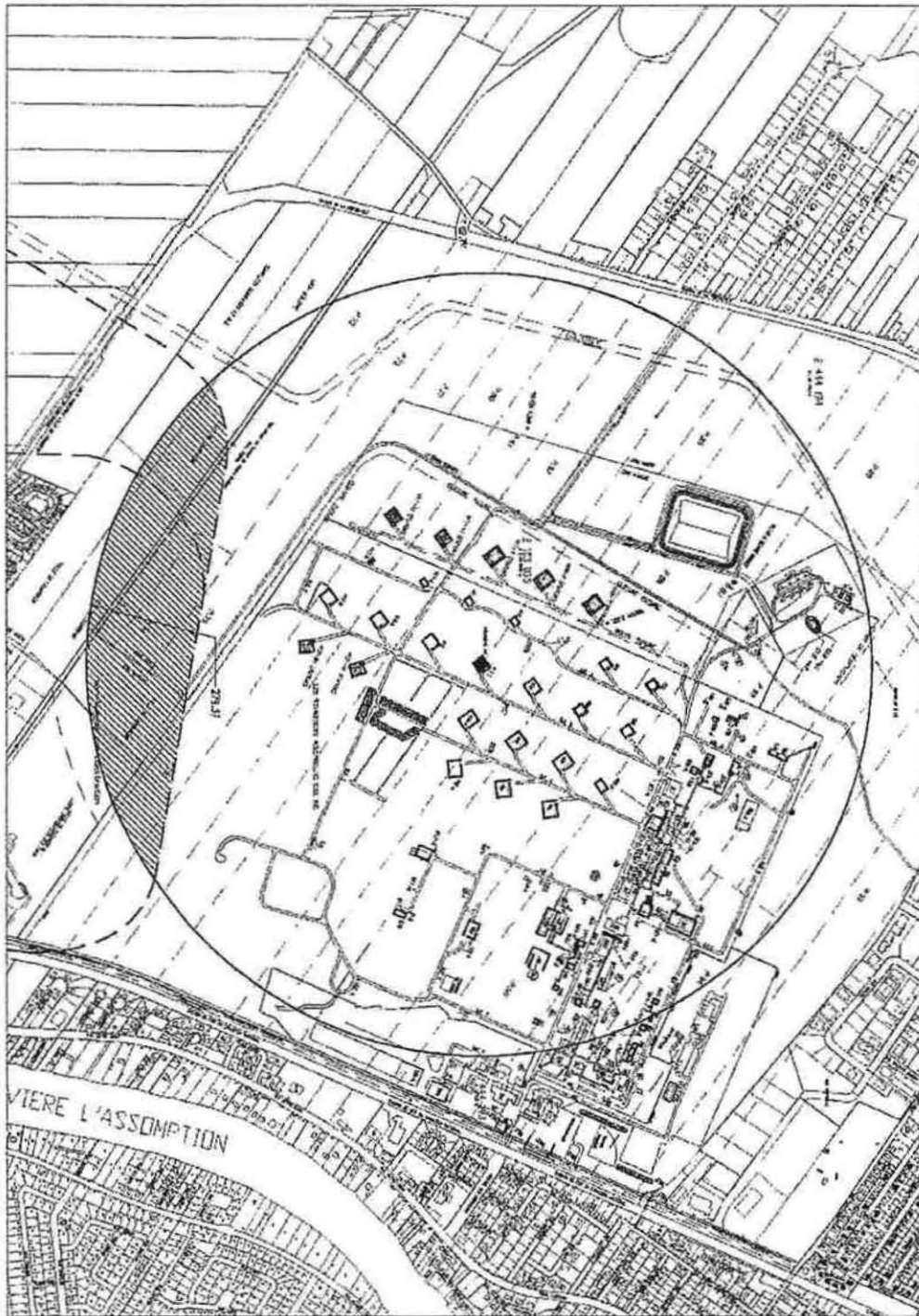


Figure 5. D7 Heavy Traffic PTR Separation Contour for Magazine 411

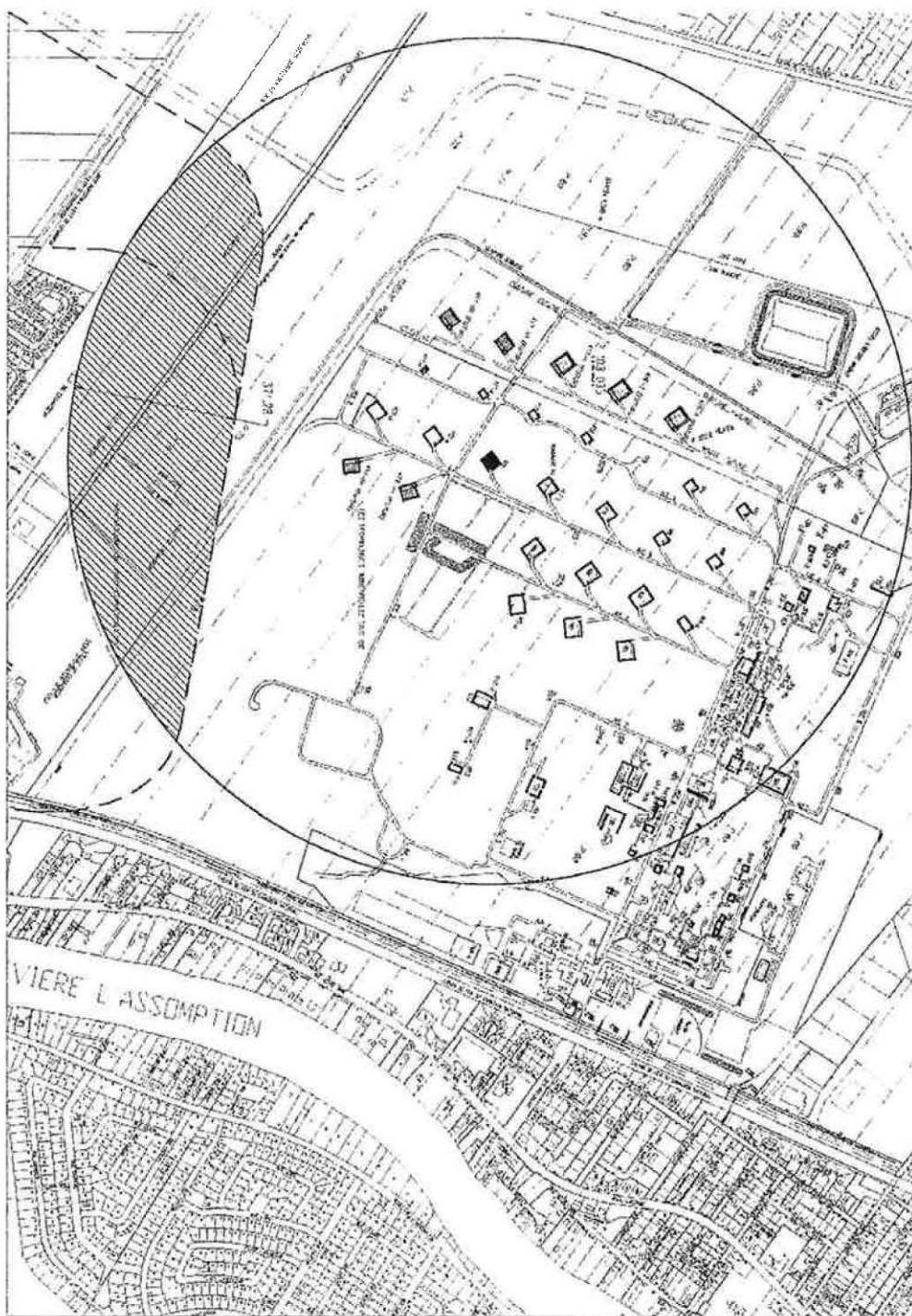


Figure 6. D7 Heavy Traffic PTR Separation Contour for Magazine 412



Figure 7. D7 Heavy Traffic PTR Separation Contour for Magazine 412-A

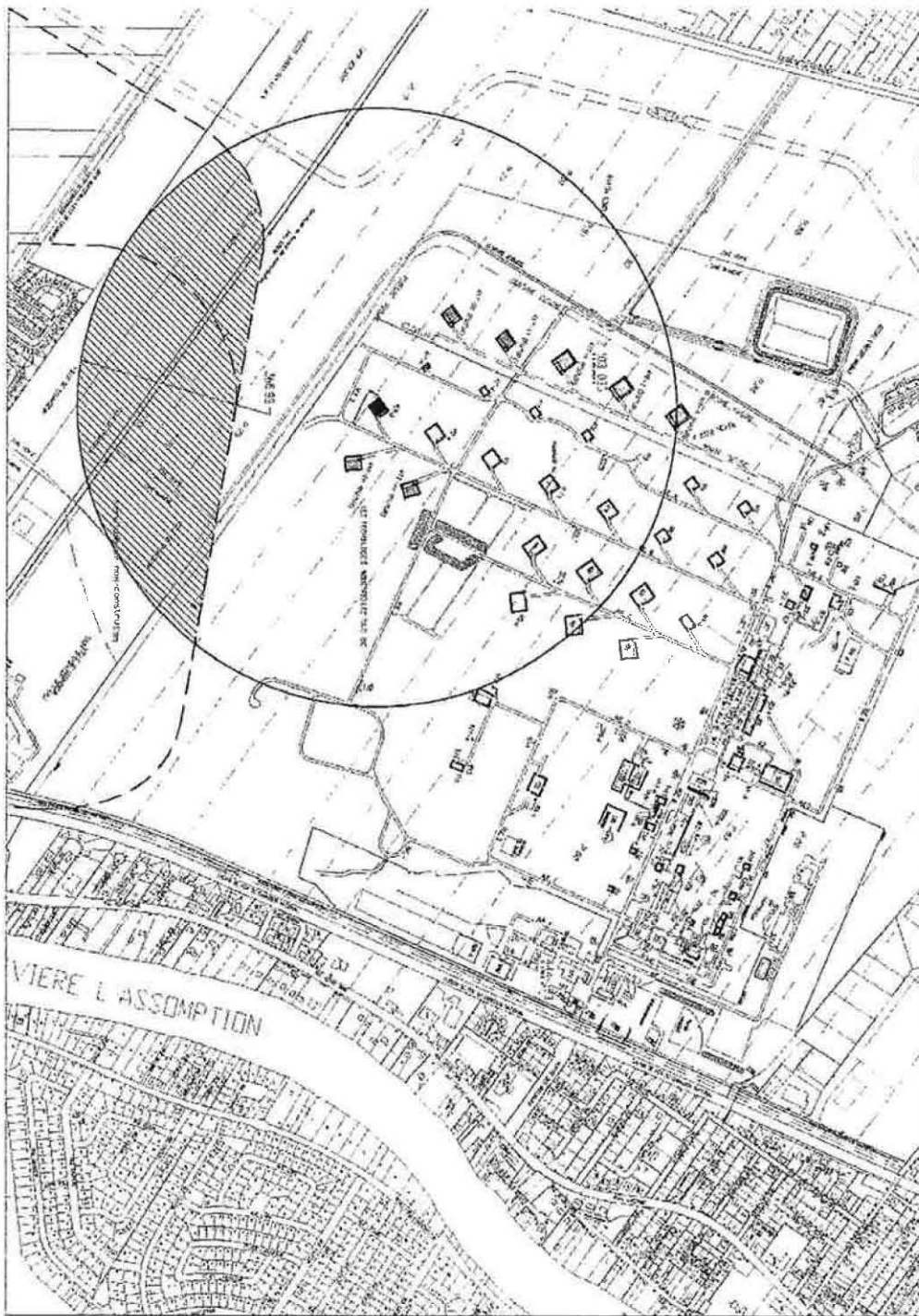


Figure 8. D7 Heavy Traffic PTR Separation Contour for Magazine 412-B

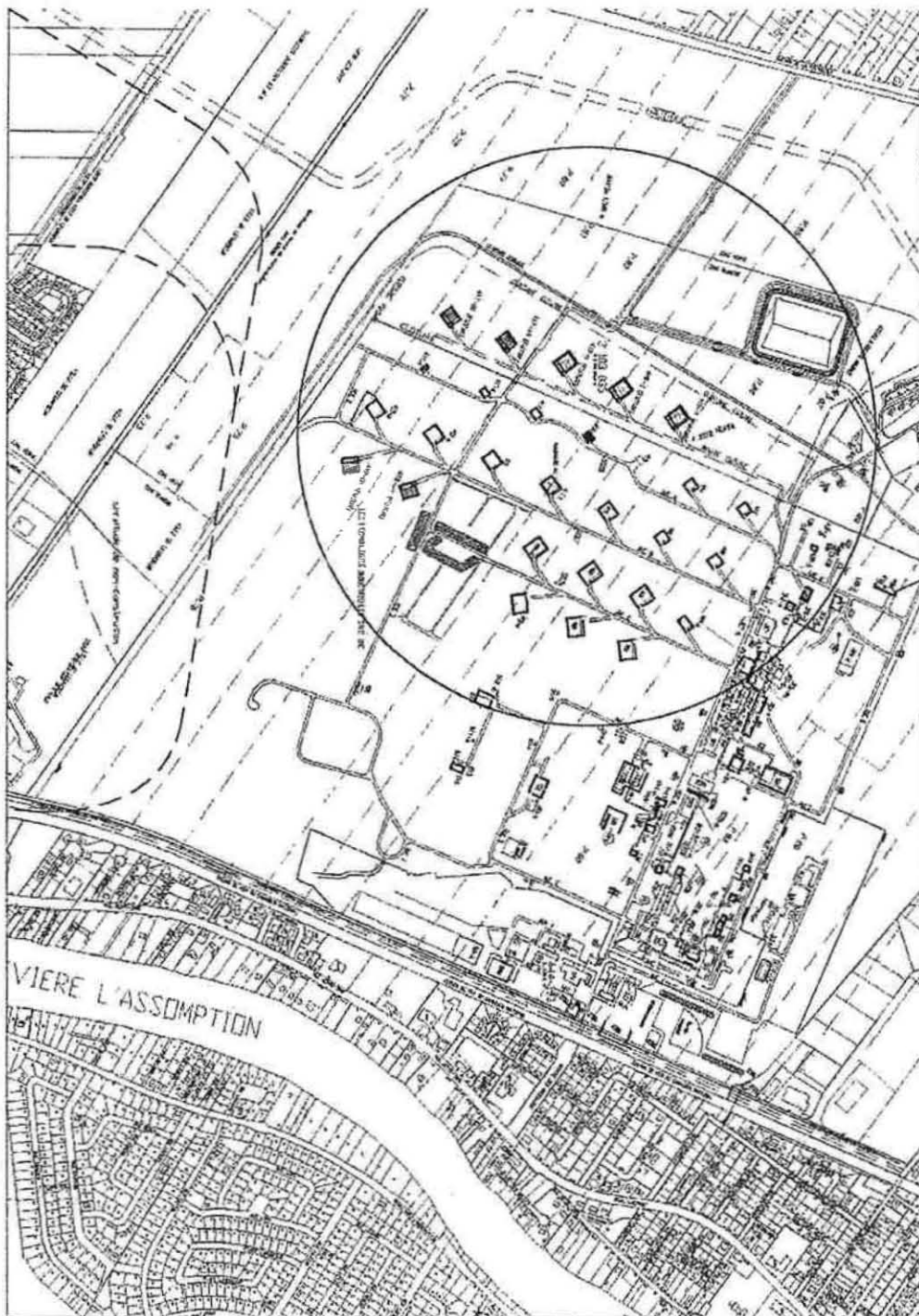


Figure 9. D7 Heavy Traffic PTR Separation Contour for Magazine 416



Figure 10. D7 Heavy Traffic PTR Separation Contour for Magazine 417



Figure 11. D7 Heavy Traffic PTR Separation Contour for Magazine 417-A