Bylaw No. 598-2005

Code 06/05

A BYLAW OF THE CITY OF LEDUC IN THE PROVINCE OF ALBERTA, TO AMEND BYLAW 510-2002 TO ADOPT THE AREA STRUCTURE PLAN FOR THE NE ¼ SECTION 28, TOWNSHIP 49, RANGE 25, WEST OF THE 4TH MERIDIAN

WHEREAS, Section 633 of the Municipal Government Act, R.S.A. 2000, Chapter M-26, as amended enables a Municipal Council to adopt by Bylaw an Area Structure Plan for the purpose of providing a framework for subsequent subdivision and development of an area of land in a municipality;

WHEREAS, Bylaw 510-2002 to adopt the Area Structure Plan for the Northeast Quarter Section 28, Township 49, Range 25, West of the 4th Meridian was passed by Council March 11, 2002;

WHEREAS, the Council has deemed it expedient and necessary to amend Bylaw 510-2002. Notice of intention to pass this Bylaw has been given and a Public Hearing held in accordance with the provisions of the Municipal Government Act, R.S.A. 2000, Chapter M-26, as amended;

THEREFORE, the Council of the City of Leduc in the Province of Alberta duly assembled, hereby enacts as follows:

That Bylaw 510-2002 be amended as per the document attached hereto as Schedule A.

This Bylaw shall come into force and effect when it receives Third Reading and is duly signed.

READ A FIRST TIME IN COUNCIL THIS 11 DAY OF APRIL, AD 2005.

READ A SECOND TIME IN COUNCIL THIS 25 DAY OF APRIL, AD 2005.

READ A THIRD TIME IN COUNCIL AND FINALLY PASSED THIS 25 DAY OF APRIL, AD 2005.

Greg Krischke
MAYOR

Coral Callioux
CITY CLERK

27/04/05
Date Signed

BYLAW 598-2005

SCHEDULE A

WEST HAVEN ESTATES
AREA STRUCTURE PLAN
CITY OF LEDUC

prepared for

816832 ALBERTA LTD.

in association with

E/A LEE CONSULTING LTD.

and

gpec Consulting Ltd.

JANUARY 2002

AMENDED FEBRUARY 17, 2005

WEST HAVEN ESTATES
AREA STRUCTURE PLAN
CITY OF LEDUC

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-August 1999

B. Environmental Site Assessment–Phase 1 by Hoggan Engineering and Testing (1980) Ltd.
- August 1999

C. Figure No. 5-Development Concept
- at 1:2500 scale (attached in pocket)

WEST HAVEN ESTATES
AREA STRUCTURE PLAN

CITY OF LEDUC

1.0 - INTRODUCTION

1.1 PURPOSE

The purpose of the West Haven Area Structure Plan is to provide a framework for the residential development of a quarter section of land at the western edge of the City of Leduc. As provided in Section 633 of the Municipal Government Act, 1994, as amended, an Area Structure Plan must describe the proposed land uses, population density, transportation routes, public utilities, and sequence of development or staging of an area proposed for development.

1.2 LOCATION AND AREA

The West Haven Estates Area Structure Plan area (the subject site) comprises approximately 63.1 ha (156 ac.) at the western edge of the City of Leduc. The boundaries of the subject site are: on the North, Highway #39/50 Avenue; on the west, the City's boundaries; on the south, a Canadian Pacific Rail line (south of which is agricultural land); and on the east, Grant MacEwan Blvd., which is the former west boundary of the City of Leduc. East of Grant MacEwan Blvd. is the residential area of Lakeside Estates and Leduc Estates (Figure No. 1).

The legal description of the area is NE 28-49-25-W4.

1.3 BACKGROUND

The development of West Haven Estates is the logical outcome of residential expansion on the west side of Highway #2 in the City of Leduc and in the Leduc Estates and Lakeside Estates Outline Plan of 1974. The broad concepts presented in that Outline Plan have served as a guide to all subsequent developments west of Highway #2 since that time, including the development of Leduc Estates and Lakeside Estates and the Windrose area to the south of Leduc Estates (southeast of the subject site).

The 1974 Outline Plan showed Black Gold Drive continuing westerly to Grant MacEwan Blvd. Black Gold Drive is a major roadway in the overall Leduc concept, connecting the eastern and western portions of the City and located 0.8 km (0.5 miles) south of 50 Avenue.

The West Haven Estates site, together with two quarter sections to the north and one quarter section to the south, were recently annexed to the City of Leduc from Leduc County. This annexation all but directs that development take place on the subject site in the immediate future.

1.4 LAND OWNERSHIP

The site comprises 63.1 ha (156 ac.) of land held under Certificate of Title 012-239-694 in the name of 816832 Alberta Ltd. A total of 1.6 ha (4 ac.) of land has been removed from the northern boundary of the original quarter section for roadway widening. The Canadian Pacific Railway right-of-way (Registered Plan 3274EO) is located immediately adjacent to the southern boundary of the subject quarter section and entirely on the quarter section to the south.

The title is subject to a Plains Western Gas & Electric Co. (now AltaGas Utilities) easement, an AGT (now Telus Communications) easement, and a City of Leduc easement. Only the City easement, which runs along the northern half of the eastern property line, is significant, as it is the location of a water line utility (Figure No. 2).

1.5 PLANNING COMPLIANCE

The Municipal Development Plan for the City of Leduc has recently been revised to take into account the area annexed to the City from Leduc County.

The revised Municipal Development Plan establishes the broad, citywide framework of development for the City. As such, it designates this subject site for residential development and establishes various broad policies under which development will occur. The West Haven Area Structure Plan has been prepared under the provisions of the Municipal Government Act, 1994, as amended, which provides for the adoption of Area Structure Plans by Bylaw in accordance with the City's Municipal Development Plan. The Area Structure Plan has also been prepared in consideration of the terms of reference for Area Structure Plans provided by the City of Leduc.

2.0 - SITE ANALYSIS

2.1 SITE CONTEXT

West Haven Estates lies immediately to the west of the residential area of Leduc Estates and Lakeside Estates, a residential community which occupies approximately 80 ha (200 ac.). West Haven Estates is separated from Leduc Estates and Lakeside Estates by Grant MacEwan Blvd. Black Gold Drive is a major collector road, which runs east/west from the east side of the City to Grant MacEwan Blvd. Black Gold Drive is a potential access to West Haven Estates, as is Highway #39/50 Avenue itself, either directly or via Grant MacEwan Blvd.

The east limit of West Haven Estates is defined by Grant MacEwan Blvd. The area to the east of Grant MacEwan Blvd. is occupied by residential development - single detached homes on normal-sized lots.

St. Benedict Separate Elementary School and Leduc Estates Public Elementary School are located approximately 0.4 ha (0.25 miles) east of the east boundary of West Haven Estates. The development of West Haven Estates and the Windrose area to the south of Leduc Estates and Lakeside Estates (where some development has taken place to date), together with existing residential development, will provide a residential area of about 200 ha (495 ac.).

The boundary to the west of West Haven Estates is the new City of Leduc boundary, with agricultural lands on the opposite side of the boundary. With recent annexations, of which West Haven Estates is a part, there is sufficient land within the city limits to provide for at least a doubling of the City's population. Thus, this boundary will remain an urban/rural interface for the foreseeable future.

Highway #39/50 Avenue defines the north boundary of West Haven Estates. The land to the north of Highway #39/50 Avenue is currently in agricultural production. However, an area structure plan has been proposed to develop this area for residential and commercial uses.

The Canadian Pacific Rail line defines the south boundary of West Haven Estates. Though land to the south of this rail line is currently in agricultural production, it is expected that this area will also eventually develop into residential uses as well as West Haven Estates.

Thus, the development of West Haven Estates comprises orderly and economical development of the City of Leduc to the west.

2.2 SITE CONDITIONS

At present, the West Haven Estates site is under agricultural use. There is a small tree stand and man-made water body (dugout) in the central portion of the site near the northern boundary (Figure No. 3).

Most of the site slopes from the east and northwest to this dugout. The southwestern portion of the subject site, however, slopes towards the southwest. The high elevation is 724 m near the southeastern corner of the subject site to a low of 720 m at the dugout. The overall elevation difference thus is about 4 m over 800 m, an average gradient of about 0.5%. Thus, slopes are fairly gentle, with natural drainage following the slopes of the land (Figure No. 4).

A geotechnical investigation of the subject site was undertaken in 1999. The resulting report indicates that the site's general soil stratigraphy consists of topsoil and organic clay overlying silty clay of medium plasticity over a clay till. There is shale bedrock below the clay till.

The report indicates that generally the subsurface soil conditions encountered were suitable for standard concrete footings for residential dwellings.

The report also indicates that the subsurface soil conditions for the site are considered fair to satisfactory for the installation of underground utilities and construction of roadways. In some areas, utility trench shoring and roadway subgrade modification may be required due to higher than optimum water table. The extent will depend, somewhat, upon the final design grades established.

3.0 - DEVELOPMENT CONCEPT

3.1 DEVELOPMENT OBJECTIVES

The West Haven Estates Area Structure Plan provides an overall framework for the development of the subject site.
Key objectives, which have guided the preparation of the West Haven Estates Area Structure Plan area as follows:

1. to create an attractive residential environment that is complementary to and integrated with the adjacent Leduc Estates and Lakeside Estates area;

2. to create a parks and recreation system that enhances the quality of life for area residents and that complements the City's park/multiway system;

3. to provide a safe and convenient transportation and circulation system that directs traffic to Grant MacEwan Blvd., Black Gold Drive, Highway #39/50 Avenue, and the proposed western bypass road located on the west boundary of the Area Structure Plan area, while providing a safe link to the area schools;

4. to provide an appropriate school site which will satisfy the Black Gold School Division's requirements; and

5. to achieve orderly and economical expansion of the City of Leduc within the capabilities and guidelines of its servicing systems.

3.2 THE DEVELOPMENT CONCEPT

3.2.1 General

The general development concept for the subject site is shown in Figure No. 5 while the development statistics are shown in Table No. 1. One site for medium density semi-detached style housing and five sites for higher density row and/or apartment housing sites are located in the northern portion of the Plan area.

The overall circulation system is specifically designed to direct traffic to Grant MacEwan Blvd., to Black Gold Drive, and to Highway #39/50 Avenue. A minor internal road loop is also designed to accommodate local traffic within the Plan area.

A central park/stormwater retention pond site is shown, bisected by Black Gold Drive. As well as serving a utility function, this site will provide substantial amenity to the Plan area. Small park areas are associated with the pond, serving as a link within the Citywide multiway system. An entrance park will be located at the south end of the main central entrance road to provide a welcoming amenity to future residents and visitors.

Two further parks are provided within the Plan area. One is currently occupied by an area of substantial, mature trees, which can be utilized for local open space purposes.

The other, on the southeastern boundaries of the quarter section, will also be the location of an elementary school.

As well as meeting a convenience commercial need within the community as a whole, one small commercial site in the north central area of the quarter section will be designed to serve the traveling public on Highway #39/50 Avenue. Access to both the community and to the Highway will be provided via the central entrance road to the Plan area and West Haven Drive. Appropriate visual design and landscaping will be required as a condition of the development of this commercial site to limit the impact of commercial development on adjacent residential uses through the use of planting and fencing, as required by the City.

TABLE NO. 1
LAND USE SUMMARY
WEST HAVEN ESTATES AREA STRUCTURE PLAN

Land Use	Area (ha)	%	Dwelling Units	%	Population	%
Gross Area	63.1	100.0				
Roadways	14.6	23.1				
PUL (including storm pond)	4.0	6.3				
Municipal Reserve	6.3	10.0				
Commercial	1.0	1.6				
Residential	37.2	59.0	733	100.0	2068	100.0
Low Density (R-1)	30.6	48.8	490	66.8	1568	75.8
Medium Density (R-2M)	1.4	2.2	35	4.8	84	4.1
Higher Density (R-3 & R-4)	5.2	8.2	208	28.4	416	20.1

Overall residential density: 32.1 persons per gross hectare

Assumptions:

1. Residential densities
   - Low Density — 16 dwellings per net hectare
   - Medium Density — 25 dwellings per net hectare
   - Higher Density — 40 dwellings per net hectare
2. Population densities
   - Low Density — 3.2 persons per dwelling
   - Medium Density — 2.4 persons per dwelling
   - Higher Density — 2.0 persons per dwelling

TABLE NO. 2
POTENTIAL STUDENT POPULATION
WEST HAVEN ESTATES AREA STRUCTURE PLAN

	K-6	7-9	10-12	Total
Public System	161	65	65	291
Separate System	86	35	35	156
Total	247	100	100	447

Assumptions:

1. Number of Students per dwelling 0.61
   Number of dwellings: 733

2. Proportion of Students in Public System 65%
   Proportion of Students in Catholic System 35%

Finally, the Plan shows appropriate widening of Highway #39/50 Avenue and Grant MacEwan Blvd., a portion of the right-of-way for the proposed western bypass road, and Public Utility Lots adjacent to Highway #39/50 Avenue and the proposed western bypass road, within which berms and fences will be built, designed to provide noise and visual attenuation between the residential areas from these major roadways.

Berms will be constructed so as to minimize the potential for invasion of privacy by persons walking or riding on the berm - to wit, the property line (between the Public Utility Lots and the residential properties) will be at the top of the berm and a fence will be erected along that property line. Private land owners will have responsibility for the fence and portion of the berm on their properties and public access will be limited to the portion of the berm adjacent to the roadway. The Public Utility Lots and the berms will also "wrap around" the ends of the residential areas (as shown on Figure No. 5) so as to increase the efficacy of the berms at their ends. Noise attenuation measures will be provided to protect the medium density semi-detached housing area located in the northeast corner of the quarter section.

The Public Utility Lot (and the berm) strip is interrupted at the park area in the northwestern portion and the commercial site in the north central portion of the Plan area in order that there be no implication that a berm will be constructed in that area. Such construction might negatively impact the mature trees in that area adjacent to the Highway and the visibility of the commercial site.

3.2.2 Residential Land Use

Westhaven Estates will offer a range of low to higher density residential development. The neighbourhood will provide primarily single detached housing located on a variety of lot sizes, together with a number of dwellings in medium and higher density forms.

The concept identifies one site for medium density semi-detached housing located as shown on Figure No. 5. It is planned that this site adjacent to Grant MacEwan Blvd. will be limited in height to 1 or 2 storeys, which is lower than the height allowed in the City's

Land Use Bylaw. It is anticipated that this site may be developed for the active adult market and will feature semi-detached housing forms.

Five sites for higher density housing are also located as shown on Figure No. 5. It is anticipated that these sites may be developed in row and/or low-rise apartment housing.

Low-density residential development will develop in the forms allowed within the R-1A, R-1B, and R-1C Districts in the City's Land Use Bylaw. For the most part, R-1A areas will be adjacent to and near the stormwater retention pond, and R-1C areas will be on the periphery of the Plan area, with R-1B areas filling the interstices. However, the specific classifications will be determined at the time of subdivision and development of the specific areas.

Low-density residential land use will occupy 30.6 ha (48.6 % of all the land in the Plan area) and medium and higher density residential development will occupy 6.6 ha (10.5%).

The overall residential density is estimated will be 32.8 persons per gross hectare, with a ratio of low-density residential units to multiple family units of 66.8%/32.2% (a bit less than 2.3/1).

3.2.3 Parks, Open Space and Walkways

Parks and open space is dispersed within the Area Structure Plan area to serve the local needs of the immediate area as well as the broader community. The major open space feature is in the southeastern portion of West Haven Estates, associated with a public elementary school site. Two other small park areas are located within the Plan area. The one in the northwestern portion of West Haven is the site of a well-treed area, and it is anticipated that this site will serve local recreational needs. The other park is located south of the central entrance road and along the western side of the storm pond, which will serve as a link within the City's multiway system. The larger area in the north of this linear park is intended to provide a recreation area with a welcoming impression to the residents and visitors of the community.

The stormwater management facility in the central portion of the Plan area, bisected by Black Gold Drive, will be a major landscape feature and amenity, although the pond itself will not qualify for Municipal Reserve credit. The pond will be visible from many parts of the Plan area, including all the substantial east/west roadways. More than half of the shoreline will have public access - approximately 50% from the multiway path along the shoreline on a 5 m wide flat area, and approximately 15% directly from roadways. This will provide for visibility of more than 20% of the pond as required by City policy.

Walkways will be located within the Plan area to join culs-de-sac with each other and to provide pedestrian routes to the school/park site in West Haven Estates and to the stormwater retention pond/park.

The open space system will be linked to Leduc's multiway trail system. The multiway will be located on the MR/School site at the southeastern corner of the Plan area, along the storm water pond and link along a widened sidewalk on West Haven Drive north to the

MR in the northwestern corner of the Plan area. Links with this multiway corridor and the neighbourhood parks/school site will be provided along the local and/or collector street network, together with the walkways between them. The multiway may also be located around the perimeter of West Haven Estates, as shown on Figure No. 10.

As shown in Table 1, the components of the open space system comprise 10.0% of the gross developable area of the Area Structure Plan area. These components will be dedicated as Municipal Reserve to meet the requirement for Reserve dedication pursuant to the Municipal Government Act, 1994, as amended.

3.2.4 Schools

An elementary school is proposed for West Haven Estates within the Municipal Reserve along the southeastern boundaries of the Plan area. No junior high school site is provided. A junior high school may be developed in the quarter section to the south of West Haven Estates when that quarter section is developed.

3.2.5 Commercial Land Use

One small (1.0 ha/2.47 ac.) commercial site is provided for in the Plan area. The population of West Haven Estates would be sufficient to support this neighbourhood commercial site; however, the populations of West Haven Estates, Leduc Estates and Lakeside Estates, Windrose, and the neighbourhoods north of Highway #2 would be large enough to support additional sites to the north of the Plan area.

With such a market area, the site must have access to the other areas. Thus, the commercial site is located adjacent to Highway #39/50 Avenue at the central main entrance road. As well, such a location would benefit from exposure to Highway #39/50 Avenue traffic.

It is anticipated that convenience-type commercial retail and service uses would be located at this site, including a bank, personal service shops (dry cleaners/beauty salon), convenience/fast food shops, a convenience retail store, and a gas bar. Access to Highway #39/50 Avenue will be carefully regulated; however it is anticipated that full access will be provided to West Haven Drive and the central entrance road (as shown on Figure No. 5). The commercial facility would be designed to face Highway #39/50 Avenue and the central entrance road, but not leave a blank wall or other unsightly facade facing West Haven Drive.

As well, appropriate visual and noise attenuation buffers will be required as a condition of the development of the commercial site to limit the impact of the commercial development on adjacent residential land uses within West Haven Estates to the east of the commercial site.

3.2.6 Other Land Uses

No sites are designated for religious assembly. It is felt that religious assembly sites would more appropriately be placed at more central locations or along major roadways.

There has been no identified need for additional community facilities in West Haven Estates.

3.3 TRANSPORTATION AND CIRCULATION

3.3.1 Access and External Roadway System

The general development concept for the subject site proposes access to West Haven Estates from Highway #39/50 Avenue, Grant MacEwan Blvd., Black Gold Drive and the future west boundary road. An internal loop road system is designed to facilitate local traffic and to encourage circulation in an east/west fashion to Grant MacEwan Blvd. and northerly fashion to Highway #39/50 Avenue as illustrated on Figure 10.

The central entrance road proposed from Highway #39/50 Avenue is located 408.5 m west of Grant MacEwan Blvd., centerline to centerline. This central entrance road has been designed to line up with the planned central entrance road to the land located north of Highway #39/50 Avenue and will initially be designed with dedicated left turn bays and acceleration/deceleration lanes in accordance with TAC standards to facilitate development of Stages 1 and 2. As illustrated in Figure 11, the roadway design includes a 9.81 m right-of-way widening for Highway #39/50 Avenue plus a 7 m PUL for berm construction. A 7 m road widening will also be provided for the western boundary road widening along with a 4 m PUL for berm construction.

Access into West Haven Estates from Highway #39/50 Avenue is considered essential in that without such an access, in a location at the mid-point of the quarter section, all traffic from the community would access Highway #39/50 Avenue at Grant MacEwan Blvd., thereby possibly overloading the intersection of Grant MacEwan Blvd. and Highway #39/50 Avenue. Speed reductions will be required along Highway #39/50 Avenue to insure compliance with current TAC standards. Traffic light signalization will also be required on Highway #39/50 Avenue at Grant MacEwan Blvd. and at the central entrance road as development generates higher traffic volume. Developer PAC contributions will be paid to the City to cover their proportionate share of these costs as a condition of Development Agreement. Further traffic analysis will be required at the detailed design phase to determine the exact timing, cost and cost allocation of these improvements.

It is also recognized that due to traffic constraints at the Highway 2/Highway 39 interchange, development growth in West Haven Estates may be limited and/or restricted by the City of Leduc as deemed necessary to control traffic congestion and safety.

Access into West Haven Estates will also be provided from Grant MacEwan Blvd. at West Haven Drive as well as Black Gold Drive. These accesses are considered essential in order that each half of the Plan area have alternative accesses in and out.

The use of Grant MacEwan Blvd. by West Haven Estates residents will be facilitated by improvements to the external roadway system to be undertaken in conjunction with the improvements required for the development of the Windrose Area Structure Plan area. The scheduling and cost responsibilities for these improvements will be decided by the City.

3.3.2 Internal Roadway System

The internal roadway system (Figure No. 10) of arterial, collector, and local roads has been designed to encourage traffic movement to Black Gold Drive, Grant MacEwan Blvd., and Highway #39/50 Avenue. The internal collector roads direct traffic to the central entrance road and Grant MacEwan Blvd., or north/south to Black Gold Drive. Care is taken to not provide a direct north/south route, and thus possible future unnecessary shortcutting, through the whole of the community.

Local roads will provide access to residential areas. The specific alignment of local roads is subject to change to reflect detailed subdivision and servicing design.

All roadways will be designed and constructed to the standards of the City.

4.0 - SERVICES

4.1 WATER DISTRIBUTION

The main water supply for West Haven Estates will be from the existing 300 mm diameter watermains located on Grant MacEwan Blvd. and Black Gold Drive to the east of West Haven Estates in Leduc Estates and Lakeside Estates. In the future, a 400 mm diameter main will be constructed to traverse the subject site in a north/south direction and a 300mm diameter main will be extended to the west along Black Gold Drive All primary mains are shown schematically on Figure No. 7 and will be oversized to accommodate future development to the north, south and west of West Haven Estates.

West Haven Estates local residential areas will be provided with water supply through a 250 mm looped internal system as shown on Figure No. 7. In all instances, watermains will be sized to provide the required fire flows directed by the City's Engineering Department prior to construction.

4.2 SANITARY SEWER SYSTEM

The nearest trunk sanitary sewer main to the subject site is located on Highway #39/50 Avenue some 200 m east of the northeastern corner of the subject quarter section. It is a 750 mm main which is planned to serve the whole of the Leduc Estates and Lakeside Estates, Windrose area and additional areas to the SE. It has recently been determined that this main has the capacity to service part of the West Haven Estates area, although the extent of gravity servicing will be limited to the two multi-family sites located in the northeast corner of the Plan area, assuming the minimum floor elevations of future buildings will be at or near the existing ground level.

According to the City of Leduc's Long Range Infrastructure Servicing Plan of 1992, the primary sanitary trunk serving the remainder of West Haven Estates will be a new trunk main running north/south in the middle to western third of the Plan area. When constructed, this trunk main will be oversized to accommodate future development to the south. However, as the time frame for its construction and thus for development of subsequent phases of West Haven Estates is not yet known, it may be necessary to construct a temporary lift station in the vicinity of the Highway #39/50 Avenue commercial site to facilitate further development until the trunk sewer to the north is constructed. Any plans to construct a temporary lift station will be reviewed with the landowner to the north in order to coordinate interim servicing for both properties and will be subject to the City's final approval..

The locations of these sanitary sewer trunk mains and their diameters are shown on Figure No. 8 along with the potential temporary lift station site.

4.3 STORMWATER MANAGEMENT

The natural drainage for West Haven Estates is generally towards the existing dugout in the central portion of the north part of the subject site, except for the southwestern portion of the quarter section. This drainage pattern will be slightly altered, as shown on Figure No. 9, to have the whole area drain towards the proposed stormwater management facility (which is split in two by Black Gold Drive). The controlled stormwater pond outlet will flow through a storm sewer pipe north to Highway #39/50 Avenue and then east into the existing 600 dia. storm outfall culvert as shown on Figure No. 9. The existing culvert will be twinned as necessary to provide the capacity needed to convey the flow north into Deer Creek, all to be validated by the City of Leduc prior to development.

A stormwater management study will be undertaken prior to approval of any subdivision for urban development. The dimensions and outline of the stormwater management facility in this Plan may be adjusted after the study is accepted by the City of Leduc and Alberta Environment.

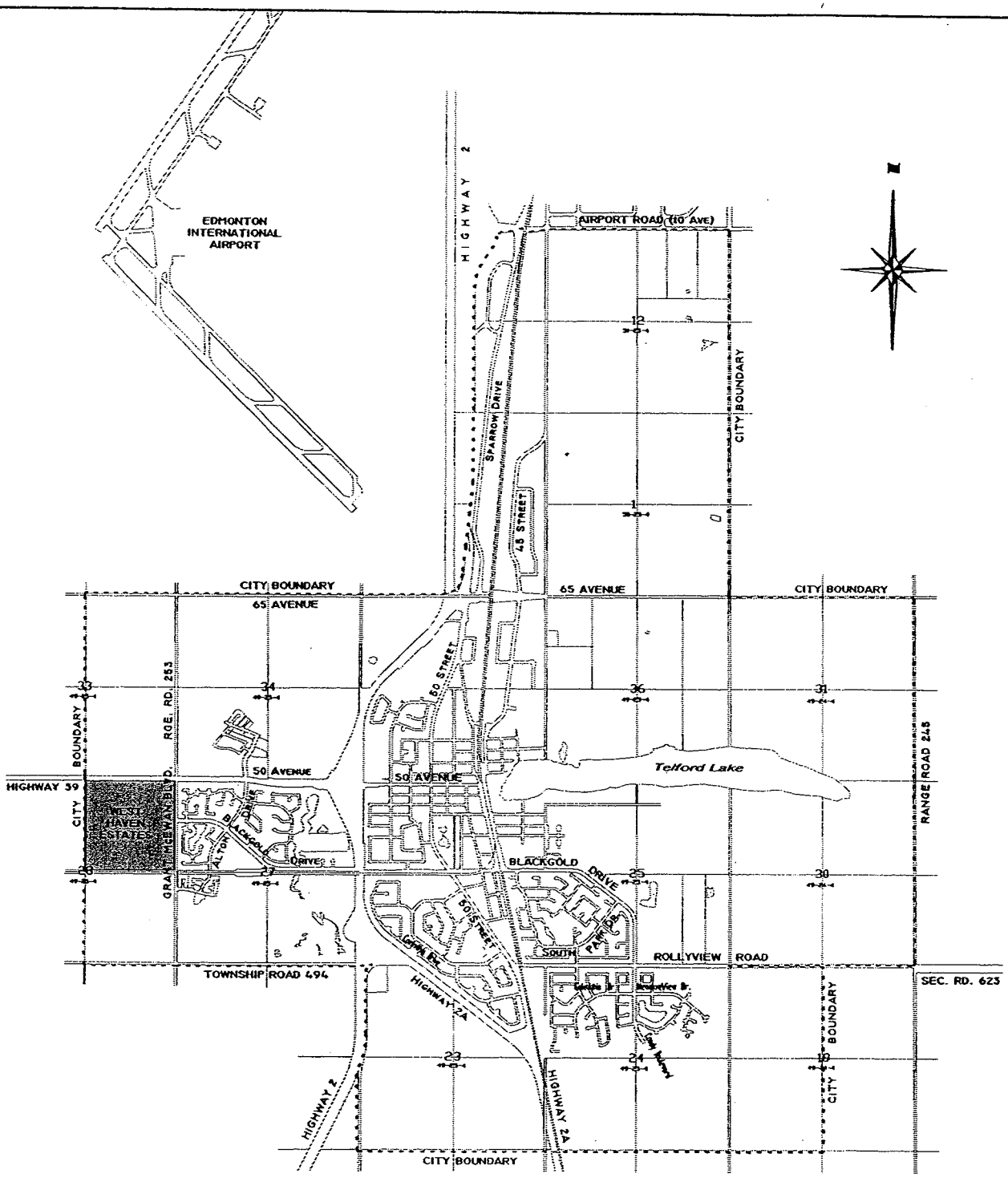
4.4 SHALLOW UTILITIES

Natural gas, electrical power, telephone and cable television are available for West Haven Estates and would be extended in conjunction with development.

4.5 DEVELOPMENT STAGING

A conceptual staging pattern is shown on Figure No. 6. It is to commence from the northeastern corner of the subject site and proceed in a southerly direction. Once the south portion of the eastern half of the subject site is reached, the western half of the subject site will be developed, from the north to the south. The construction of the stormwater management facility would be staged as required to control off-site stormwater release rates; however, the first part of the stormwater management facility is located within the first stage of development.

The rate of development is subject to changing market conditions.



WEST HAVEN ESTATES

NOTES / LEGEND

1. ASP BOUNDARY
2. CITY BOUNDARY
3. TITLED AREA 63.1 HECTARES

Scale 1:50,000 500 0 500 1000 1500 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

CONTEXT PLAN

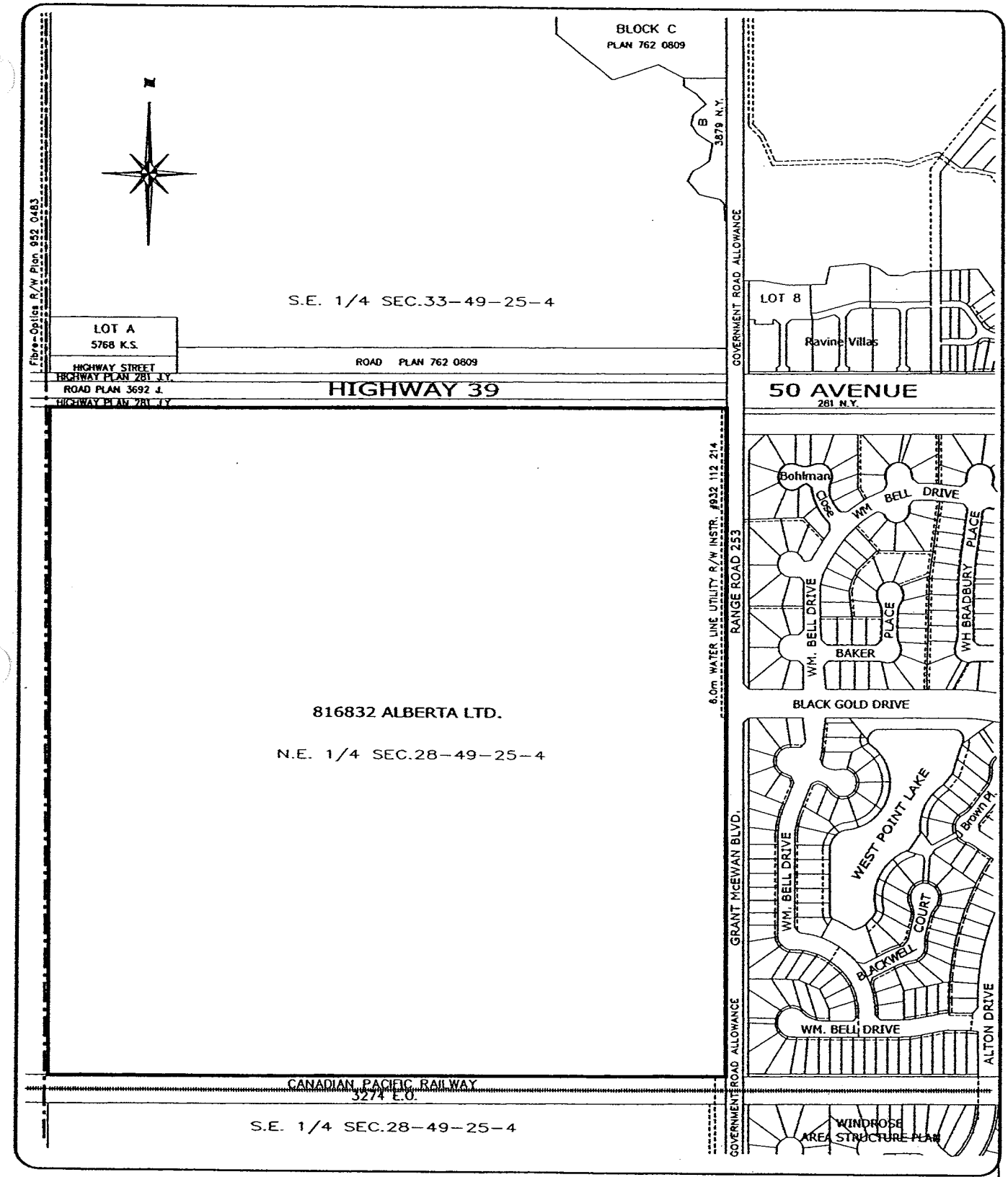
N.E.1/4 SEC.28, TWP.49, RGE.25, W.4th M.

City of Leduc

JAN., 2002

gpec

FIGURE No. 1



NOTES / LEGEND

1. ASP BOUNDARY
2. CITY BOUNDARY
3. TITLED AREA — 63.1 HECTARES
4.

Scale 1:4500 60 30 0 60 120 180 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

LAND OWNERSHIP

N.E.1/4 SEC.28, TWP.49, RGE.25, W.4th M.

City of Leduc

JAN., 2002

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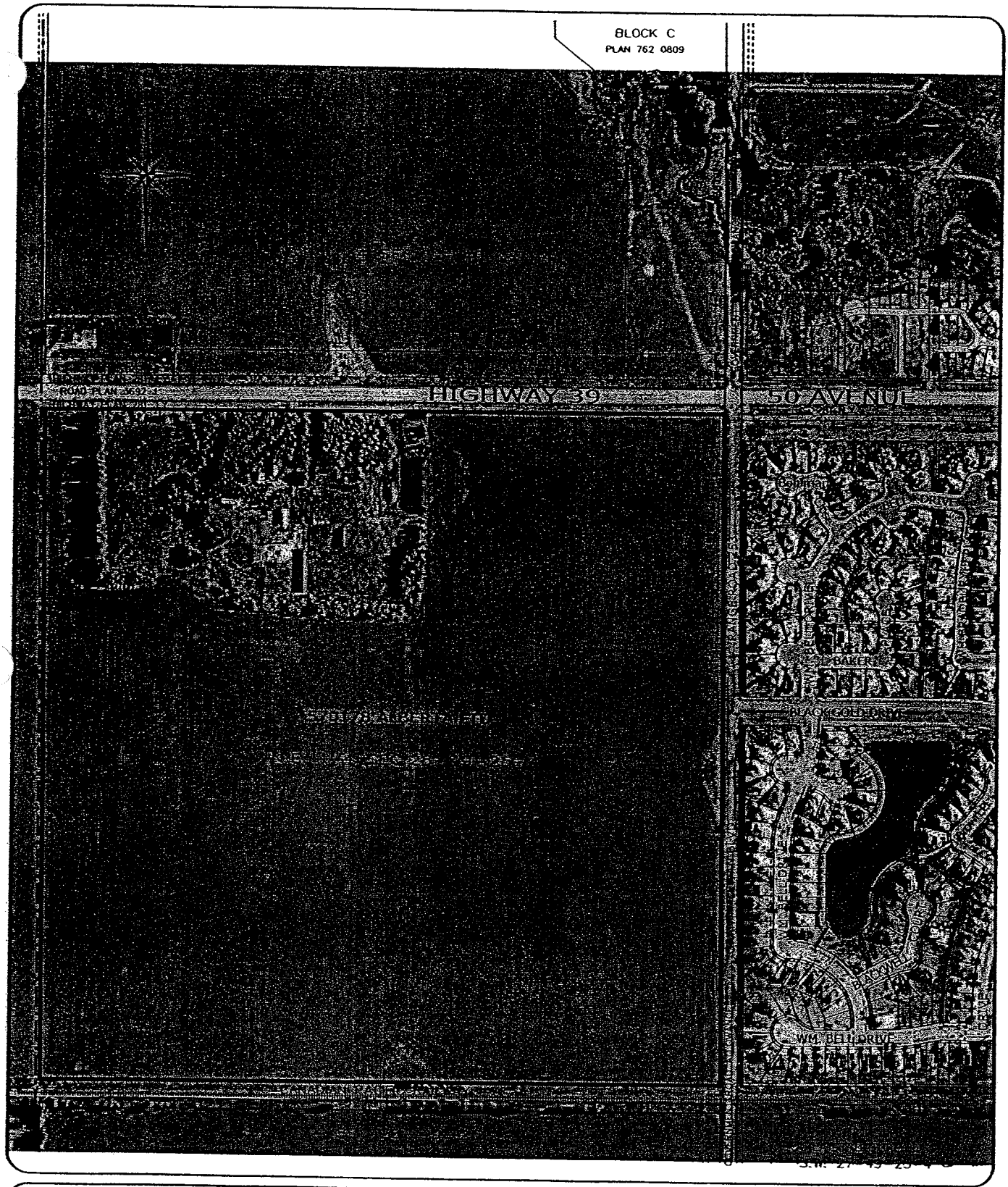
FIGURE No. 2



NOTES / LEGEND

1. ASP BOUNDARY
2. CITY BOUNDARY
3. TITLED AREA 63.1 HECTARES
4.

Scale 1:6000 60 30 0 60 120 180 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

PHOTOGRAPH

N.E.1/4 SEC.28, TWP.49, RGE.25, W.4th M.

City of Leduc

JAN., 2002

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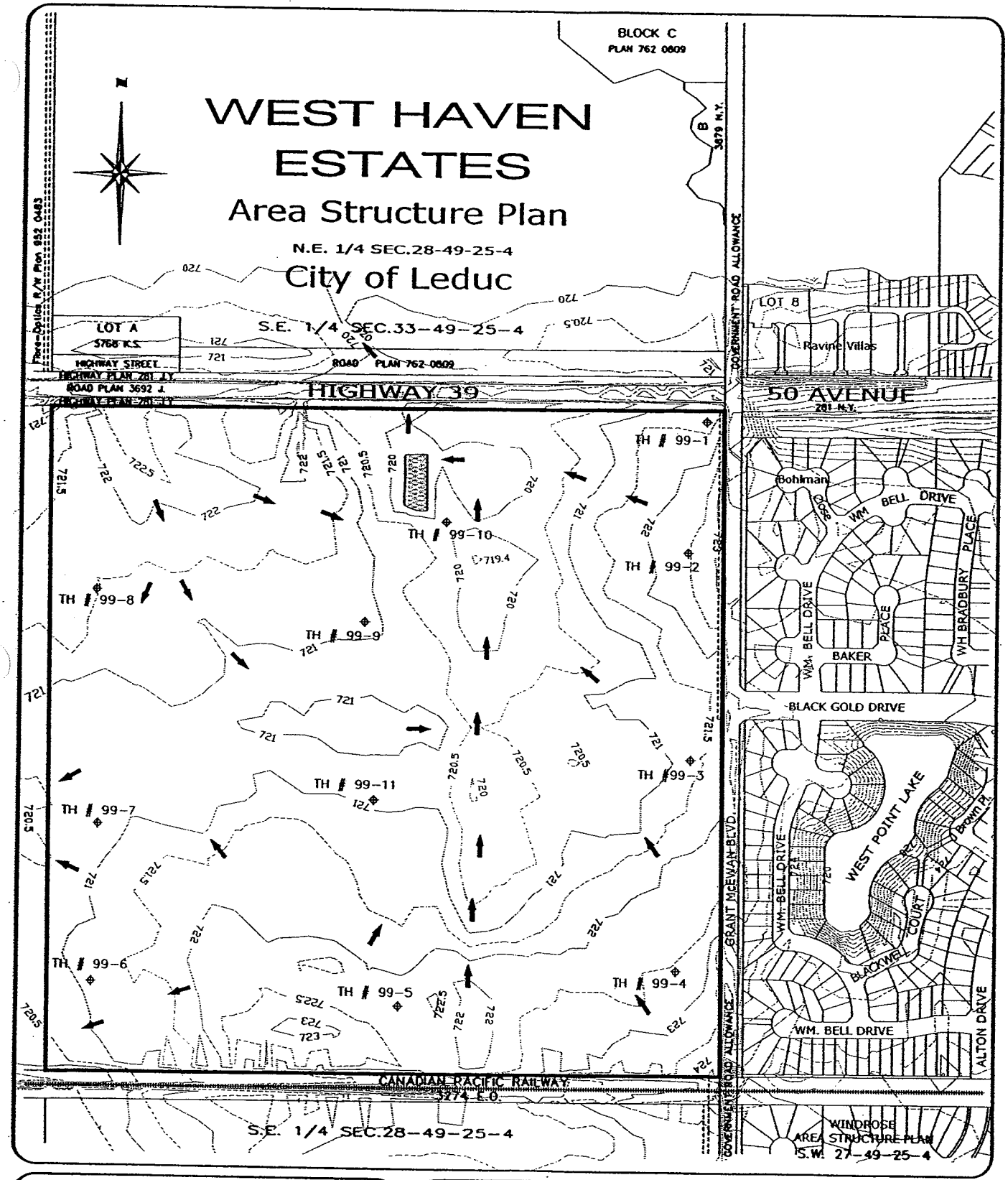
FIGURE No. 3



NOTES / LEGEND

1. ASP Boundary
2. Contours shown at 0.5 metre intervals
3. Existing Surface Storm Flows
4. Geotechnical Testhole Location

Scale 1:6000 60 30 0 60 120 180 Metric

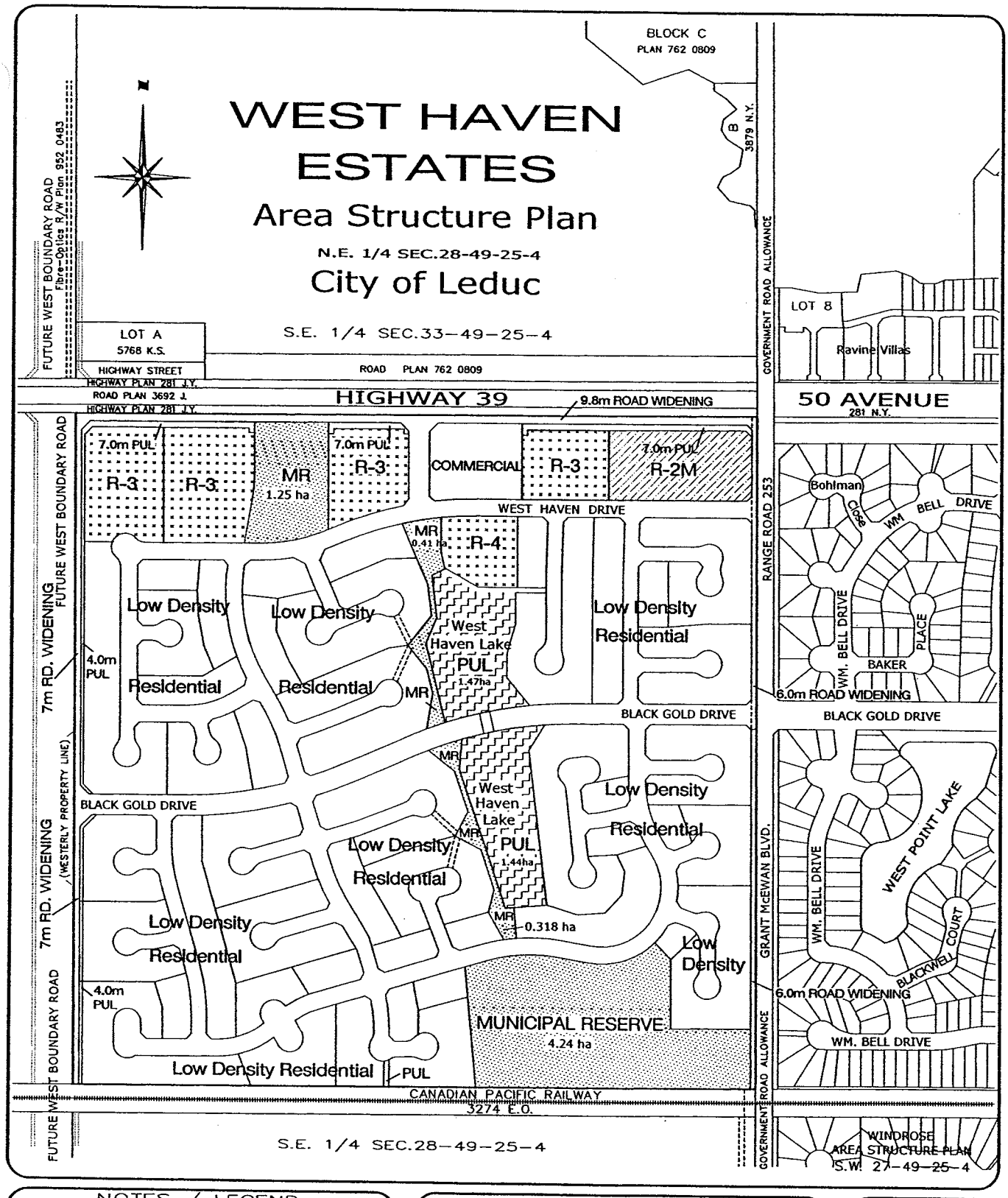
WEST HAVEN ESTATES AREA STRUCTURE PLAN

SITE CONDITIONS

JAN., 2002

gpec

FIGURE No. 4



NOTES / LEGEND

1.	ASP Boundary	63.1 ha
2.	C-3 Commercial	1.0 ha
3.	R-3 Residential	4.5 ha
5.	R-4 Residential	0.6 ha
6.	R-2M Residential	1.4 ha
7.	Low Density Residential	30.6 ha
8.	MR Municipal Reserve	6.2 ha
9.	PUL Public Utility Lot	4.1 ha
10.	Public Roadways	14.6 ha

Scale 1:2500 60 30 0 60 120 180 Metric

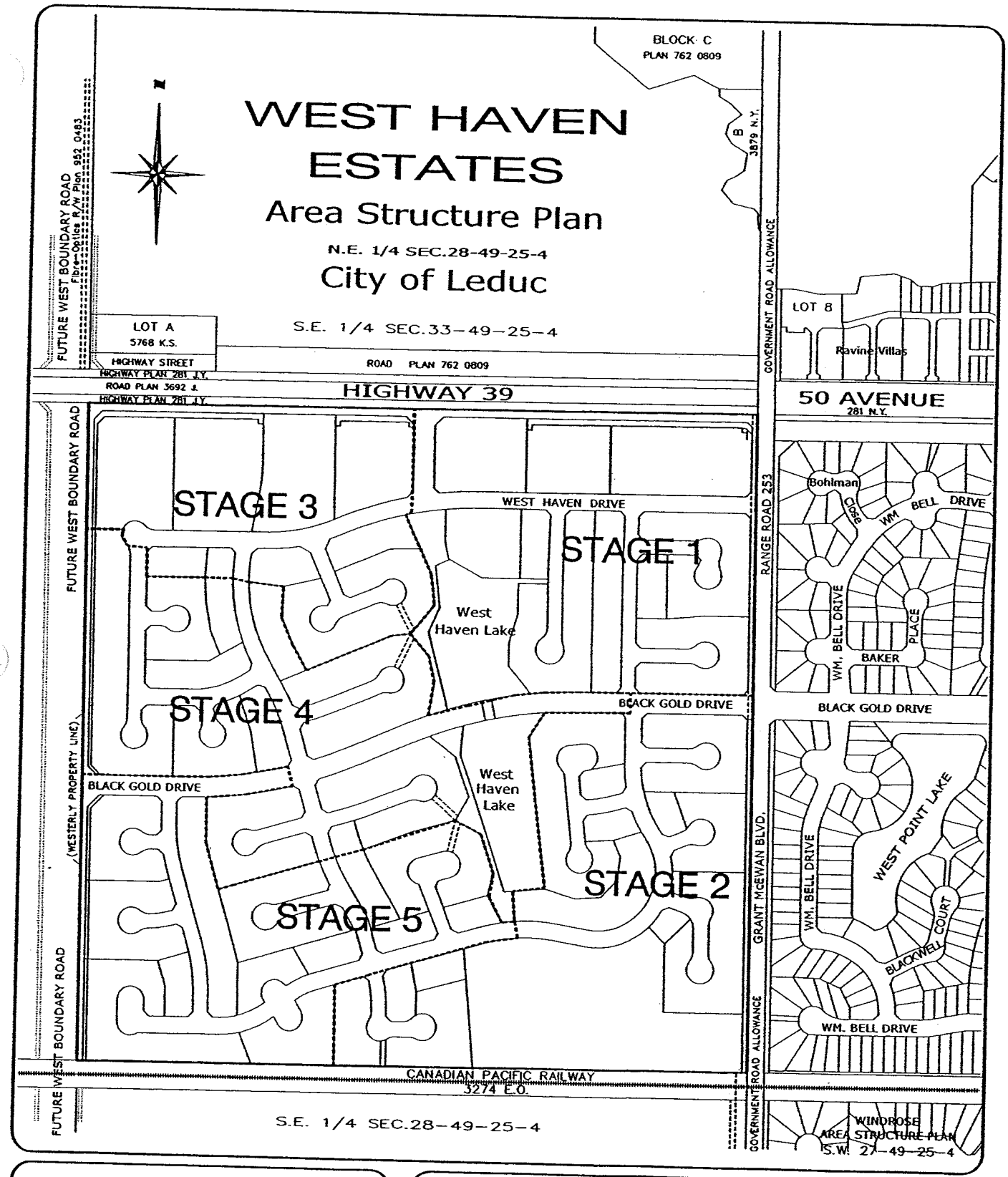
WEST HAVEN ESTATES AREA STRUCTURE PLAN

DEVELOPMENT CONCEPT

JAN., 2002
REVISED JAN., 2004
REVISED FEB., 2005
REVISED MARCH, 2005

gpec

FIGURE No. 5



NOTES / LEGEND

1. ASP Boundary
2. Stage Boundary

Scale 1:6000 60 30 0 60 120 180 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

DEVELOPMENT STAGING

JAN., 2002
REVISED: FEB., 2005
REVISED: MARCH, 2005

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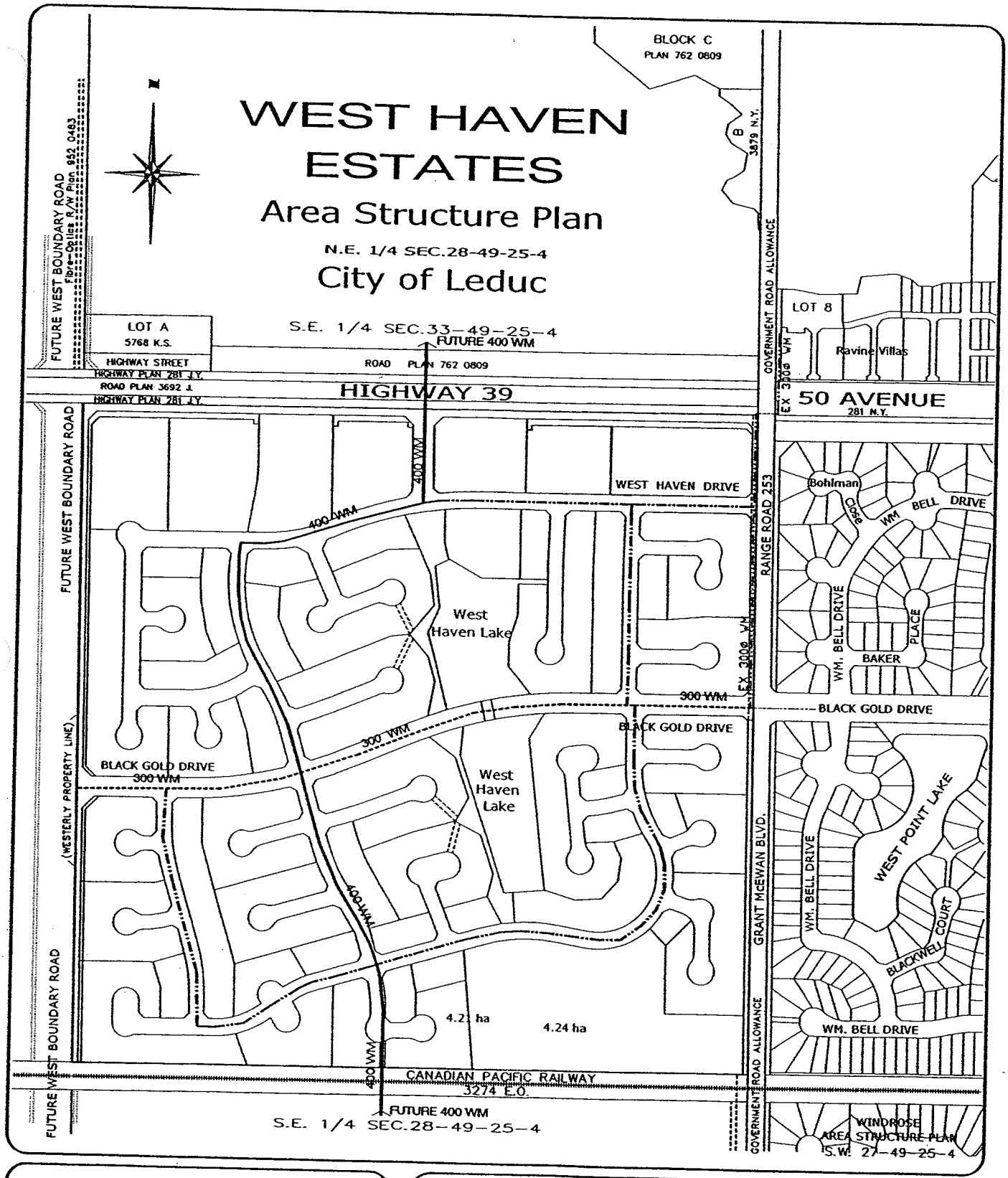
FIGURE No. 6



NOTES / LEGEND

1. ASP Boundary
2. Proposed Watermain 400
3. Proposed Watermain 300
4. Proposed Watermain 250
5. Existing Watermain

Scale 1:6000 60 30 0 60 120 180 Metric

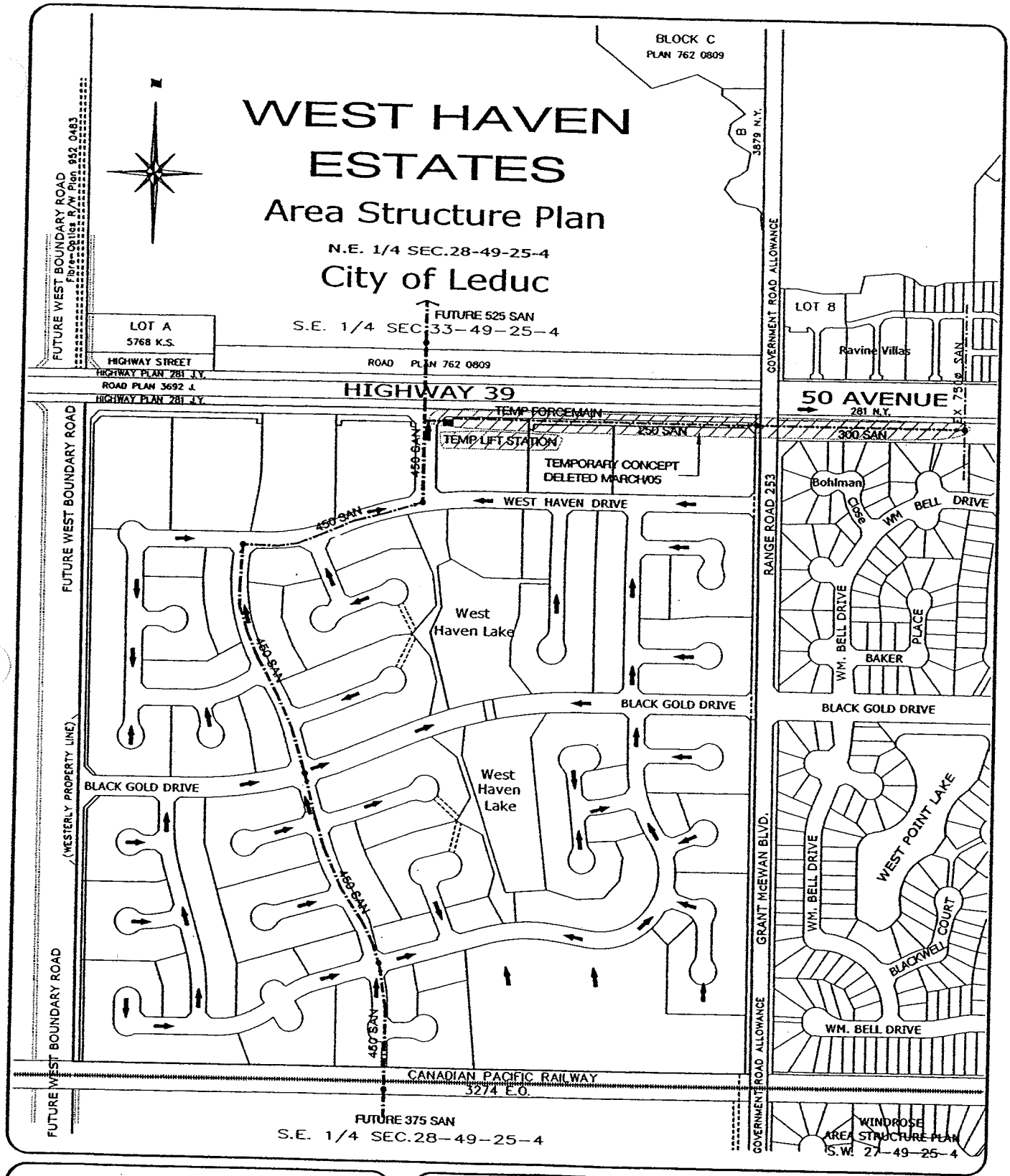
WEST HAVEN ESTATES AREA STRUCTURE PLAN

WATER DISTRIBUTION

JAN., 2002
REVISED: FEB., 2005
REVISED: MARCH, 2005

gpec

FIGURE No. 7



NOTES / LEGEND

1. ASP Boundary
2. Proposed Sanitary Trunk
3. Existing Sanitary Trunk
4. Direction of Sanitary Drainage

Scale 1:6000 60 30 0 60 120 180 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

SANITARY SEWER SERVICES

JAN., 2002
REVISED: FEB., 2005
REVISED: MARCH, 2005

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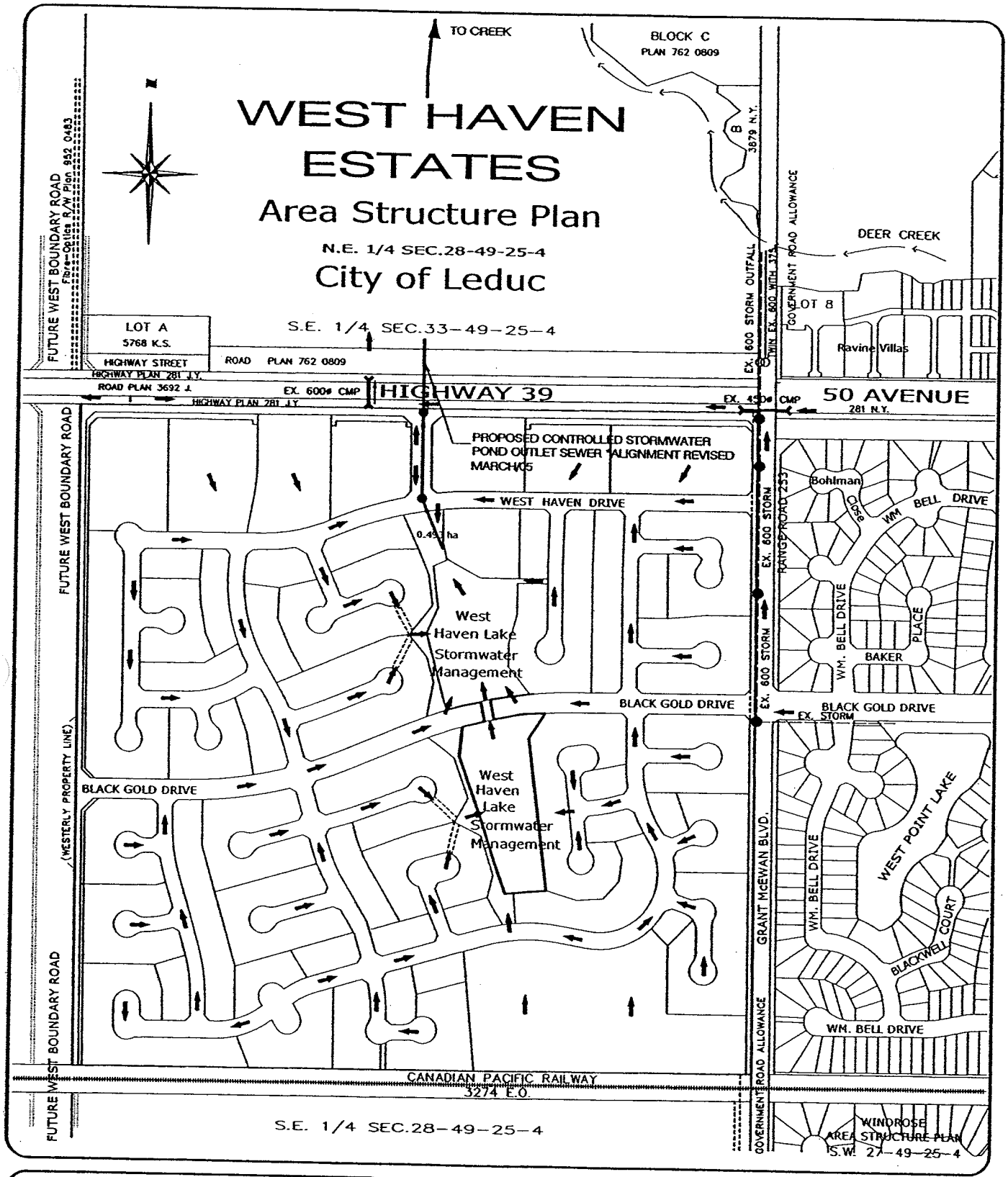
FIGURE No. 8



NOTES / LEGEND

1. ASP Boundary
2. Proposed Storm Outfall
3. Existing Storm Outfall
4. Direction of Major Storm
5. Culvert

Scale 1:6000 60 30 0 60 120 180 Metric

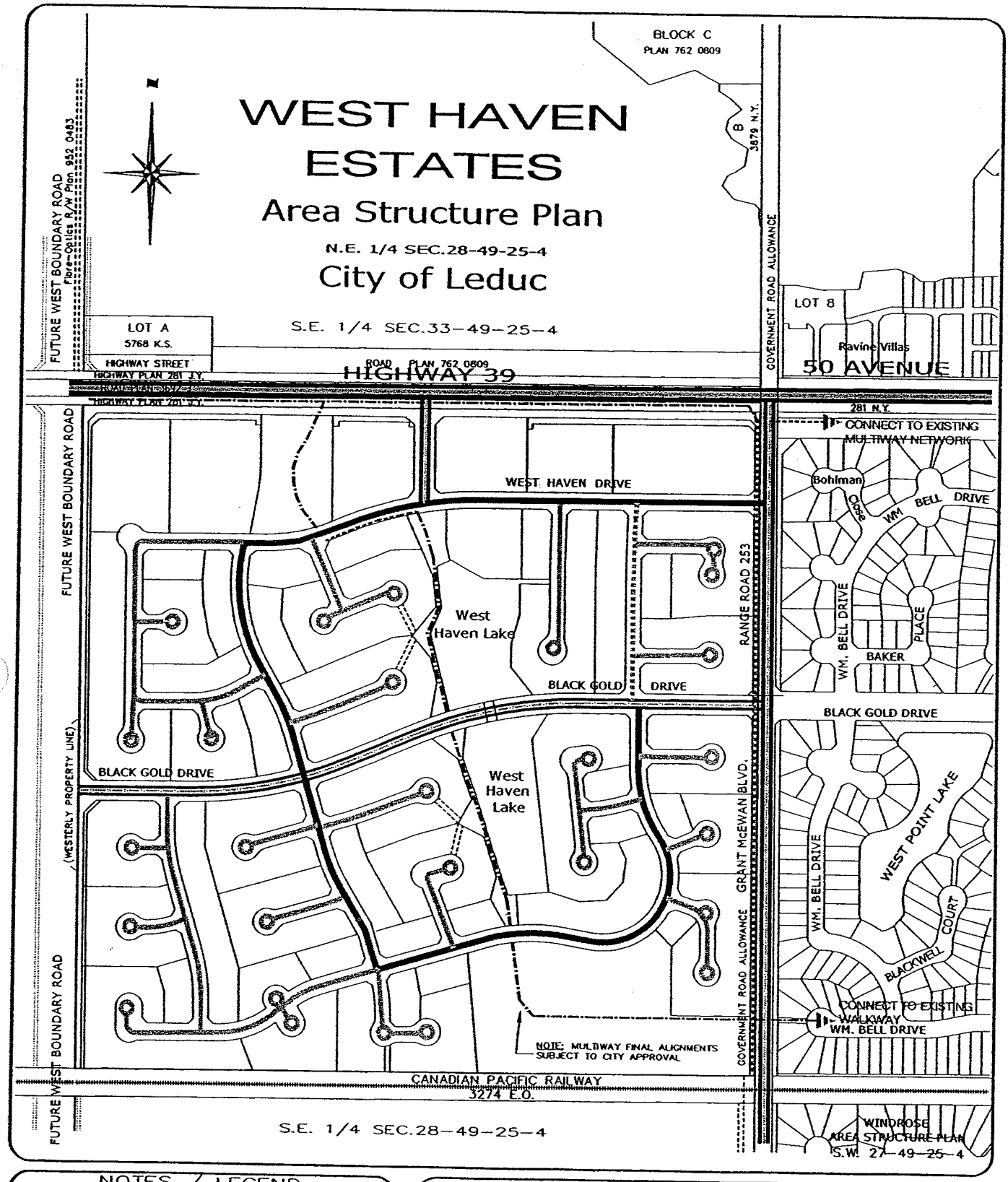
WEST HAVEN ESTATES AREA STRUCTURE PLAN

STORMWATER MANAGEMENT

JAN., 2002
(Amended Jan. 21, 2002)
REVISED: FEB., 2005
REVISED: MARCH, 2005

gpec

FIGURE No. 9



NOTES / LEGEND

1. ASP Boundary
2. Arterial
3. Major Collector 13.0m /24m ROW
4. Collector 11.5m /20m ROW
5. Local 9m/18m ROW
6. Local 9.5m/18m ROW
7. Multiway 2.5m/6 ROW
8. Multiway 3.0m/6 ROW

Scale 1:6000 60 30 0 60 120 180 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

TRANSPORTATION NETWORK

JAN., 2002
REVISED: FEB., 2005
REVISED: MARCH, 2005

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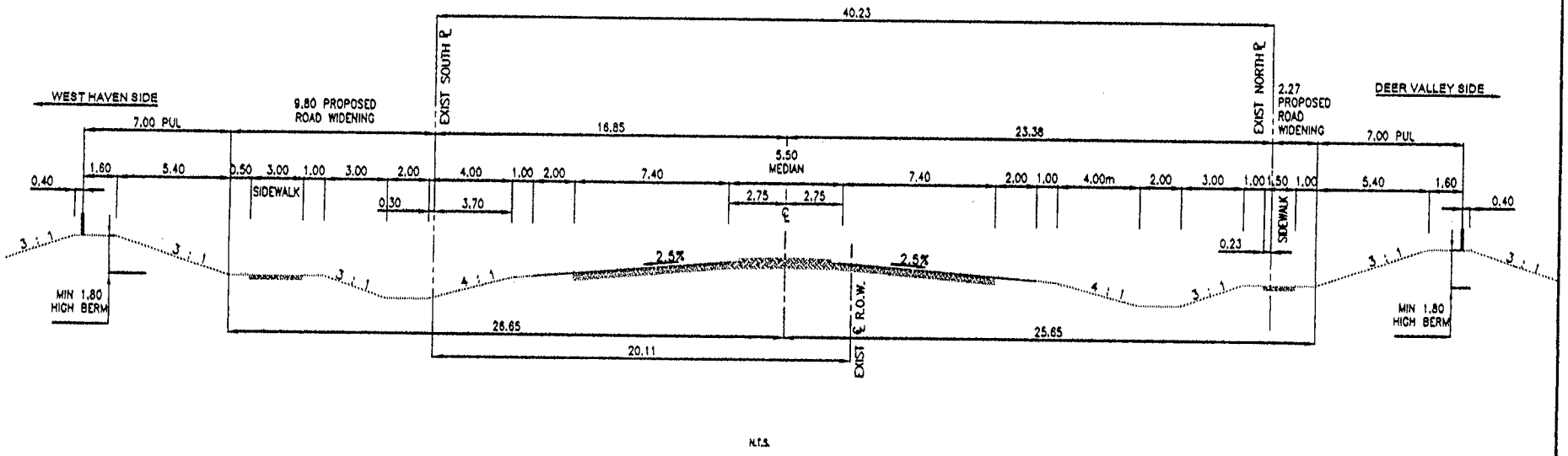
FIGURE No. 10



4 LANE DIVIDED ARTERIAL - RURAL
HWY 39 LOOKING WEST
WEST OF GRANT MacEVAN BLVD.

WEST HAVEN ESTATES AREA STRUCTURE PLAN

PROPOSED HWY 39 X - SECTION

JAN., 2002
REVISED MARCH, 2005

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FIGURE No. 11

WEST HAVEN ESTATES
AREA STRUCTURE PLAN
CITY OF LEDUC

prepared for

816832 ALBERTA LTD.

in association with

E/A LEE CONSULTING LTD.

and

gpec Consulting Ltd.

JANUARY 2002

WEST HAVEN ESTATES
AREA STRUCTURE PLAN
CITY OF LEDUC

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   - August 1999

B. Environmental Site Assessment–Phase 1 by Hoggan Engineering and Testing (1980) Ltd. August 1999

C. Figure No. 5-Development Concept
   - at 1:2500 scale (attached in pocket)

WEST HAVEN ESTATES
AREA STRUCTURE PLAN

CITY OF LEDUC

1.0 - INTRODUCTION

1.1 PURPOSE

The purpose of the West Haven Area Structure Plan is to provide a framework for the residential development of a quarter section of land at the western edge of the City of Leduc. As provided in Section 633 of the Municipal Government Act, 1994, as amended, an Area Structure Plan must describe the proposed land uses, population density, transportation routes, public utilities, and sequence of development or staging of an area proposed for development.

1.2 LOCATION AND AREA

The West Haven Estates Area Structure Plan area (the subject site) comprises approximately 63.1 ha (156 ac.) at the western edge of the City of Leduc. The boundaries of the subject site are: on the North, Highway #39/50 Avenue; on the west, the City's boundaries; on the south, a Canadian Pacific Rail line (south of which is agricultural land); and on the east, Grant MacEwan Blvd., which is the former west boundary of the City of Leduc. East of Grant MacEwan Blvd. is the residential area of Lakeside Estates and Leduc Estates (Figure No. 1).

The legal description of the area is NE 28-49-25-W4.

1.3 BACKGROUND

The development of West Haven Estates is the logical outcome of residential expansion on the west side of Highway #2 in the City of Leduc and in the Leduc Estates and Lakeside Estates Outline Plan of 1974. The broad concepts presented in that Outline Plan have served as a guide to all subsequent developments west of Highway #2 since that time, including the development of Leduc Estates and Lakeside Estates and the Windrose area to the south of Leduc Estates (southeast of the subject site).

The 1974 Outline Plan showed Black Gold Drive continuing westerly to Grant MacEwan Blvd. Black Gold Drive is a major roadway in the overall Leduc concept, connecting the eastern and western portions of the City and located 0.8 km (0.5 miles) south of 50 Avenue.

The West Haven Estates site, together with two quarter sections to the north and one quarter section to the south, were recently annexed to the City of Leduc from Leduc County. This annexation all but directs that development take place on the subject site in the immediate future.

1.4 LAND OWNERSHIP

The site comprises 63.1 ha (156 ac.) of land held under Certificate of Title 012-239-694 in the name of 816832 Alberta Ltd. A total of 1.6 ha (4 ac.) of land has been removed from the northern boundary of the original quarter section for roadway widening. The Canadian Pacific Railway right-of-way (Registered Plan 3274EO) is located immediately adjacent to the southern boundary of the subject quarter section and entirely on the quarter section to the south.

The title is subject to a Plains Western Gas & Electric Co. (now AltaGas Utilities) easement, an AGT (now Telus Communications) easement, and a City of Leduc easement. Only the City easement, which runs along the northern half of the eastern property line, is significant, as it is the location of a water line utility (Figure No. 2).

1.5 PLANNING COMPLIANCE

The Municipal Development Plan for the City of Leduc has recently been revised to take into account the area annexed to the City from Leduc County.

The revised Municipal Development Plan establishes the broad, citywide framework of development for the City. As such, it designates this subject site for residential development and establishes various broad policies under which development will occur. The West Haven Area Structure Plan has been prepared under the provisions of the Municipal Government Act, 1994, as amended, which provides for the adoption of Area Structure Plans by Bylaw in accordance with the City's Municipal Development Plan. The Area Structure Plan has also been prepared in consideration of the terms of reference for Area Structure Plans provided by the City of Leduc.

2.0 - SITE ANALYSIS

2.1 SITE CONTEXT

West Haven Estates lies immediately to the west of the residential area of Leduc Estates and Lakeside Estates, a residential community which occupies approximately 80 ha (200 ac.). West Haven Estates is separated from Leduc Estates and Lakeside Estates by Grant MacEwan Blvd. Black Gold Drive is a major collector road, which runs east/west from the east side of the City to Grant MacEwan Blvd. Black Gold Drive is a potential access to West Haven Estates, as is Highway #39/50 Avenue itself, either directly or via Grant MacEwan Blvd.

The east limit of West Haven Estates is defined by Grant MacEwan Blvd. The area to the east of Grant MacEwan Blvd. is occupied by residential development - single detached homes on normal-sized lots.

St. Benedict Separate Elementary School and Leduc Estates Public Elementary School are located approximately 0.4 ha (0.25 miles) east of the east boundary of West Haven Estates. The development of West Haven Estates and the Windrose area to the south of Leduc Estates and Lakeside Estates (where some development has taken place to date), together with existing residential development, will provide a residential area of about 200 ha (495 ac.).

The boundary to the west of West Haven Estates is the new City of Leduc boundary, with agricultural lands on the opposite side of the boundary. With recent annexations, of which West Haven Estates is a part, there is sufficient land within the city limits to provide for at least a doubling of the City's population. Thus, this boundary will remain an urban/rural interface for the foreseeable future.

Highway #39/50 Avenue defines the north boundary of West Haven Estates. The land to the north of Highway #39/50 Avenue is currently in agricultural production. However, an area structure plan has been proposed to develop this area for residential and commercial uses.

The Canadian Pacific Rail line defines the south boundary of West Haven Estates. Though land to the south of this rail line is currently in agricultural production, it is expected that this area will also eventually develop into residential uses as well as West Haven Estates.

Thus, the development of West Haven Estates comprises orderly and economical development of the City of Leduc to the west.

2.2 SITE CONDITIONS

At present, the West Haven Estates site is under agricultural use. There is a small tree stand and man-made water body (dugout) in the central portion of the site near the northern boundary (Figure No. 3).

Most of the site slopes from the east and northwest to this dugout. The southwestern portion of the subject site, however, slopes towards the southwest. The high elevation is 724 m near the southeastern corner of the subject site to a low of 720 m at the dugout. The overall elevation difference thus is about 4 m over 800 m, an average gradient of about 0.5%. Thus, slopes are fairly gentle, with natural drainage following the slopes of the land (Figure No. 4).

A geotechnical investigation of the subject site was undertaken in 1999. The resulting report indicates that the site's general soil stratigraphy consists of topsoil and organic clay overlying silty clay of medium plasticity over a clay till. There is shale bedrock below the clay till.

The report indicates that generally the subsurface soil conditions encountered were suitable for standard concrete footings for residential dwellings.

The report also indicates that the subsurface soil conditions for the site are considered fair to satisfactory for the installation of underground utilities and construction of roadways. In some areas, utility trench shoring and roadway subgrade modification may be required due to higher than optimum water table. The extent will depend, somewhat, upon the final design grades established.

3.0 - DEVELOPMENT CONCEPT

3.1 DEVELOPMENT OBJECTIVES

The West Haven Estates Area Structure Plan provides an overall framework for the development of the subject site.

Key objectives, which have guided the preparation of the West Haven Estates Area Structure Plan area as follows:

1. to create an attractive residential environment that is complementary to and integrated with the adjacent Leduc Estates and Lakeside Estates area;

2. to create a parks and recreation system that enhances the quality of life for area residents and that complements the City's park/multiway system;

3. to provide a safe and convenient transportation and circulation system that directs traffic to Grant MacEwan Blvd., Black Gold Drive, Highway #39/50 Avenue, and the proposed western bypass road located on the west boundary of the Area Structure Plan area, while providing a safe link to the area schools;

4. to provide an appropriate school site which will satisfy the Black Gold School Division's requirements; and

5. to achieve orderly and economical expansion of the City of Leduc within the capabilities and guidelines of its servicing systems.

3.2 THE DEVELOPMENT CONCEPT

3.2.1 General

The general development concept for the subject site is shown in Figure No. 5 while the development statistics are shown in Table No. 1. One site for medium density semi-detached style housing and four sites for higher density row and/or apartment housing sites are located in the northern portion of the Plan area.

The overall circulation system is specifically designed to direct traffic to Grant MacEwan Blvd., to Black Gold Drive, and to Highway #39/50 Avenue. A minor internal road loop is also designed to accommodate local traffic within the Plan area.

A central park/stormwater retention pond site is shown, bisected by Black Gold Drive. As well as serving a utility function, this site will provide substantial amenity to the Plan area. Small park areas are associated with the pond, serving as a link within the Citywide multiway system. An entrance park will be located at the south end of the main central entrance road to provide a welcoming amenity to future residents and visitors.

Two further parks are provided within the Plan area. One is currently occupied by an area of substantial, mature trees, which can be utilized for local open space purposes. The other, on the southeastern boundaries of the quarter section, will also be the location of an elementary school.

As well as meeting a convenience commercial need within the community as a whole, one small commercial site in the north central area of the quarter section will be designed to serve the traveling public on Highway #39/50 Avenue. Access to both the community and to the Highway will be provided via the central entrance road to the Plan area and West Haven Drive. Appropriate visual design and landscaping will be required as a condition of the development of this commercial site to limit the impact of commercial development on adjacent residential uses through the use of planting and fencing, as required by the City.

TABLE NO. 1
LAND USE SUMMARY
WEST HAVEN ESTATES AREA STRUCTURE PLAN

Land Use	Area (ha)	%	Dwelling Units	%	Population	%
Gross Area	63.1	100.0				
Roadways	14.6	23.1				
PUL (including storm pond)	4.4	7.0				
Municipal Reserve	6.3	10.0				
Commercial	1.0	1.6				
Residential	36.8	58.3	708	100.0	2026	100.0
Low Density (R-1)	31.1	49.3	498	70.3	1594	78.7
Medium Density (R-2M)	1.2	1.9	30	4.2	72	3.6
Higher Density (R-3)	4.5	7.1	180	25.5	360	17.7

Overall residential density: 32.1 persons per gross hectare

Assumptions:

1. Residential densities
   - Low Density — 16 dwellings per net hectare
   - Medium Density — 25 dwellings per net hectare
   - Higher Density — 40 dwellings per net hectare
2. Population densities
   - Low Density — 3.2 persons per dwelling
   - Medium Density — 2.4 persons per dwelling
   - Higher Density — 2.0 persons per dwelling

TABLE NO. 2
POTENTIAL STUDENT POPULATION
WEST HAVEN ESTATES AREA STRUCTURE PLAN

	K-6	7-9	10-12	Total
Public System	155	63	63	281
Separate System	84	34	33	151
Total	239	97	96	432

Assumptions:

1. Number of Students per dwelling 0.61
   Number of dwellings: 708

2. Proportion of Students in Public System 65%
   Proportion of Students in Catholic System 35%

Finally, the Plan shows appropriate widening of Highway #39/50 Avenue and Grant MacEwan Blvd., a portion of the right-of-way for the proposed western bypass road, and Public Utility Lots adjacent to Highway #39/50 Avenue and the proposed western bypass road, within which berms and fences will be built, designed to provide noise and visual attenuation between the residential areas from these major roadways.

Berms will be constructed so as to minimize the potential for invasion of privacy by persons walking or riding on the berm - to wit, the property line (between the Public Utility Lots and the residential properties) will be at the top of the berm and a fence will be erected along that property line. Private land owners will have responsibility for the fence and portion of the berm on their properties and public access will be limited to the portion of the berm adjacent to the roadway. The Public Utility Lots and the berms will also "wrap around" the ends of the residential areas (as shown on Figure No. 5) so as to increase the efficacy of the berms at their ends. Noise attenuation measures will be provided to protect the medium density semi-detached housing area located in the northeast corner of the quarter section.

The Public Utility Lot (and the berm) strip is interrupted at the park area in the northwestern portion and the commercial site in the north central portion of the Plan area in order that there be no implication that a berm will be constructed in that area. Such construction might negatively impact the mature trees in that area adjacent to the Highway and the visibility of the commercial site.

3.2.2 Residential Land Use

Westhaven Estates will offer a range of low to higher density residential development. The neighbourhood will provide primarily single detached housing located on a variety of lot sizes, together with a number of dwellings in medium and higher density forms.

The concept identifies one site for medium density semi-detached housing located as shown on Figure No. 5. It is planned that this site adjacent to Grant MacEwan Blvd. will be limited in height to 1 or 2 storeys, which is lower than the height allowed in the City's

Land Use Bylaw. It is anticipated that this site may be developed for the active adult market and will feature semi-detached housing forms.

Four sites for higher density housing are also located as shown on Figure No. 5. It is anticipated that these sites may be developed in row and/or low-rise apartment housing.

Low-density residential development will develop in the forms allowed within the R-1A, R-1B, and R-1C Districts in the City's Land Use Bylaw. For the most part, R-1A areas will be adjacent to and near the stormwater retention pond, and R-1C areas will be on the periphery of the Plan area, with R-1B areas filling the interstices. However, the specific classifications will be determined at the time of subdivision and development of the specific areas.

Low-density residential land use will occupy 31.1 ha (49.3 % of all the land in the Plan area) and medium and higher density residential development will occupy 5.7 ha (9.0%).

The overall residential density is estimated will be 32.1 persons per gross hectare, with a ratio of low-density residential units to multiple family units of 70%/30% (a bit more than 2.3/1).

3.2.3 Parks, Open Space and Walkways

Parks and open space is dispersed within the Area Structure Plan area to serve the local needs of the immediate area as well as the broader community. The major open space feature is in the southeastern portion of West Haven Estates, associated with a public elementary school site. Two other small park areas are located within the Plan area. The one in the northwestern portion of West Haven is the site of a well-treed area, and it is anticipated that this site will serve local recreational needs. The other park is located south of the central entrance road and along the western side of the storm pond, which will serve as a link within the City's multiway system. The larger area in the north of this linear park is intended to provide a recreation area with a welcoming impression to the residents and visitors of the community.

The stormwater management facility in the central portion of the Plan area, bisected by Black Gold Drive, will be a major landscape feature and amenity, although the pond itself will not qualify for Municipal Reserve credit. The pond will be visible from many parts of the Plan area, including all the substantial east/west roadways. More than half of the shoreline will have public access - approximately 50% from the multiway path along the shoreline on a 5 m wide flat area, and approximately 15% directly from roadways. This will provide for visibility of more than 20% of the pond as required by City policy.

Walkways will be located within the Plan area to join culs-de-sac with each other and to provide pedestrian routes to the school/park site in West Haven Estates and to the stormwater retention pond/park.

The open space system will be linked to Leduc's multiway trail system. The multiway will be located on the MR/School site at the southeastern corner of the Plan area, along

the storm water pond and link along a widened sidewalk on West Haven Drive north to the MR in the northwestern corner of the Plan area. Links with this multiway corridor and the neighbourhood parks/school site will be provided along the local and/or collector street network, together with the walkways between them. The multiway may also be located around the perimeter of West Haven Estates, as shown on Figure No. 10.

As shown in Table 1, the components of the open space system comprise 10.0% of the gross developable area of the Area Structure Plan area. These components will be dedicated as Municipal Reserve to meet the requirement for Reserve dedication pursuant to the Municipal Government Act, 1994, as amended.

3.2.4 Schools

An elementary school is proposed for West Haven Estates within the Municipal Reserve along the southeastern boundaries of the Plan area. No junior high school site is provided. A junior high school may be developed in the quarter section to the south of West Haven Estates when that quarter section is developed.

3.2.5 Commercial Land Use

One small (1.0 ha/2.47 ac.) commercial site is provided for in the Plan area. The population of West Haven Estates would be sufficient to support this neighbourhood commercial site; however, the populations of West Haven Estates, Leduc Estates and Lakeside Estates, Windrose, and the neighbourhoods north of Highway #2 would be large enough to support additional sites to the north of the Plan area.

With such a market area, the site must have access to the other areas. Thus, the commercial site is located adjacent to Highway #39/50 Avenue at the central main entrance road. As well, such a location would benefit from exposure to Highway #39/50 Avenue traffic.

It is anticipated that convenience-type commercial retail and service uses would be located at this site, including a bank, personal service shops (dry cleaners/beauty salon), convenience/fast food shops, a convenience retail store, and a gas bar. Access to Highway #39/50 Avenue will be carefully regulated; however it is anticipated that full access will be provided to West Haven Drive and the central entrance road (as shown on Figure No. 5). The commercial facility would be designed to face Highway #39/50 Avenue and the central entrance road, but not leave a blank wall or other unsightly facade facing West Haven Drive.

As well, appropriate visual and noise attenuation buffers will be required as a condition of the development of the commercial site to limit the impact of the commercial development on adjacent residential land uses within West Haven Estates to the east of the commercial site.

3.2.6 Other Land Uses

No sites are designated for religious assembly. It is felt that religious assembly sites would more appropriately be placed at more central locations or along major roadways.

There has been no identified need for additional community facilities in West Haven Estates.

3.3 TRANSPORTATION AND CIRCULATION

3.3.1 Access and External Roadway System

The general development concept for the subject site proposes access to West Haven Estates from Highway #39/50 Avenue, Grant MacEwan Blvd., Black Gold Drive and the future west boundary road. An internal loop road system is designed to facilitate local traffic and to encourage circulation in an east/west fashion to Grant MacEwan Blvd. and northerly fashion to Highway #39/50 Avenue as illustrated on Figure 10.

The central entrance road proposed from Highway #39/50 Avenue is located 408.5 m west of Grant MacEwan Blvd., centerline to centerline. This central entrance road has been designed to line up with the planned central entrance road to the land located north of Highway #39/50 Avenue and will initially be designed with dedicated left turn bays and acceleration/deceleration lanes in accordance with TAC standards to facilitate development of Stages 1 and 2. As illustrated in Figure 11, the roadway design includes a 9.81 m right-of-way widening for Highway #39/50 Avenue plus a 7 m PUL for berm construction. A 7 m road widening will also be provided for the western boundary road widening along with a 4 m PUL for berm construction.

Access into West Haven Estates from Highway #39/50 Avenue is considered essential in that without such an access, in a location at the mid-point of the quarter section, all traffic from the community would access Highway #39/50 Avenue at Grant MacEwan Blvd., thereby possibly overloading the intersection of Grant MacEwan Blvd. and Highway #39/50 Avenue. Speed reductions will be required along Highway #39/50 Avenue to insure compliance with current TAC standards. Traffic light signalization will also be required on Highway #39/50 Avenue at Grant MacEwan Blvd. and at the central entrance road as development generates higher traffic volume. Developer PAC contributions will be paid to the City to cover their proportionate share of these costs as a condition of Development Agreement. Further traffic analysis will be required at the detailed design phase to determine the exact timing, cost and cost allocation of these improvements.

It is also recognized that due to traffic constraints at the Highway 2/Highway 39 interchange, development growth in West Haven Estates may be limited and/or restricted by the City of Leduc as deemed necessary to control traffic congestion and safety.

Access into West Haven Estates will also be provided from Grant MacEwan Blvd. at West Haven Drive as well as Black Gold Drive. These accesses are considered essential in order that each half of the Plan area have alternative accesses in and out.

The use of Grant MacEwan Blvd. by West Haven Estates residents will be facilitated by improvements to the external roadway system to be undertaken in conjunction with the improvements required for the development of the Windrose Area Structure Plan area. The scheduling and cost responsibilities for these improvements will be decided by the City.

3.3.2 Internal Roadway System

The internal roadway system (Figure No. 10) of arterial, collector, and local roads has been designed to encourage traffic movement to Black Gold Drive, Grant MacEwan Blvd., and Highway #39/50 Avenue. The internal collector roads direct traffic to the central entrance road and Grant MacEwan Blvd., or north/south to Black Gold Drive. Care is taken to not provide a direct north/south route, and thus possible future unnecessary shortcutting, through the whole of the community.

Local roads will provide access to residential areas. The specific alignment of local roads is subject to change to reflect detailed subdivision and servicing design.

All roadways will be designed and constructed to the standards of the City.

4.0 - SERVICES

4.1 WATER DISTRIBUTION

The main water supply for West Haven Estates will be from the existing 300 mm diameter watermains located on Grant MacEwan Blvd. and Black Gold Drive to the east of West Haven Estates in Leduc Estates and Lakeside Estates. In the future, a 400 mm diameter main will be constructed to traverse the subject site in a north/south direction and a 300mm diameter main will be extended to the west along Black Gold Drive All primary mains are shown schematically on Figure No. 7 and will be oversized to accommodate future development to the north, south and west of West Haven Estates.

West Haven Estates local residential areas will be provided with water supply through a 250 mm looped internal system as shown on Figure No. 7. In all instances, watermains will be sized to provide the required fire flows directed by the City's Engineering Department prior to construction.

4.2 SANITARY SEWER SYSTEM

The nearest trunk sanitary sewer main to the subject site is located on Highway #39/50 Avenue some 200 m east of the northeastern corner of the subject quarter section. It is a 750 mm main which is planned to serve the whole of the Leduc Estates and Lakeside Estates, Windrose area and additional areas to the SE. It has recently been determined that this main has the capacity to service part of the West Haven Estates area, although the extent of gravity servicing will be limited to the two multi-family sites located in the northeast corner of the Plan area, assuming the minimum floor elevations of future buildings will be at or near the existing ground level.

According to the City of Leduc's Long Range Infrastructure Servicing Plan of 1992, the primary sanitary trunk serving the remainder of West Haven Estates will be a new trunk main running north/south in the middle to western third of the Plan area. When constructed, this trunk main will be oversized to accommodate future development to the south. However, as the time frame for its construction and thus for development of subsequent phases of West Haven Estates is not yet known, it may be necessary to construct a temporary lift station in the vicinity of the Highway #39/50 Avenue commercial site to facilitate further development until the trunk sewer to the north is constructed. Any plans to construct a temporary lift station will be reviewed with the landowner to the north in order to coordinate interim servicing for both properties and will be subject to the City's final approval..

The locations of these sanitary sewer trunk mains and their diameters are shown on Figure No. 8 along with the potential temporary lift station site.

4.3 STORMWATER MANAGEMENT

The natural drainage for West Haven Estates is generally towards the existing dugout in the central portion of the north part of the subject site, except for the southwestern portion of the quarter section. This drainage pattern will be slightly altered, as shown on Figure No. 9, to have the whole area drain towards the proposed stormwater management facility (which is split in two by Black Gold Drive). The controlled stormwater pond outlet will flow through a storm sewer pipe north to Highway #39/50 Avenue and then east into the existing 600 dia. storm outfall culvert as shown on Figure No. 9. The existing culvert will be twinned as necessary to provide the capacity needed to convey the flow north into Deer Creek, all to be validated by the City of Leduc prior to development.

A stormwater management study will be undertaken prior to approval of any subdivision for urban development. The dimensions and outline of the stormwater management facility in this Plan may be adjusted after the study is accepted by the City of Leduc and Alberta Environment.

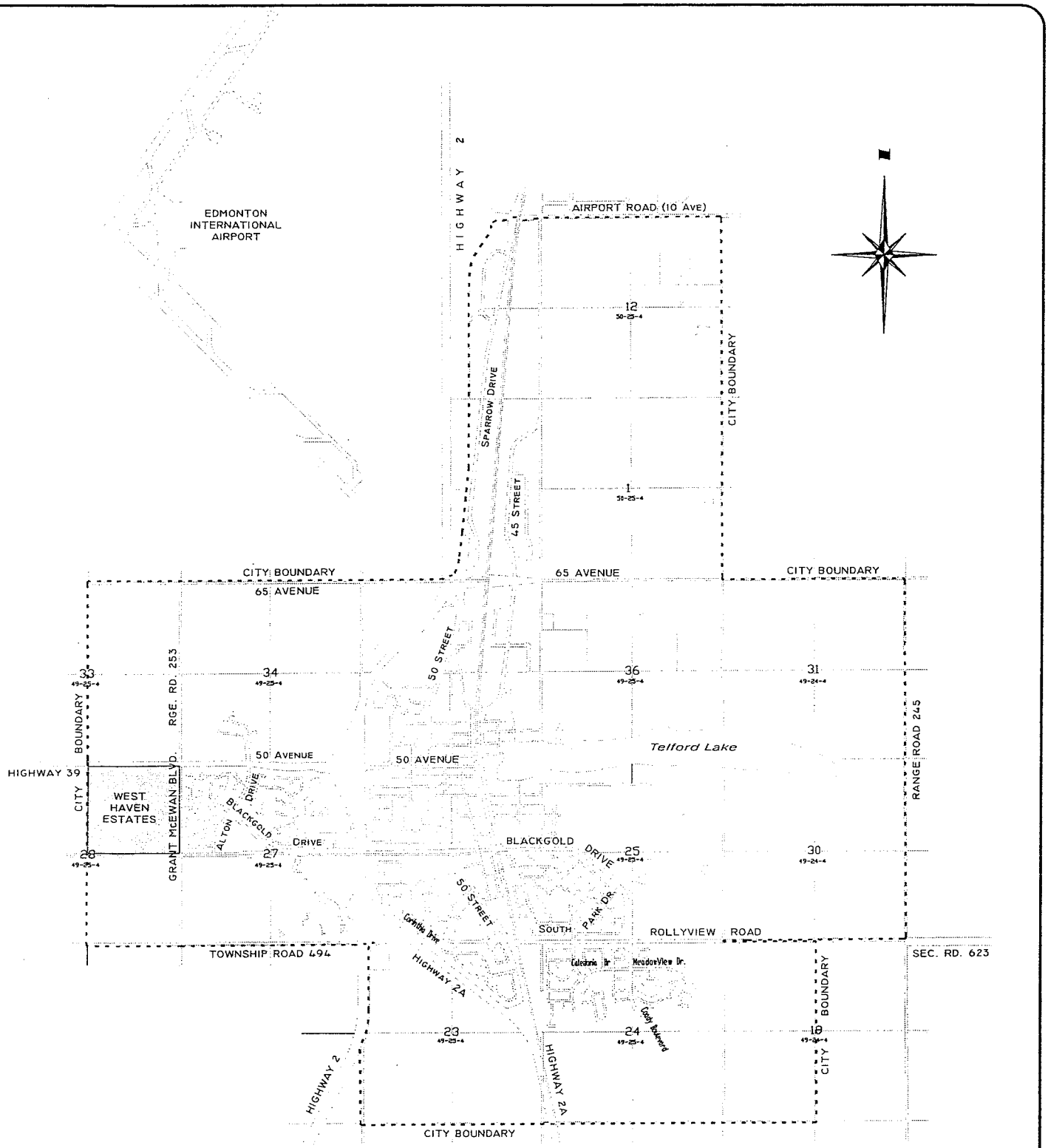
4.4 SHALLOW UTILITIES

Natural gas, electrical power, telephone and cable television are available for West Haven Estates and would be extended in conjunction with development.

4.5 DEVELOPMENT STAGING

A conceptual staging pattern is shown on Figure No. 6. It is to commence from the northeastern corner of the subject site and proceed in a southerly direction. Once the south portion of the eastern half of the subject site is reached, the western half of the subject site will be developed, from the north to the south. The construction of the stormwater management facility would be staged as required to control off-site stormwater release rates; however, the first part of the stormwater management facility is located within the first stage of development.

The rate of development is subject to changing market conditions.



WEST HAVEN ESTATES

NOTES / LEGEND

1. ASP BOUNDARY
2. CITY BOUNDARY
3. TITLED AREA 63.1 HECTARES

Scale 1:50,000 500 0 500 1000 1500 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

CONTEXT PLAN

N.E.1/4 SEC.28, TWP.49, RGE.25, W.4th M.

City of Leduc

JAN., 2002

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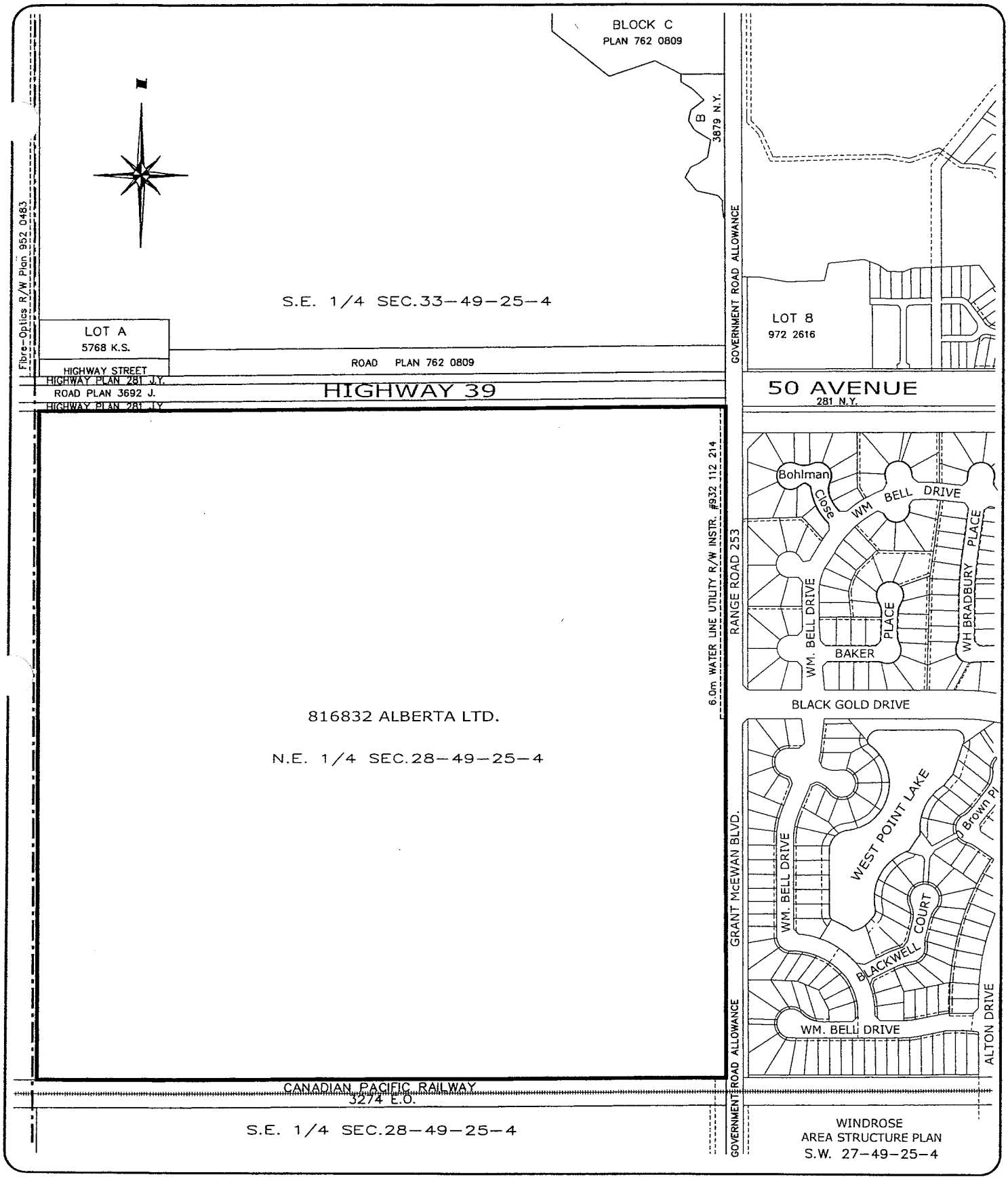
FIGURE No. 1



NOTES / LEGEND

1. ASP BOUNDARY
2. CITY BOUNDARY
3. TITLED AREA — 63.1 HECTARES
4.

Scale 1: 4500 60 30 0 60 120 180 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

LAND OWNERSHIP

N.E.1/4 SEC.28, TWP.49, RGE.25, W.4th M.

City of Leduc

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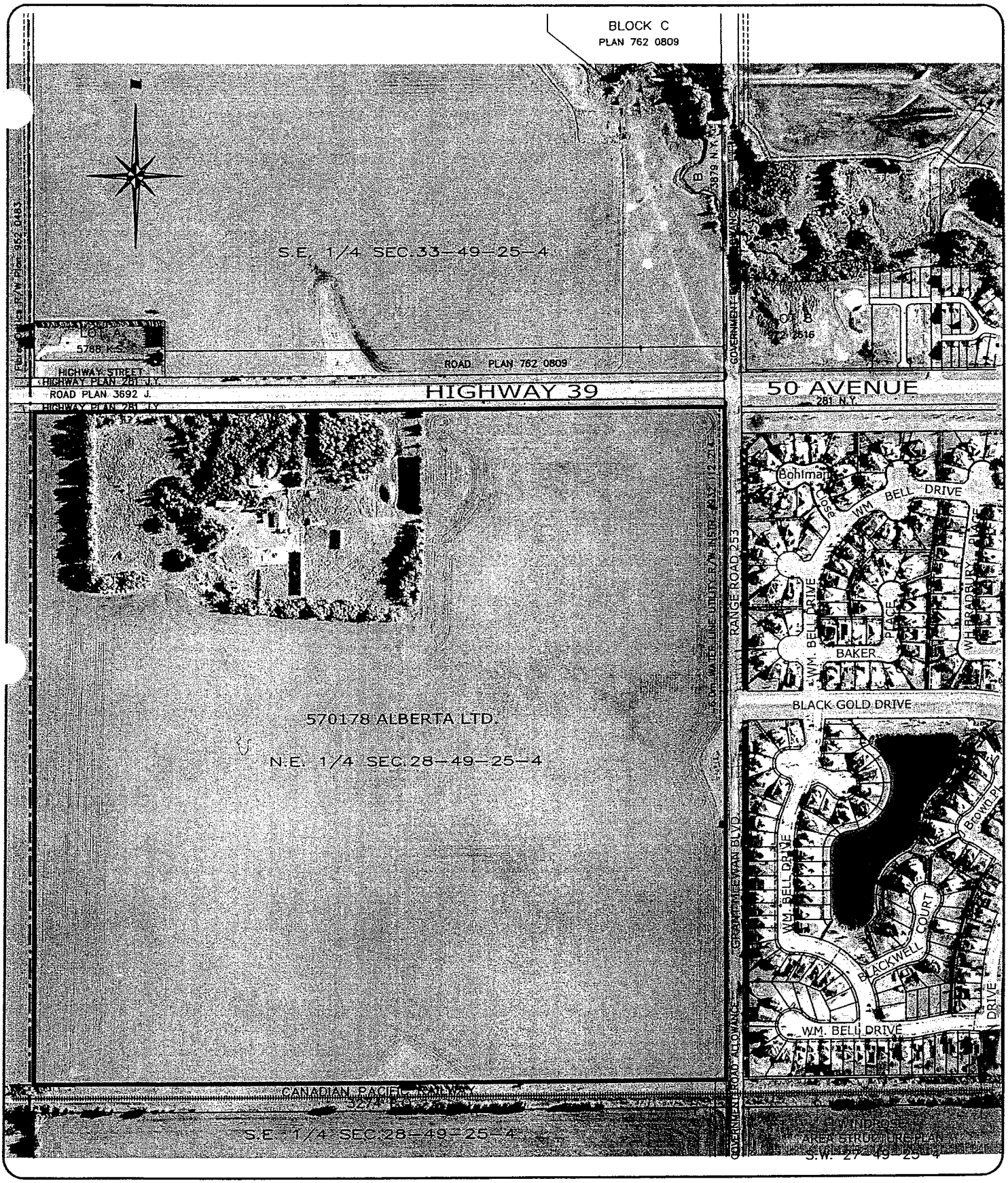
FIGURE No. 2



NOTES / LEGEND

1. ASP BOUNDARY
2. CITY BOUNDARY
3. TITLED AREA 63.1 HECTARES
4.

Scale 1: 6000 60 30 0 60 120 180 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

PHOTOGRAPH

N.E.1/4 SEC.28, TWP.49, RGE.25, W.4th M.

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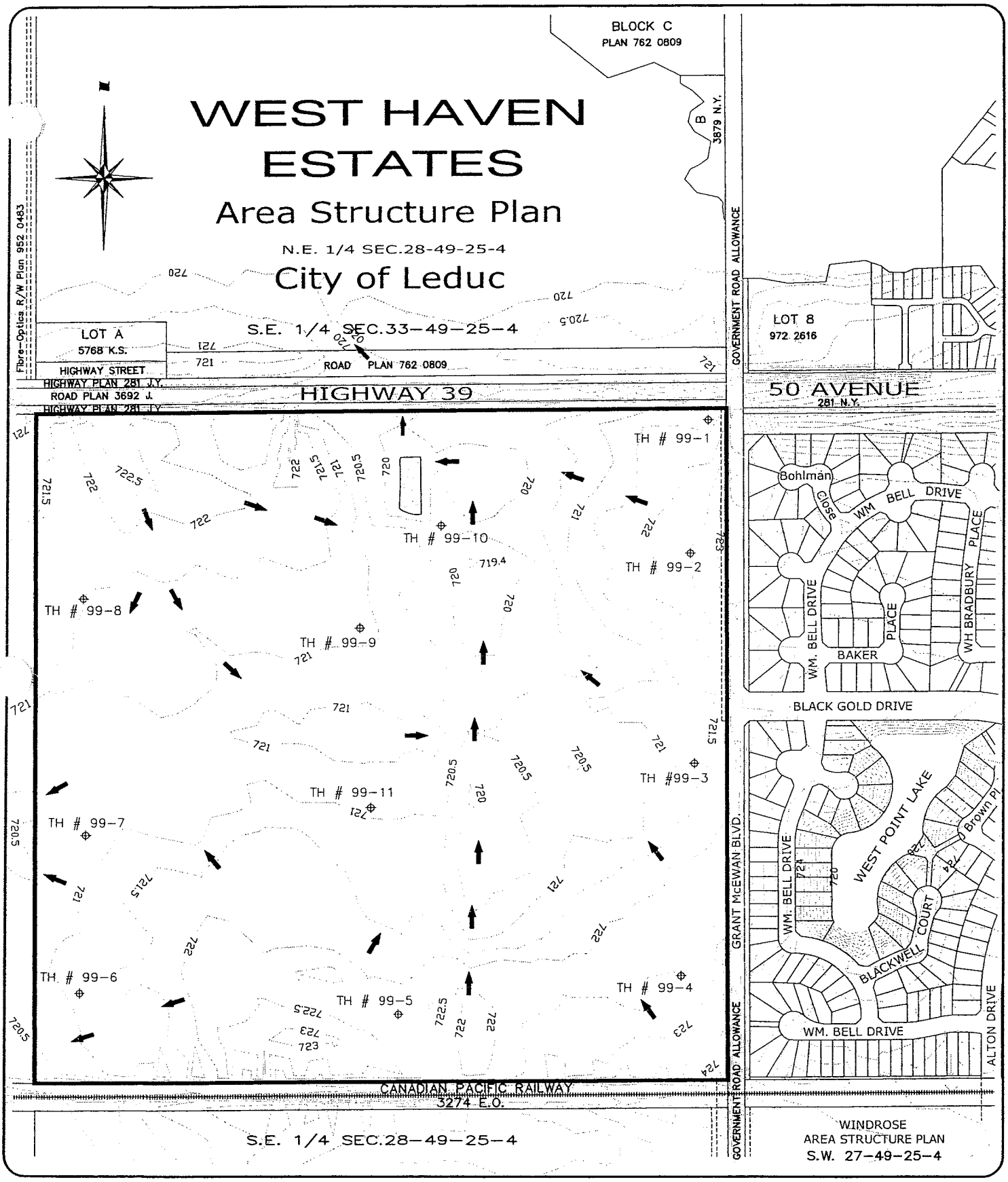
FIGURE No. 3



NOTES / LEGEND

1. ASP Boundary
2. Contours shown at 0.5 metre intervals
3. Existing Surface Storm Flows
4. Geotechnical Testhole Location

Scale 1:6000 60 30 0 60 120 180 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

SITE CONDITIONS

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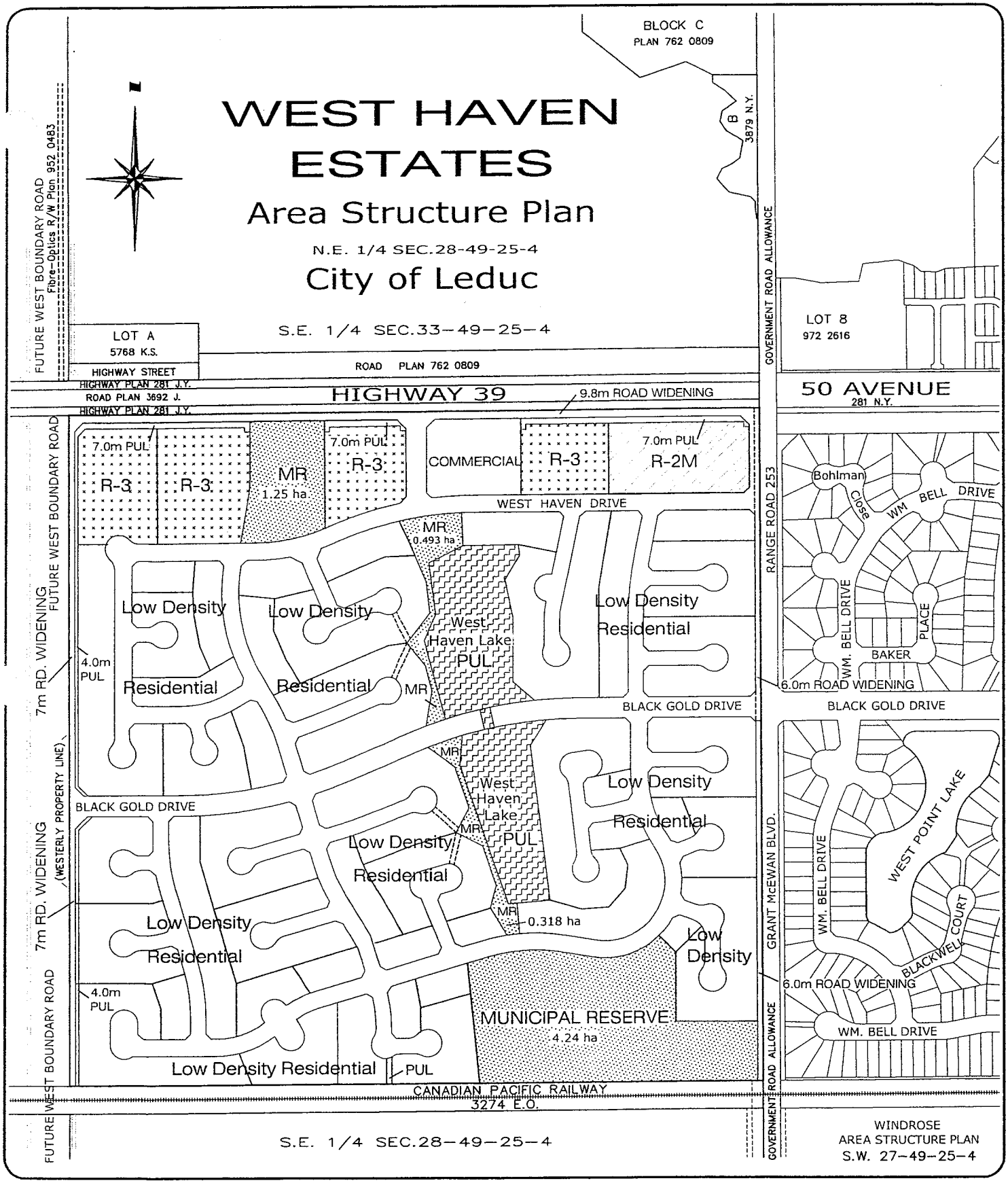
FIGURE No. 4



NOTES / LEGEND

1.	ASP Boundary	63.1 ha
2.	C-3 Commercial	1.0 ha
3.	R-3 Residential	4.5 ha
4.	R-2M Residential	1.2 ha
5.	Low Density Residential	31.1 ha
6.	MR Municipal Reserve	6.3 ha
7.	PUL Public Utility Lot	4.4 ha
8.	Public Roadways	14.6 ha

Scale 1:6000 60 30 0 60 120 180 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

DEVELOPMENT CONCEPT

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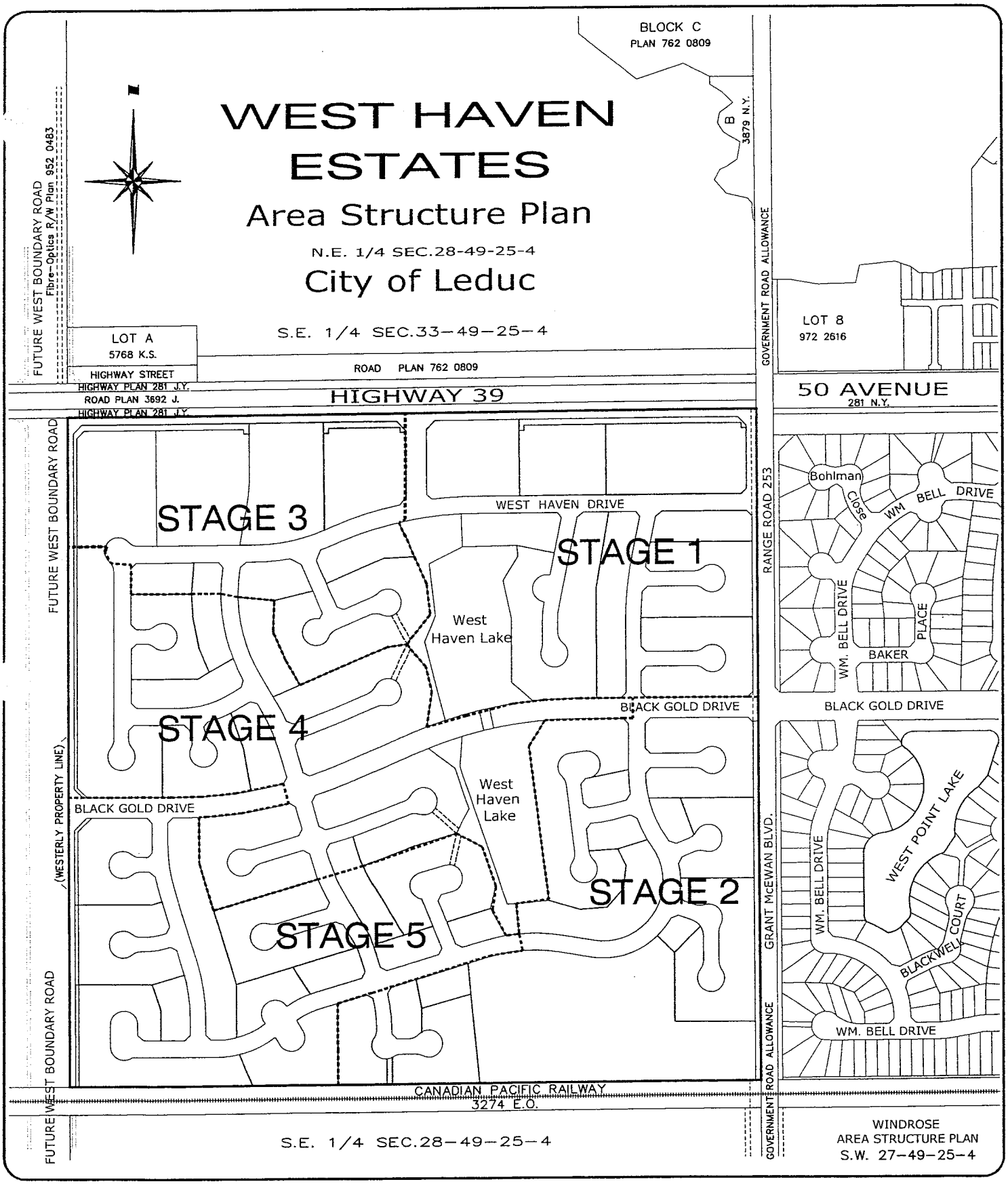
FIGURE No. 5



NOTES / LEGEND

1. ASP Boundary
2. Stage Boundary

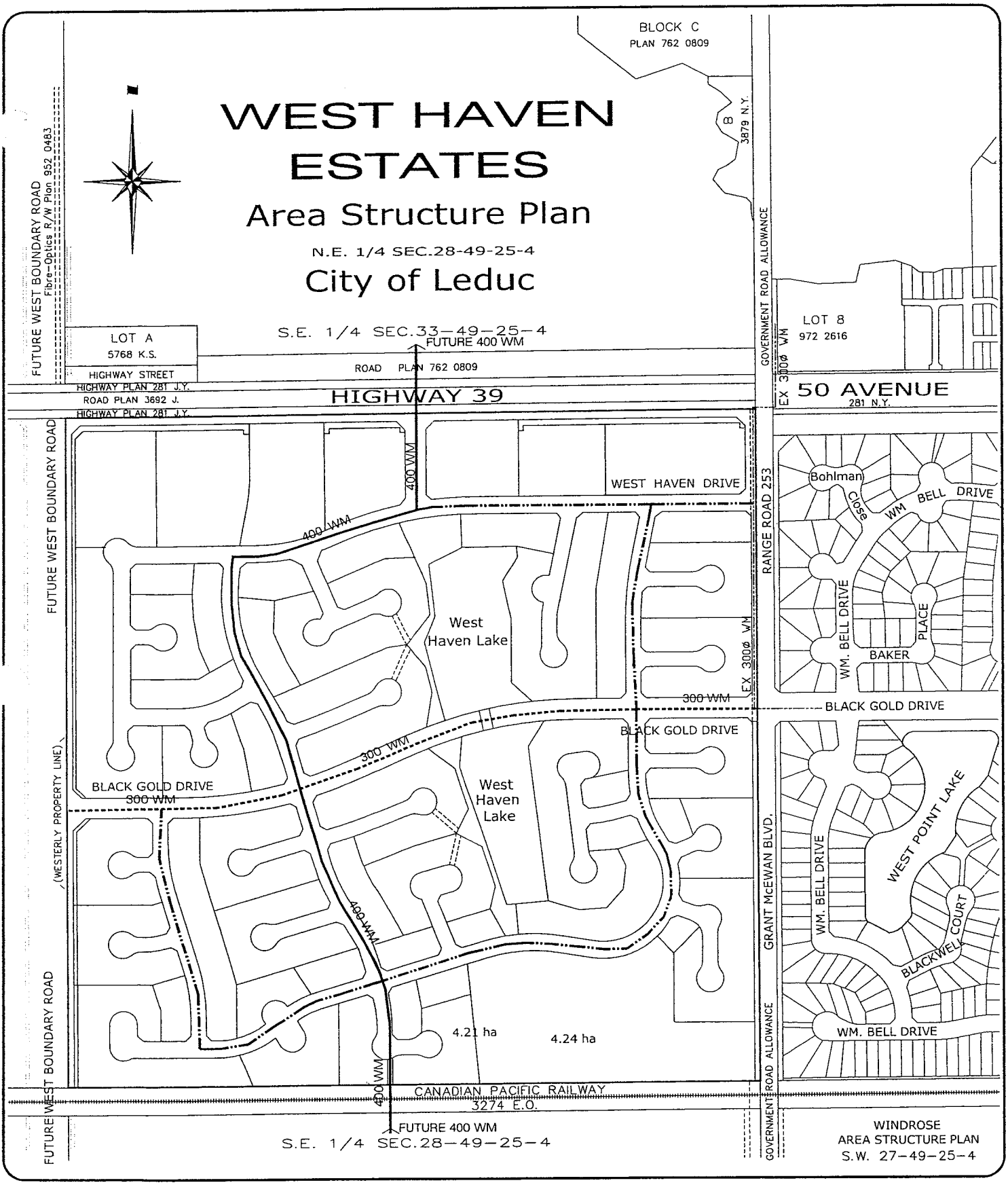
Scale 1:6000 60 30 0 60 120 180 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

DEVELOPMENT STAGING

JAN., 2002

FIGURE No. 6



NOTES / LEGEND

1. ASP Boundary
2. Proposed Watermain 400
3. Proposed Watermain 300
4. Proposed Watermain 250
5. Existing Watermain

Scale 1:6000 60 30 0 60 120 180 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

WATER DISTRIBUTION

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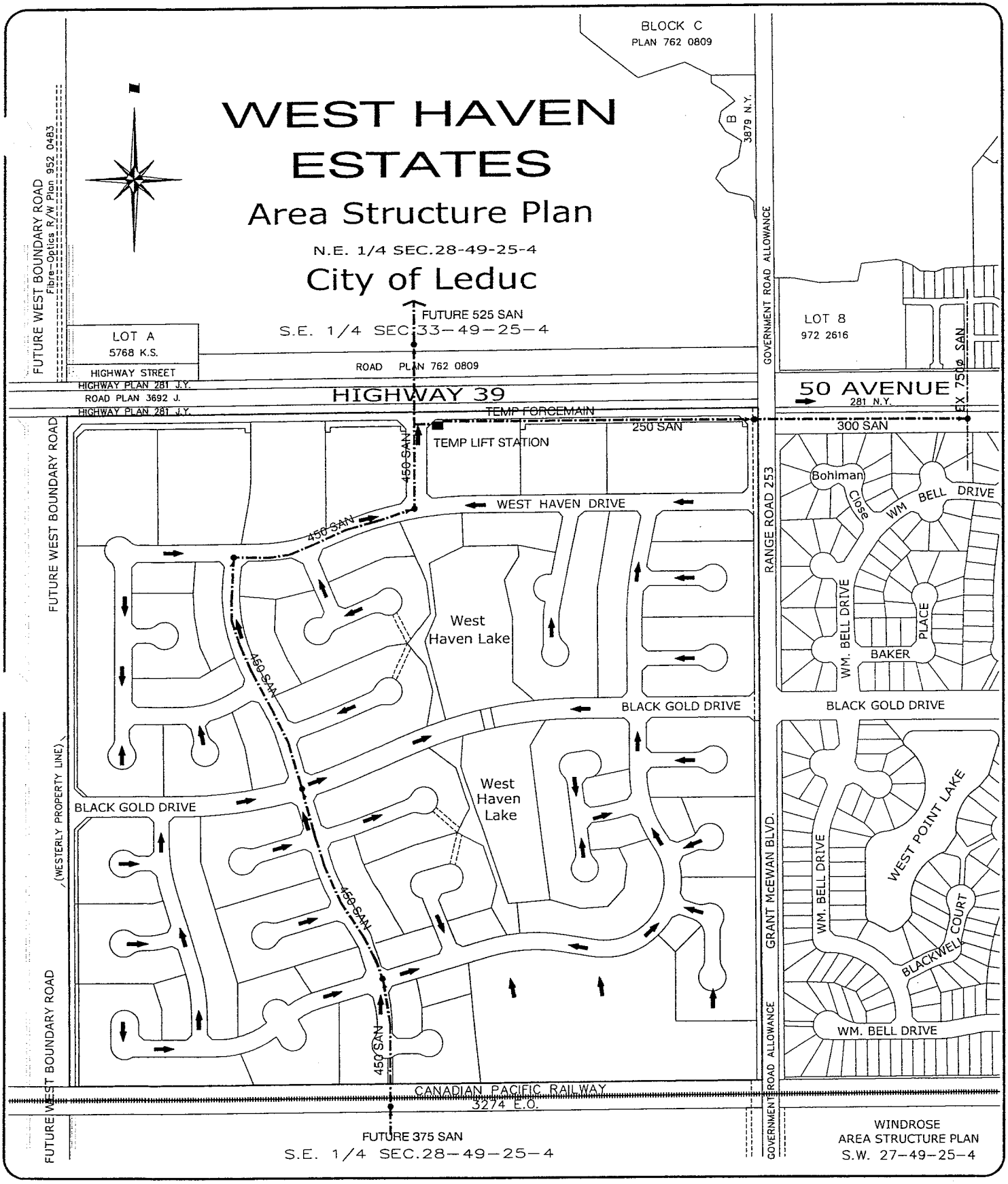
FIGURE No. 7



NOTES / LEGEND

1. ASP Boundary
2. Proposed Sanitary Trunk
3. Existing Sanitary Trunk
4. Direction of Sanitary Drainage

Scale 1:6000 60 30 0 60 120 180 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

SANITARY SEWER SERVICES

JAN., 2002

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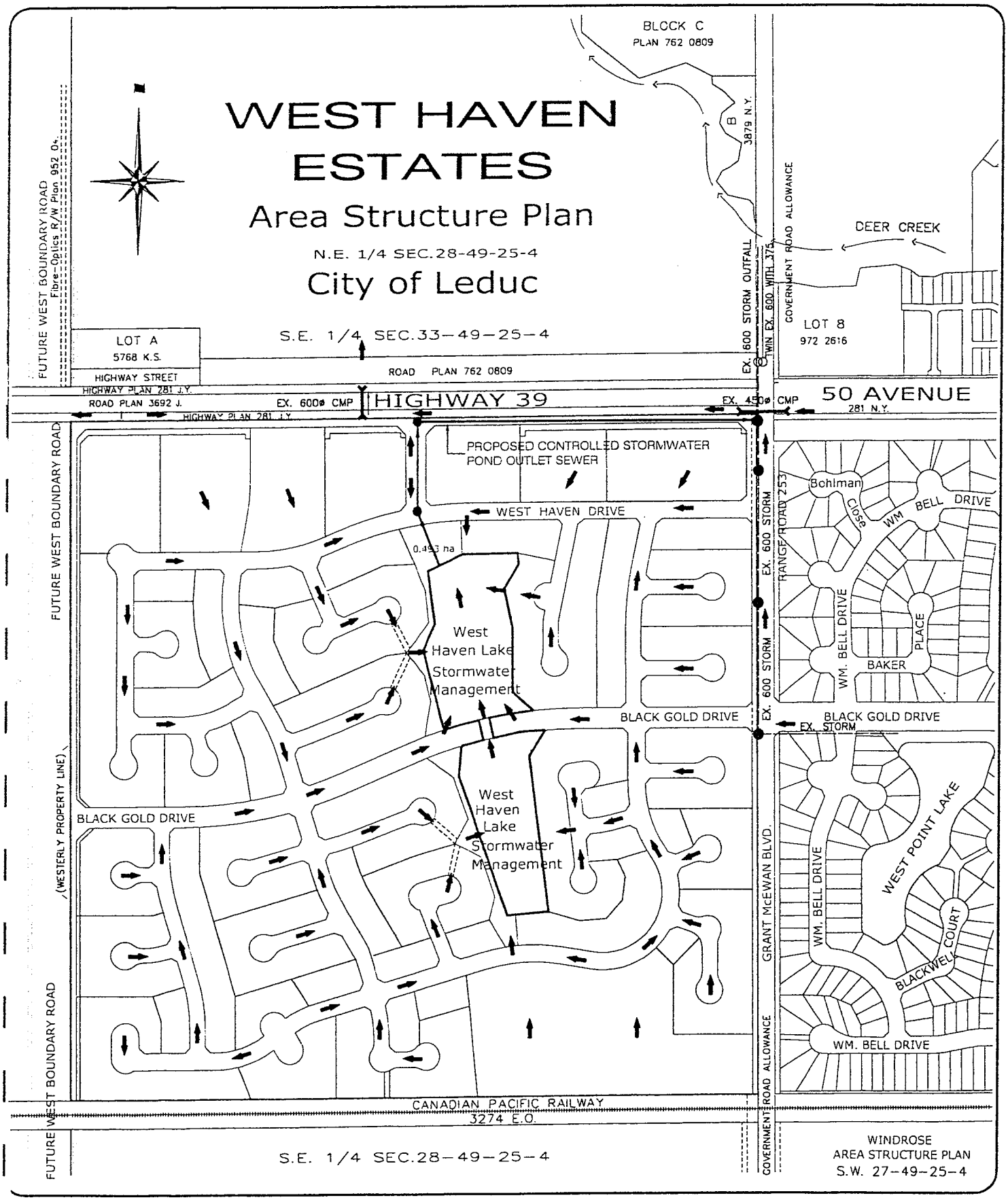
FIGURE No. 8



NOTES / LEGEND

1. ASP Boundary
2. Proposed Storm Outfall
3. Existing Storm Outfall
4. Direction of Major Storm
5. Culvert

Scale 1:6000 60 30 0 60 120 180 Metric

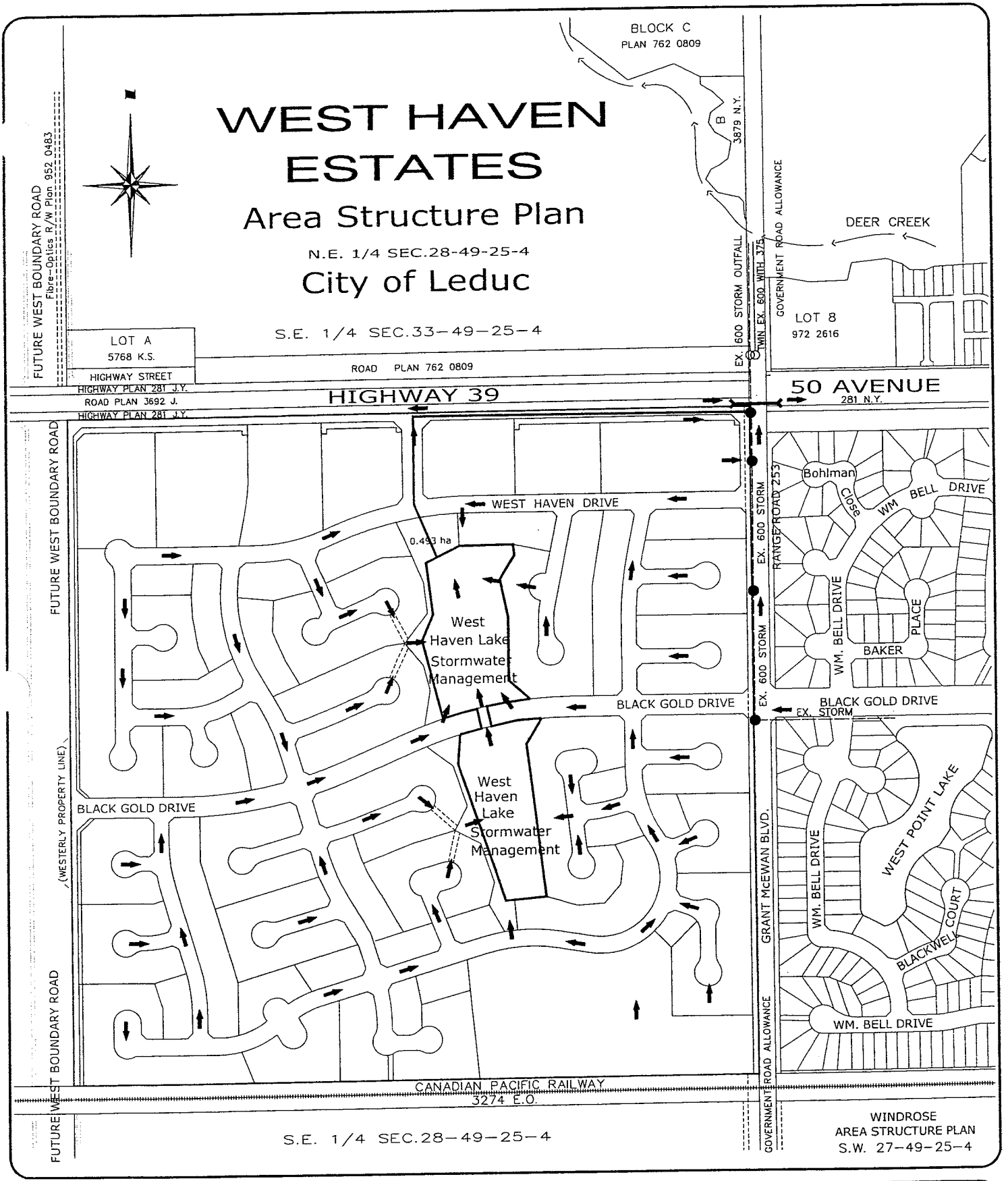
WEST HAVEN ESTATES AREA STRUCTURE PLAN

STORMWATER MANAGEMENT

JAN., 2002
(Amended Jan. 21, 2002)

gpec

FIGURE No. 9



NOTES / LEGEND

1. ASP Boundary
2. Proposed Storm Outfall
3. Existing Storm Outfall
4. Direction of Major Storm

Scale 1:6000 60 30 0 60 120 180 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

STORMWATER MANAGEMENT

JAN., 2002

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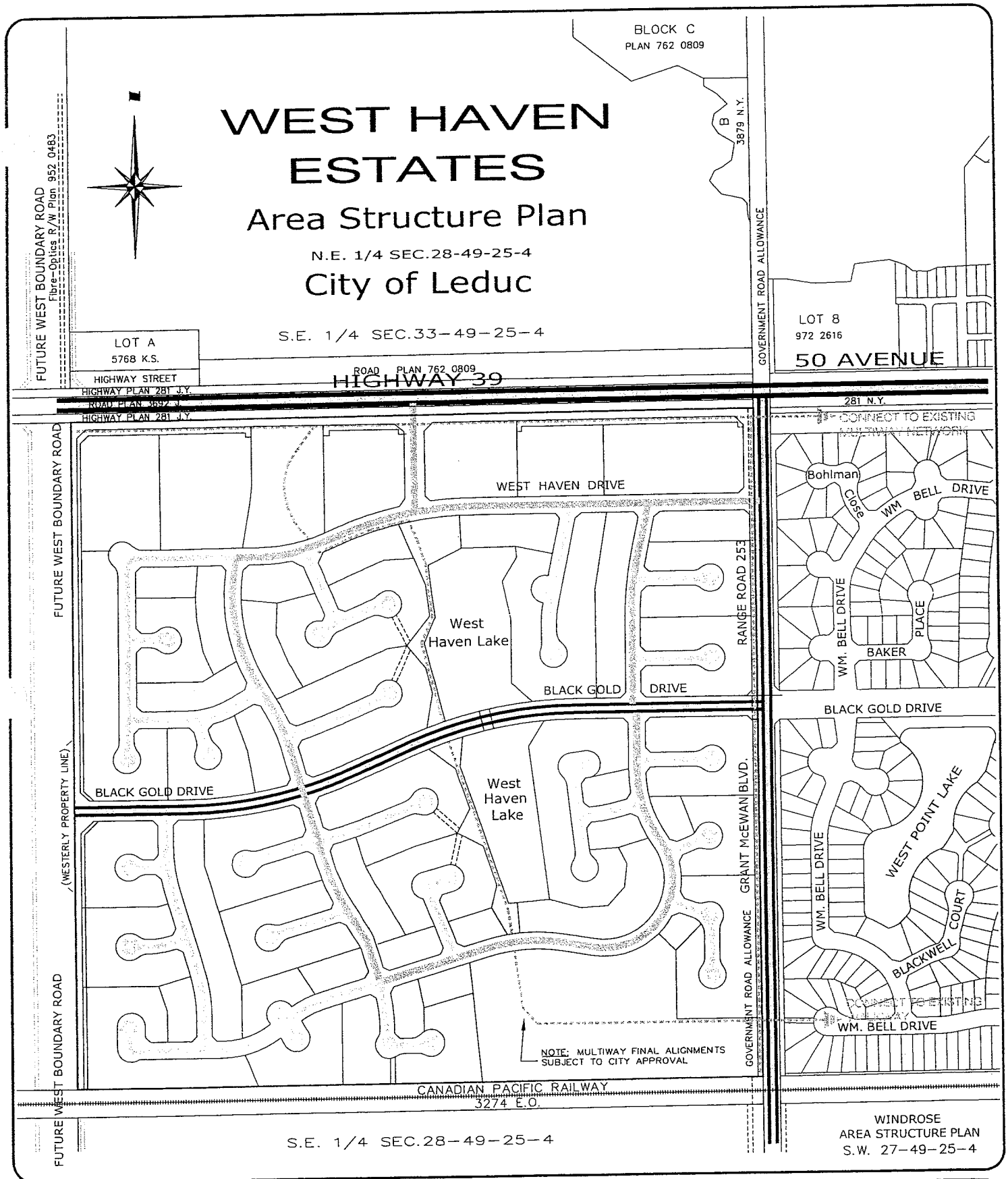
FIGURE No. 9



NOTES / LEGEND

1. ASP Boundary
2. Arterial
3. Major Collector
4. Collector 9.5m /20m ROW
5. Local 9m/18m ROW
6. Multiway 2.5m/6 ROW

Scale 1: 6000 60 30 0 60 120 180 Metric

WEST HAVEN ESTATES AREA STRUCTURE PLAN

TRANSPORTATION NETWORK

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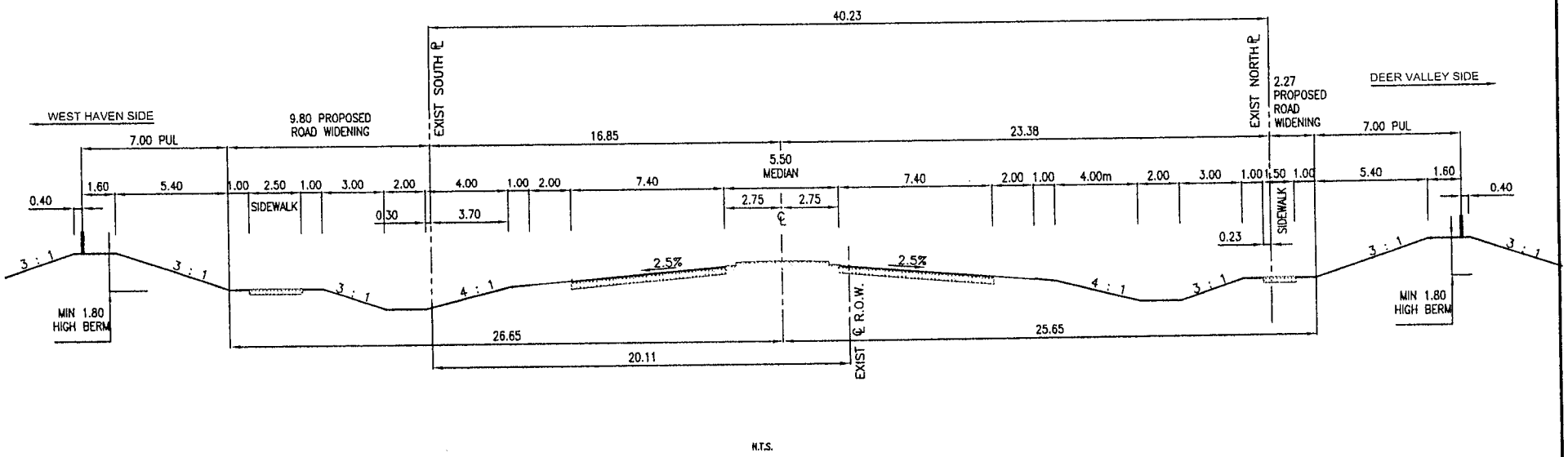
FIGURE No. 10



N.T.S.

4 LANE DIVIDED ARTERIAL - RURAL
HWY 39 LOOKING WEST
WEST OF GRANT MacEVAN BLVD.

WEST HAVEN ESTATES AREA STRUCTURE PLAN

PROPOSED HWY 39 X - SECTION

JAN., 2002

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FIGURE No. 11

A . Geotechnical Investigation
by J.R. Paine & Associates Ltd.
- August 1999

J.R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS
EDMONTON — GRANDE PRAIRIE — PEACE RIVER — WHITEHORSE

17505-106 Avenue
EDMONTON, Alberta
T5S 1E7

September 15, 1999
File No. 2706-15

570178 Alberta Ltd
C/O LWS GROUP
11420 142 STREET
EDMONTON, AB
T5M 1V1

ATTENTION: Mr Harvey Leach, P. Eng.

Dear Sir:

Re: Geotechnical Investigation
Proposed Residential Neighbourhood
NE ¼ 28-49-25W4M
Leduc, Alberta

Please find enclosed our report for the above noted project. The report presents the soil data and design recommendations concerning the geotechnical aspects of the proposed neighbour subdivision development.

Thank you for the privilege of providing this service to your organization. If you should have any questions or comments, please feel free to contact our office.

Yours truly,

J.R. PAINE & ASSOCIATES LTD.

Gary R. Kerr, P.Eng.

\\Jrp_fsrv1\data\DATA\Data99\2706- LWS group\2706-15 Leduc Prop.Subd\r0792lws.doc

REPORT NO: 2706-15

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL NEIGHBOURHOOD
NE ¼ 28-49-25W4M
LEDUC, ALBERTA

August 1999

J.R. PAINE & ASSOCIATES LTD.
17505-106 AVENUE
EDMONTON, ALBERTA
T5S 1E7

Phone: 489-0700
Fax: 489-0800

REPORT NO: 2706-15

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL NEIGHBOURHOOD
NE ¼ 28-49-25W4M
LEDUC, ALBERTA

TABLE OF CONTENTS

GEOTECHNICAL INVESTIGATION

PROJECT: Proposed Residential Neighbourhood

LOCATION: NE ¼ 28-49-25W4M
Leduc, Alberta

CLIENT: 570178 Alberta Ltd
c/o LWS GROUP
11420 142 STREET
EDMONTON, AB
T5M 1V1

ATTENTION: **Mr Harvey Leach, P. Eng.**

1.0 INTRODUCTION

This report presents the results of the subsurface investigation made on the site of the Proposed Residential Neighbourhood in Leduc, Alberta. The objective of the investigation was to determine the subsoil data for use in the hydro-geotechnical planning and design aspects of the residential development project. Authorization to proceed was received from Mr. Harvey Leach, P.Eng. of LWS Group in June 1999.

2.0 PROJECT AND SITE DESCRIPTION

The proposed residential Neighbourhood development is located on the North East quarter of Section 28, Township 49, Range 25, West of the 4th Meridian near Leduc, Alberta. The subject property has been previously utilized for farm land. The property is surrounded by farm land to the south and west, by City of Leduc development on the east across RR 253, and to the north is Highway 39.

It is understood that the proposed residential neighbourhood will consist of single family housing and related utilities, with some potential for multi-family properties. It is understood that two deep Storm Water Management Facilities, one on each side of Black Gold Drive, are being

considered. These are anticipated to be similar to the adjacent facility, east of the subject property. Walkout basements are anticipated adjacent to the Storm Water Management Facilities.

Previous land use, old structures, environmental concerns and buried objects, are beyond the scope of this study.

3.0 FIELD INVESTIGATION

The subsurface soil investigation for this project was performed on July 1 and 13, 1999, utilizing a truck mounted B61 drill unit owned and operated by SPT Drilling Ltd and Sun Alta Drilling Ltd. Eleven testholes were drilled at locations shown on the attached site plan. Testholes were advanced to a depth of 7.3 metres below ground surface. The testholes were advanced with solid stem augers in 1.5 metre increments. A continuous visual description was recorded on site which included the soil types, depths, moisture, transitions, and other pertinent observations. Disturbed samples were removed from the auger cuttings at 750 millimeter intervals for determination of the moisture content, Atterberg limits and sulphate contents. Standard Penetration Tests, c/w split spoon sampling, and Shelby Tube samples were also taken at regular 1.5 metre depth intervals.

Following the drilling operation, slotted piezometric standpipes were inserted into all testholes for future water table level determination. The testholes were backfilled with drill cuttings, and a bentonite seal was placed at the surface.

4.0 LABORATORY TESTING

All disturbed bag samples returned to the laboratory were tested for moisture content. Plastic and liquid Atterberg limits and soluble soil sulphate concentrations were determined on selected samples. The Shelby tube samples were tested for unconfined compressive strength. Lab results are included on the attached Testhole logs and data sheets located in the Appendix.

5.0 SOIL CONDITIONS

A detailed description of the soils encountered and testing performed is provided on the attached testhole logs. In general, the subsurface soil profile consisted of organic topsoil, glaciofluvial silt or clays, glacial clay till, and bedrock.

Topsoil was encountered in all testholes. The thickness varied from 150 to 800 millimetres, and was typically near 300 millimetres. The depths are only known at testhole locations and may vary locally due to previous utilization.

Below the organic topsoil, native glaciofluvial deposits of silty clay were encountered. In Testhole 99-5, this deposit was entirely absent, while 99-8 and 99-9 were very silty. The depth to the bottom this strata varied from 0.8 to 1.8 meters. These strata were described as soft and wet, to stiff and moist.

Below the glaciofluvial deposits, glacial clay till was encountered. The clay till was typically described as silty, sandy, moist, firm to stiff, brown and grey, and contained traces of coal and pebbles. Sand laminations and pockets were noted.

The clay till was underlain at a depth of 4.4 to over 8.8 metres by the local bedrock formation of interbeded sandstones, mudstones, shales, and may contain ironstone and coal beds.

6.0 GROUNDWATER CONDITIONS

Groundwater level measurements were taken in the Testhole standpipes 6 to 43 days after drilling on July 7, 13, 23 and August 13, 1999.

Results from the groundwater monitoring are summarized as follows:

Groundwater Level Readings
Depth below ground surface, metres

Testhole	6 days, July 7	12 days, July 13	22 days, July 23	10 days, July 23	31/43 days August 13
99-1	1.33	1.23	1.40		1.76
99-2	3.39	3.23	3.30		3.51
99-3	0.75	0.68	0.61		0.95
99-4	1.10	1.07	0.99		1.29
99-5	1.49	1.47	1.33		1.65
99-6	1.47	1.35	1.24		1.72
99-7				2.23	2.34
99-8				4.98	4.03
99-9				1.66	1.65
99-10				0.58	0.80
99-11				0.80	1.30

The groundwater levels for this site are high and will likely cause problems for underground utility construction, storm water management facility construction and basement excavations.

It should be noted that water table levels may fluctuate on a seasonal or yearly basis with the highest readings obtained in the spring and during periods of heavy rainfall. It is noted that several of the slough areas contain surface water, which may act as recharge for the ground water.

7.0 RECOMMENDATIONS

7.1 House Foundations

1. No major problems with construction of residential units on the non-organic native soils encountered throughout this site are anticipated. The proposed housing units may be supported by continuous or spread footings bearing on undisturbed native clay or silt soil. The footing elevation should allow for 1.5 metres of earthen cover over the footings in order to reduce the movement caused by seasonal variation in moisture contents and/or frost action. Footings are not recommended on the clay fill soils.
2. Lot grading plans are unknown at this time. However, it is expected that final lot grading will largely correspond to existing conditions. If general lot grading will produce areas of fill extending to depths below that of footing elevation, it is strongly recommended that house excavations be inspected by qualified geotechnical personnel. Generally, it is not recommended that footings be constructed on non-engineered fill. In such cases, the following alternatives are commonly recommended:
   i) Removal of the fill down to native soil and replacement with a compacted granular material. A normal footing foundation may then be utilized.

   Or

   ii) Utilize a pile foundation.
3. In the case of deep pile foundations, some installation problems may be encountered. Silt and sand seams were encountered in the clay till layer and may create sloughing or groundwater concerns. It is not likely that casing of the piles would be required, however the pile concrete should be on-site during the pile drilling to allow quick concrete placement.
4. Engineered fill may be considered in areas where low elevations necessitate deep fill zones. This option should be reviewed prior to implementation by a geotechnical consultant to evaluate site conditions and borrow material sources. Basically, engineered fill is fill which is placed in a controlled manner under the full-time inspection of a qualified soils

technician. The fill is placed and compacted to a minimum 98 percent of its Standard Proctor Density near its optimum moisture content, in maximum 150 millimetre lifts. All topsoil and non-engineered fill must first be stripped from the engineered fill area. Engineered fill construction requires full-time monitoring and extensive testing by the geotechnical consultant during construction. Clean well placed engineered fill will negate the need for pile foundations in deep lot fill areas, and possibly reduce the foundation costs to the developer.

5. No loose, disturbed, remoulded or slough material should be allowed to remain in the open footing excavations. Hand cleaning is advised if an acceptable surface cannot be prepared by mechanical equipment. To avoid disturbing the bearing surface, all basement excavations should be excavated by a backhoe operating remote from the bearing surface.
6. A 150 millimetre layer of sand or sand-gravel mixture should be placed immediately below all floor slabs. This material should be uniformly compacted to 100 percent of the corresponding Standard Proctor Density at optimum moisture content.
7. A non-deteriorating vapour barrier should be placed immediately below the floor slab to prevent desiccation of the subgrade material.
8. Groundwater was close to the surface throughout the site. Ingressing groundwater into basement excavations is expected, however the volumes are expected to be small. Basements should be provided with a suitable peripheral drainage system with an adequate filter placed at footing elevation and connected positively with an approved drainage system (see Section 7.2).
9. It is recommended that floor joists and basement slabs be placed prior to backfilling the excavation in order to minimize any detrimental effects on the foundation walls caused by backfilling operations.
10. Water dispersed on the property from roof drains must not be allowed to reduce the integrity of the foundations. To ensure this, provisions must be made to ensure the runoff is not allowed to accumulate around the basement (see Section 7.2).

11. The time span between the start of excavation to the installation of footings, basement walls, peripheral weeping tile and backfilling operations, should be minimized in order to prevent any problems developing with the excavation due to ingressing of ground or surface waters, or desiccation of the subsoil. Footing excavations should be protected from drying, rain, snow, freezing and the ingress of surface or groundwater.

12. Other foundation types, besides footings, should be evaluated for the specific site conditions on which they are to be used.

13. During winter construction, it is essential that all interior fill and load bearing materials remain frost free. Recommended winter construction practices, with respect to hoarding and heating of the forms and the fresh concrete, should be followed. In order to minimize the potential frost heave problems the interior of the building must be heated as soon as the walls have been poured. The period in which the excavation is left open to freezing conditions should be as short as possible. If doubts remain as to the suitability of the foundation during construction, the builder should consult J. R. Paine & Associates Ltd.

7.2 Hydrogeological Concerns

1. Water dispersed on the property from the roof leaders should not be allowed to accumulate against the foundation walls. To ensure positive drainage, the soil surface of all lots should be made sloping away from all buildings. This will require a positive lot grading of at least ten percent away from the foundation walls toward the sidewalk for a minimum of 1.5 metres. In cases where the lot drainage runs from the back of the lot to the front, runoff should be kept 1.2 metres away from the house.

2. At least the top 1.0 metre of backfill around the basement walls should be a suitable impermeable clay material. The native, non-organic clay soils located at this site are suitable as fill for this purpose.

3. In order to ensure no flow paths for water from the roof leaders occur adjacent to the foundation walls, the following two alternatives are proposed:

   i) A concrete splash pad, placed beneath the downspouts, a minimum of 1.2 metres long and firmly anchored to the house foundation can be used.

or

ii) A permanent downspout extension could be used to carry water away from the foundation wall.

4. Peripheral weeping tile lines will be required. All lines should be placed at or slightly below footing elevation and will require a suitable clean tile rock drainage filter, with a minimum of 150 millimetres of filter around the line. The weeping tile should be connected, with positive drainage, to a sump fitted with a pump. The discharge may go to the surface at distance from the foundation or be connected to the storm sewer through a exterior drainpipe.

5. The watertable readings at this site were high but slightly varied, therefore the discharge method for house weeping tile flow will need to be determined on a lot specific basis. For the higher watertable areas, depending on foundation design, the footing elevations may intercept the groundwater level, and the flow may need to be directed to storm services. Based on the ground water table readings from the Testhole logs the majority of the site appears to require storm services. Only two of the eleven testholes (Testhole 99-2 and 99-8) show that storm services may not be required. Once final lot grades are available, our firm could assist in choosing which lots would benefit from having storm service connections. Comparison of proposed footing elevations with watertable levels in the vicinity would be necessary to determine if and where storm services are required. The need for storm services will also depend on the level of flow desired from the future basement sump pumps. Houses with footing elevations below the watertable may have frequent sump operation, winter sump flows, and other drainage concerns. Preventing only winter flows in order to reduce street and sidewalk icing and pump outlet maintenance will require a different standard than preventing excessive flows throughout the year.

6. In instances where the excavation base intercepts the seasonal high groundwater elevation, subgrade softening may occur, requiring the use of a washed rock base. It is also likely that interior weeping tile will need to be installed in these instances. The interior tile should be placed around the perimeter and have several laterals across the basement subgrade. A filter sock should be applied to the interior weeping tile. If free water is noted in any basement

excavation, a geotechnical engineering firm should be contacted to inspect the site and provide the recommended action to account for the water.

7.3 Underground Utilities

1. The subsurface soil conditions in the testholes are fair to satisfactory for the installation of underground utilities. The moisture content of this upper clay and silts are above optimum for much of these materials, and drying of this material will likely be required. Much of the underlying clay is near optimum moisture. The base bedrocks are dry of optimum in some areas and moist in others. The City of Leduc standards are considered suitable for the soils encountered.
2. The watertable was close to the surface in many testholes, indicating that saturated conditions and ingressing groundwater will likely be encountered. In general, it is anticipated that surface water will recharge the ground water, and that the flows through the clay till will rapidly decrease as the surface dries. It is noted that experience indicates the till will be blocky, and that water will travel in the cracks and occasional sand lens. Without recharge, the quantity of water released is usually small.
3. Free standing trench slopes in the order of 2 vertical to 1 horizontal are anticipated in the clay till soils throughout this site. The surficial silts require increased cutback angles due to generally poor strength and expected sloughing conditions. Exact values cannot be pinpointed without detailed and extensive analysis. For this reason, this information should be used as a guideline only and the optimum cutback angles for utility trenches be determined in the field during construction. The Occupational Health and Safety Act, General Safety Regulation Items 173 and 174 should be strictly followed except where superseded by this report.
4. Temporary surcharge loads, such as spill piles, should not be allowed within 2.0 metres of an unsupported excavation face while mobile vehicles should be kept back at least 1.0 metre. All excavations should be checked regularly for signs of sloughing or failures, especially after rainfall periods.

5. To minimize pipe loading, trench widths should be minimal, but compatible with safe construction operations. The trench must be wide enough to accommodate pipe bedding and compaction equipment.

6. Pipe bedding and trench backfill procedures should adhere to City of Leduc standard, to control future settlement. The minimum backfill material beneath and to 300 millimetres above the pipe should be an approved bedding sand material where conditions allow. This material should be hand placed and hand tamped, with care taken to fill the underside of the pipe. The compaction of the sand bedding should be 95 percent of the corresponding Standard Proctor Density. Sand seams were encountered in the clay till starting at a depth of 2.3 metres below ground surface. Should ground water ingress from the sand seams, pipe support conditions will rapidly deteriorate. Where soft and wet subgrade conditions occur, it is recommended that a washed rock and geotextile separator be utilized for the pipe bedding. The washed rock and geotextile should surround the entire pipe with the exact dimensions determined in the field during construction.

7. The moisture content of the soils in the testholes was variable but generally was moist to saturated, ranging from 15 to 25 percent with occasionally wetter surface soils. The variable condition of the soils will cause a corresponding variability in the backfill conditions. Drying of the trench backfill is likely especially in the area of Testholes 99-1, 99-3, 99-4, 99-5, 99-6, 99-10 and 99-11. In addition, mixing of the backfill prior to placement in the trench will be beneficial. Opening relatively long portions of utility trench is not recommended for this site.

8. Trench compaction is required to provide support for surface development, therefore, rigorous compaction control is recommended and should adhere to the City of Leduc standard. All backfill must be compacted, including bedding and along the side of the pipes. The maximum lift thickness should be 300 millimetres below 1.5 metres depth, and 150 millimetres from 1.5 metres and above. All service and shallow trenches should be rigorously compacted and tested. Compaction specifications of 97 percent of One Point Proctor Density to 1.5 metres below grade; and 95 percent of Standard Proctor Density (SPD) from 1.5 to 1.0 meters below grade; and 98 percent of SPD from 1.0 meters and

above. Considerable drying or mixing will likely be required in order to obtain the 98 percent of standard proctor. This degree of compaction should be achievable with a portion of the subsoils encountered some areas. An aggressive drying program, as outlined, of the trench backfill will improve road subgrade conditions. It is important to dry these soils enough to obtain machine compaction in order to minimize trench settlement and to not jeopardize the road subgrade conditions. The subgrade materials are medium to high plastic and are subject to some swelling, hence it is recommended that the materials be placed 1 to 3 percent above optimum moisture.

9. Pavement, curb, and sidewalk performance is heavily dependent on good trench backfill. It should be noted that the ultimate performance of the trench backfill is directly related to the consistency and uniformity of the backfill compaction, as well as the underground contractors construction procedures. In order to achieve this uniformity, the lift thickness and compaction criterion should be strictly enforced, especially adjacent to manholes, hydrants, valves, lines and in other tight access locations. Proper compaction greatly improves the long term pavement and surface utility performance.

7.4 Surface Utilities

1. The subsurface soil conditions encountered in the site were considered poor to satisfactory for the construction of roads, curbs, and sidewalks, once the surficial topsoil and any other deleterious material is removed. Silty clay was generally encountered below the topsoil, and the silt content was especially severe in Testholes 99-8 and 99-9. The existing topsoil and other deleterious materials must be removed prior to the construction of roads, sidewalks and other surface utilities. It is understood that two deep Storm Water Management Facilities will provide considerable material, hence clay till is expected to be utilized as road fills. Many areas (Testholes 99-1, 99-3, 99-4, 99-5, 99-6, 99-9, 99-10, 99-11) may require extra subgrade work, drying and/or cement stabilizing, or subcutting and placement of pitrun, in order to achieve pavement structure support. It is noted that the degree of trench backfill drying during underground utility installation affects the soil conditions for road and sidewalk construction.

2. Cement stabilization is the minimum required subgrade treatment for the City of Leduc. As the a minimum, the City of Leduc requires the addition of 13 kilograms of cement per square metre of subgrade mixed to a depth of 150 millimetres. Application rates would best be determined in the field during construction or once more site specific information is known. But in areas of high silt content the addition of up to 20 to 30 kilograms of cement per square metre of subgrade mixed to a depth of up to 300 millimetres is likely required. In order to reduce the frost heave potential it is beneficial to remove silty material completely. Care must be taken not to allow any excess moisture changes in these soils. Early curb backfill should be considered. The cement stabilized subgrade shall be compacted to the City Of Leduc standard of 100 percent of SPD at a moisture content not less than 1 percent under and not more than 3 percent over optimum.

3. As per the City of Leduc standards, prepared subgrade shall be proof-rolled using a single axle truck loaded to give 8200 kg on the rear axle. The subgrade shall show no visible evidence of rolling or weaving under the axle load test. This test shall be conducted under the direction and in the presence of the Developer's Engineer.

4. It is noted that installation of underground utilities will disturb and mix deeper soils and may degrade the support conditions. Fill placed before installation of the underground utilities could also be degraded. Dryer fills placed after the underground work is complete could be utilized to bridge any soft areas. Any fills placed should be near optimum moisture content.

5. The lacustrine and glacial soils at this site are considered to have a low to high frost susceptibility. The near surface plastic clays are considered to have a low susceptibility, while the silts are of high susceptibility. A water table within approximately 2.5 metres of the road surface is required for significant frost heaving to occur. Measured water levels indicated many values above this level. Frost heave is therefore an issue especially in the area of Testhole 99-9 where very silty clay was encountered and the ground water level was high. Therefore no substantial cuts are recommended. The silty clay should be removed to a depth of 1.5 metres below the subgrade elevation. In addition, the installation of subdrains to draw down the water may prove beneficial throughout the site.

6. An aggressive clay trench backfill drying program would improve the road surface support conditions, as will cement stabilization. All materials should only be dried to within 1 and 3 percent over the optimum moisture. Additional drying will create other difficulties.

7. Several sloughs were observed throughout the site. The sloughs will create some problems for construction. Based on experience, the silt content of the near surface soils in a slough area is typically higher then the surrounding areas. In addition the material will likely be saturated. A suitable low to medium plastic clay fill material should be placed in the slough areas, raising the grade by at least 1.0 metre to the design elevation. The clay fill should be near optimum moisture content and compacted in maximum 150 millimetre lifts to 98 percent of the corresponding standard proctor density. The thickness of the first lift may be increased to 300 millimetres with moderate compaction to allow for the effects of the soft in-situ subgrade. The clay till material from the site is considered suitable for use as fill but some drying is likely required and the top lift will still require cement stabilization. In extremely wet areas the use of geotextile may be required.

8. The following typical 20 year design road structures may be considered. The designs are based upon an assumed soaked C.B.R. of 3.0 applied to a prepared clay subgrade and estimated traffic volumes as shown. The table shows design thicknesses for soil cement base, and gravel base design options.

Recommended Pavement Designs

NE ¼ 28-49-25-W4M

Leduc, Alberta

Stage 1

Road Category	Traffic (ESALs)	Option A Soil Cement Base	Option B Gravel Base or Sub-base
Local Residential	3×10^4	65 ACR 150 Soil Cement	65 ACR 225 Crush (20 mm)
Minor Collector (no buses)	1×10^5	85 ACR 175 Soil Cement	85 ACR 260 Crush (20 mm)
Major Collectors (with buses)	6×10^5	100 ACR 210 Soil Cement	100 ACR 325 Crush (20 mm)

Note: All above thicknesses are in millimetres

Stage 2

The second stage would consist of a 35 millimetre type ACO overlay in 2 years. A 30 millimetres overlay is acceptable if it can be proven that it is possible to place this thickness of asphalt properly.

Note: ACR = City of Edmonton Designation Asphaltic Concrete Residential
ACO = City of Edmonton Designation Asphaltic Concrete Overlay

7.5 Storm Water Management Facilities

1. It is understood that two storm water management facilities, one on each side of Black Gold Drive, are planned. The soil conditions throughout the site show that glacial deposits of either clay or silt were encountered from 0.8 to 1.8 metres in depth. Silty clay with a very high silt content was encountered in Testholes 99-8 and 99-9 in the North East portion of

the site. Construction of a storm water management facility in silt requires extra care and can be difficult, especially where the ground water conditions are high. Underlying the glaciofluvial deposits a layer of clay till was encountered. Sand seams with in the clay till may cause some seepage into the storm water management facilities during construction. The observed groundwater level from 0.58 to 4.98 metres below existing ground surface with the median ground water level of 1.33 metres.

2. The recommended maximum sideslopes in the pond is 3H:1V for stability purposes, based on the anticipated clay till conditions. Storm water facilities located in the north-east will likely encounter silt near surface and will require shallower sideslopes of 4H:1V for stability purposes. Side slopes below water level will need to be 4H:1V in clay tills and 7H:1V in silts. Erosion protection in the form of rip-rap should be placed where water velocities are anticipated or wave action is possible. The side slopes should be seeded to grass as soon as possible in order to prevent erosion.
3. Due to the high groundwater level observed in this area, seepage into the pond from the base and sideslopes are likely. The infiltration rate may be substantial due to the high sand content in the clay till soils. Seasonal fluctuation of the ground water level may produce even higher water levels.
4. The soil conditions at the base and lower sidewalls of the pond are expected to be stiff with good bearing capacity.
5. All berm compaction should be to 95% of the corresponding standard Proctor density at optimum moisture content. Storm water ponds will likely not require a liner as the native clays are quite impermeable. But it should be noted that some lining of the sand and or silt layers may be required.
6. Additional evaluation, after the nature of the water management facility is better defined may be required.

7.6 Cement

1. Soluble soil sulphate concentrations determined on representative soil samples indicate that severe to negligible concentrations are present. Therefore C.S.A. Type 50 Portland cement

should be applied to all surface concrete works including curbs, sidewalks, pedestals, etc. All concrete for residential houses should also be made with C.S.A. Type 50 cement, with a minimum 28 day compressive strength of 30 MPa. All storm sewer concrete pipe and manholes should be made with CSA Type 50 cement, regardless of the soil sulphate content. All concrete subject to freeze-thaw cycles should be air entrained to between 5 and 7 percent.

8.0 CLOSURE

This report has been prepared for the exclusive and confidential use of 570178 Alberta Ltd. and LWS Group Ltd. Use of this report is limited to the subject Residential Neighbourhood Development only. The recommendations given are based on the subsurface soil conditions encountered during test boring, current construction techniques and generally accepted engineering practices. No other warranty, expressed or implied, is made. Due to geological randomness of many soils formations, no interpolation of soil conditions, other than those encountered has been made or implied. Soil conditions are known only at the test boring locations. Should other soils be encountered during construction or other information pertinent become available, the recommendations may be altered or modified in writing by the undersigned.

We trust this information is satisfactory. If you should have any further questions, please contact our office.

Yours truly,

J.R. PAINE & ASSOCIATES LTD.

APPROVED BY:

PERMIT TO PRACTICE
JR PAINE & ASSOCIATES LTD.
Signature R. Stefaniw
Date Sept 15/99
PERMIT NUMBER: P 401
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PROFESSIONAL ENGINEER ALBERTA
GARY R. KERR

R. Stefaniw, P. Eng.

Gary R. Kerr, P. Eng.

Reviewed by Rick Evans, P.Eng.

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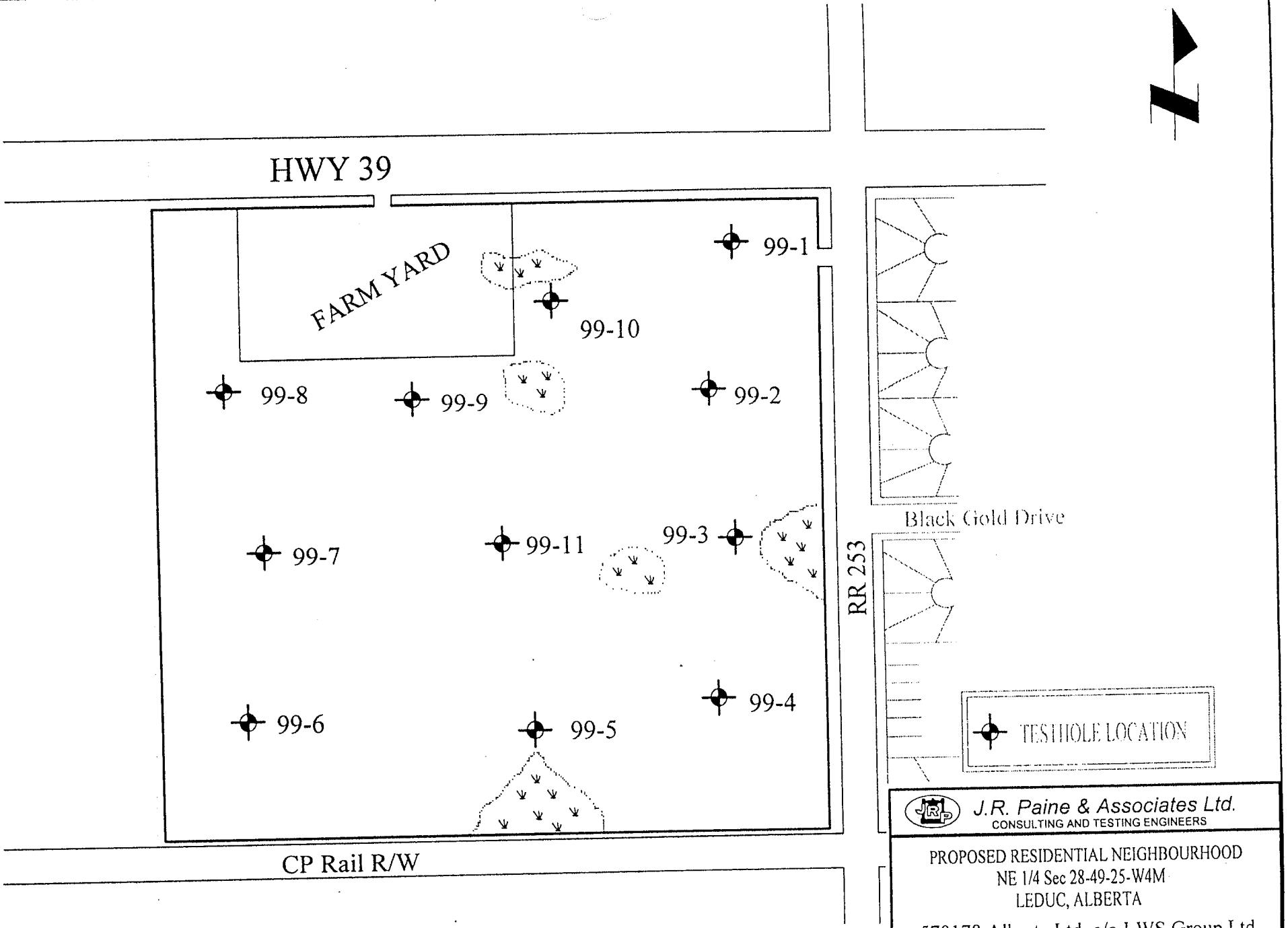
APPENDIX



J.R. Paine & Associates Ltd.
CONSULTING AND TESTING ENGINEERS

PROPOSED RESIDENTIAL NEIGHBOURHOOD
NE 1/4 Sec 28-49-25-W4M
LEDUC, ALBERTA

570178 Alberta Ltd. c/o LWS Group Ltd.

SCALE: NTS	FILE #: 2706-15
DRAWN BY: DZ	DATE:24/07/99

Project: Prop. Subd. NE 1/4Sec28-25-W4M	Client: 570178 AB. c/o LWS Group	TEST HOLE NO: 99-1
Location: NE corner of 1/4 sec	Drill Method: Solid stem auger	PROJECT NO: 2706-15
Project Engineer: Fred Tully	PROJECT ENGINEER: JS	ELEVATION: 717.37 (m)

SAMPLE TYPE: Disturbed; Shelby Tube; SPT; Bulk

BACKFILL TYPE: BENTONITE; PEA GRAVEL; SLOUGH; GROUT; DRILL CUTTINGS; SAND

DEPTH(m)	USC	SOIL DESCRIPTION	SPT(N)
0.0	TS	TOPSOIL: black, organic	
		0.5m	
	CL-CI	CLAY: Silty, medium to low plastic, moist stiff, medium to light brown.	7
1.0		0.9m	
		CLAY TILL: Silty, medium to high plastic, moist, stiff, brown and grey, trace of pebbles, coal.	
2.0	CI	- below 1.8m: very moist, firm, sandy.	7
3.0		- below 3.1m: some sand inclusions.	
		- below 3.4m: stiff	
		4.0m	
4.0	SH	SHALE: damp, hard, light brown to grey.	40/50
		END OF TESTHOLE @ 4.1m. (Auger Refusal)	
5.0		No water or slough in testhole on completion of drilling.	
		Slotted standpipe installed and testhole backfilled with drill cuttings	
6.0		Groundwater level after 6 days: 1.33m bgs	
		after 12 days: 1.23m bgs	
7.0		after 23 days: 1.40m bgs	
8.0			
9.0			
10.0			
11.0			
12.0			

▲ Pocket Pen. (kPa) ▲ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

TEST RESULTS

Soil Sulfates: Nil

SLOTTED PIEZOMETER

ELEVATION(m): 717.0, 716.0, 715.0, 714.0, 713.0, 712.0, 711.0, 710.0, 709.0, 708.0, 707.0, 706.0

J.R. Paine & Associates
Edmonton, Alberta

LOGGED BY: DZ
REVIEWED BY: JS
Fig. No: 2

COMPLETION DEPTH: 4.0 m
COMPLETE: 01/07/99

99/09/13 04:55PM (ELEV12HP)

Project: Prop. Subd. NE1/4Sec28-25	Client: 570178AB. c/o LWS Group	TEST HOLE NO: 99-2
Location: middle of east side of 1/4 sec	Drill Method: Solid stem auger	PROJECT NO: 2706-15
Project Engineer: Fred Tully	PROJECT ENGINEER: JS	ELEVATION: 722.45 (m)

SAMPLE TYPE: Disturbed; Shelby Tube; SPT; Bulk

BACKFILL TYPE: BENTONITE; PEA GRAVEL; SLOUGH; GROUT; DRILL CUTTINGS; SAND

DEPTH(m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SPT(N)
0.0	TS		TOPSOIL: black, organic 0.3m		
			CLAY: Silty, sandy, medium plastic, moist very stiff, medium brown, trace of pebbles. 0.8m		30
1.0			CLAY TILL: Silty, sandy, medium plastic, moist, hard, medium brown, trace of pebbles, coal.		
2.0			- below 1.8m: trace of 20mm rock, white deposits.		
	CI		- below 2.7m: very stiff.		
3.0			- below 3.4m: stiff		
4.0					18
			- below 4.7m: dark brown and grey. 5.0m		
5.0			SANDSTONE: Moist, very stiff, light grey.		40/150
6.0	SA		- below 6.4m: free water on auger. 7.0m		
7.0			SHALE: damp, very hard, light grey.		40/125
	SH				
8.0					50/75
			END OF TESTHOLE @ 8.5m.		
9.0			Water in testhole on completion of drilling.		
			Slotted standpipe installed and testhole backfilled with drill cuttings.		
10.0			Groundwater level after 6 days: 3.39m bgs		
			after 12 days: 3.32m bgs		
11.0			after 23 days: 3.30m bgs		
12.0					

▲ Pocket Pen. (kPa) ▲ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

TEST RESULTS

Soil Sulfates: Nil

Soil Sulfates: Nil

Shelby Tube
Qu - 433 kPa
DD - 1858 kg/m3
MC - 15.6%

Sieve Analysis
Gravel: 5.5%
Sand: 49.4%
Silt and Clay: 45.1%

SLOTTED PIEZOMETER

ELEVATION(m): 722.0, 721.0, 720.0, 719.0, 718.0, 717.0, 716.0, 715.0, 714.0, 713.0, 712.0, 711.0

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LOGGED BY: DZ
REVIEWED BY: JS
Fig. No: 3

COMPLETION DEPTH: 8.5 m
COMPLETE: 01/07/99

99/09/02 11:59AM (ELEV12HP)

Project: Prop. Subd. NE1/4Sec28-25-W4M	Client: 570178AB. c/o LWS Group	TEST HOLE NO: 99-3
Location: mid south of east side 1/4 sec	Drill Method: Solid stem auger	PROJECT NO: 2706-15
Project Engineer: Fred Tully	PROJECT ENGINEER: JS	ELEVATION: 721.03 (m)

SAMPLE TYPE: Disturbed; Shelby Tube; SPT; Bulk

BACKFILL TYPE: BENTONITE; PEA GRAVEL; SLOUGH; GROUT; DRILL CUTTINGS; SAND

DEPTH(m)	USC	SOIL DESCRIPTION	SAMPLE TYPE	SPT(N)
0.0	TS	TOPSOIL: black, organic 150mm		
	CL-CI	CLAY: Silty, low to medium plastic, wet, soft. medium brown. 0.9m		9
1.0		CLAY TILL: Silty, medium plastic, wet, firm, brown and grey, trace of coal.		
2.0		– below 1.8m: sandy, very moist, stiff. trace of pebbles, rock.		
	CI			14
3.0		– below 2.7m: moist, very stiff.		
4.0		4.1m		51
		SHALE: damp, very hard, light grey.		
5.0				
	SH			
6.0				
7.0		END OF TESTHOLE @ 6.9m. no water or slough in testhole on completion of drilling. Slotted standpipe installed and testhole backfilled with drill cuttings. Groundwater level after 6 days: 0.75m bgs after 12 days: 0.68m bgs after 23 days: 0.61m bgs		
8.0				
9.0				
10.0				
11.0				
12.0				

▲ Pocket Pen. (kPa) ▲
100 200 300 400

PLASTIC M.C. LIQUID
20 40 60 80

TEST RESULTS

Soil Sulfates: Nil

SLOTTED PIEZOMETER

ELEVATION(m): 721.0, 720.0, 719.0, 718.0, 717.0, 716.0, 715.0, 714.0, 713.0, 712.0, 711.0, 710.0

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Edmonton, Alberta

LOGGED BY: DZ
REVIEWED BY: JS
Fig. No: 4

COMPLETION DEPTH: 6.9 m
COMPLETE: 01/07/99

99/09/02 11:59AM (ELEV12HP)

Project: Prop. Subd. NE1/4Sec28-25-W4M	Client: 570178AB. c/o LWS Group	TEST HOLE NO: 99-4
Location: SE corner of 1/4 sec	Drill Method: Solid stem auger	PROJECT NO: 2706-15
Project Engineer: Fred Tully	PROJECT ENGINEER: JS	ELEVATION: 722.36 (m)

SAMPLE TYPE: Disturbed; Shelby Tube; SPT; Bulk

BACKFILL TYPE: BENTONITE; PEA GRAVEL; SLOUGH; GROUT; DRILL CUTTINGS; SAND

DEPTH(m)	USC	SOIL DESCRIPTION	SPT(N)
0.0	TS	TOPSOIL: black, organic 150mm	
	CL-CI	CLAY: Silty, low to medium plastic, very moist, firm to soft, medium brown. 0.6m	
1.0		CLAY TILL: Silty, sandy, medium plastic, moist, firm to stiff, brown and grey, trace of pebbles, coal.	
		- below 0.9m: stiff.	
2.0			
			15
3.0	CI		
		- below 3.4m: trace of 20mm rock.	
4.0			23
		- below 4.3m: hard, medium to dark brown	
5.0		- below 4.9m: very sandy, wet, firm. free water on auger. 5.3m	
	SA	SANDSTONE: moist, hard. 5.8m	77
6.0		SHALE: damp, very hard, light grey.	
	SH		
7.0			50/75
		END OF TESTHOLE @ 6.9m.	
8.0		Water in testhole on completion of drilling.	
		Slotted standpipe installed and testhole backfilled with drill cuttings	
9.0		Groundwater level after 6 days: 1.10m bgs	
		after 12 days: 1.07m bgs	
10.0		after 23 days: 0.99m bgs	
11.0			
12.0			

▲ Pocket Pen. (kPa) ▲
100 200 300 400

PLASTIC M.C. LIQUID
20 40 60 80

TEST RESULTS

Shelby Tube
Qu - 90 kPa
DD - 1514 kg/m3
MC - 27.6%

Soil Sulfates: Nil

Sieve Analysis:
Gravel: 2.4%
Sand: 59.4%
Silt and Clay: 38.2%

SLOTTED PIEZOMETER

ELEVATION(m): 722.0, 721.0, 720.0, 719.0, 718.0, 717.0, 716.0, 715.0, 714.0, 713.0, 712.0, 711.0

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Edmonton, Alberta

LOGGED BY: DZ	COMPLETION DEPTH: 6.9 m
REVIEWED BY: JS	COMPLETE: 01/07/99
Fig. No: 5	Page 1 of 1

99/09/02 11:59AM (ELEV12HP)

Project: Prop. Subd. NE1/4Sec28-25-W4M	Client: 570178AB. c/o LWS Group	TEST HOLE NO: 99-5
Location: middle of south side of 1/4	Drill Method: Solid stem auger	PROJECT NO: 2706-15
Project Engineer: Fred Tully	PROJECT ENGINEER: JS	ELEVATION: 721.52 (m)

SAMPLE TYPE: Disturbed | Shelby Tube | SPT | Bulk

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

DEPTH(m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SPT(N)
0.0	TS		TOPSOIL: black, organic		
			0.8m		
1.0			CLAY TILL: Silty, sandy, medium plastic, very moist, soft to firm, brown and grey, trace of pebbles, coal.		8
2.0			– below 0.9m: moist, stiff to very stiff		
3.0	CI				
4.0					24
5.0			– below 4.9m: very stiff, medium to dark brown.		
			5.8m		36
6.0	SA		SANDSTONE: silty, clayey, moist, stiff.		
			6.4m		
	SH		SHALE: damp, hard, light grey.		50/130
7.0			END OF TESTHOLE @ 7.0m Water in testhole on completion of drilling. Slotted standpipe installed and testhole backfilled with drill cuttings Groundwater level after 6 days: 1.49m bgs after 12 days: 1.47m bgs after 23 days: 1.33m bgs		
8.0					
9.0					
10.0					
11.0					
12.0					

▲ Packet Pen. (kPa) ▲
100 200 300 400

PLASTIC M.C. LIQUID
20 40 60 80

TEST RESULTS

Soil Sulfates: Nil

Shelby Tube
Qu – 197 kPa
DD – 1745 kg/m3
MC – 20.0

Soil Sulfates: Nil

SLOTTED PIEZOMETER

ELEVATION(m)
721.0
720.0
719.0
718.0
717.0
716.0
715.0
714.0
713.0
712.0
711.0
710.0

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Edmonton, Alberta

LOGGED BY: DZ	COMPLETION DEPTH: 7.0 m
REVIEWED BY: JS	COMPLETE: 01/07/99
Fig. No: 6	Page 1 of 1

99/09/02 11:59AM (ELEV12HP)

Project: Prop. Subd. NE1/4Sec28-25-W4M	Client: 570178AB. c/o LWS Group	TEST HOLE NO: 99-6
Location: SW corner of 1/4 sec	Drill Method: Solid stem auger	PROJECT NO: 2706-15
Project Engineer: Fred Tully	PROJECT ENGINEER: JS	ELEVATION: 720.63 (m)

SAMPLE TYPE: Disturbed | Shelby Tube | SPT | Bulk

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

DEPTH(m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SPT(N)	▲ Pocket Pen. (kPa) ▲ 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	TEST RESULTS	SLOTTED PIEZOMETER	ELEVATION(m)
0.0	TS		TOPSOIL: black, organic 150mm						720.0
	CL-CI		CLAY: Silty, medium plastic, moist, stiff, medium brown. 1.2m				Soil Sulfates: Nil Shelby Tube Qu - 201 kPa DD - 1626 kg/m3 MC - 24.5%		
1.0			CLAY TILL: Silty, medium plastic, very moist, soft, brown and grey, trace of pebbles, coal.						719.0
2.0			- below 2.3m: sandy, firm to stiff.		12				718.0
3.0			- below 3.4m: stiff						717.0
4.0							Shelby Tube Qu - 174 kPa DD - 1768 kg/m3 MC - 19.7%		716.0
5.0	CI		- below 4.9m: stiff to very stiff, medium to dark brown.		52				715.0
6.0			- below 5.8m: small sand laminations, hard. - below 5.9m: very stiff, dark grey.						714.0
7.0					32		Soil Sulfates: Nil		713.0
8.0					29				712.0
9.0			END OF TESTHOLE @ 8.8m No water or slough in testhole on completion of drilling. Slotted standpipe installed and testhole backfilled with drill cuttings Groundwater level after 6 days: 1.47m bgs after 12 days: 1.35m bgs after 23 days: 1.24m bgs						711.0
10.0									710.0
11.0									709.0
12.0									

J.R. Paine & Associates
Edmonton, Alberta

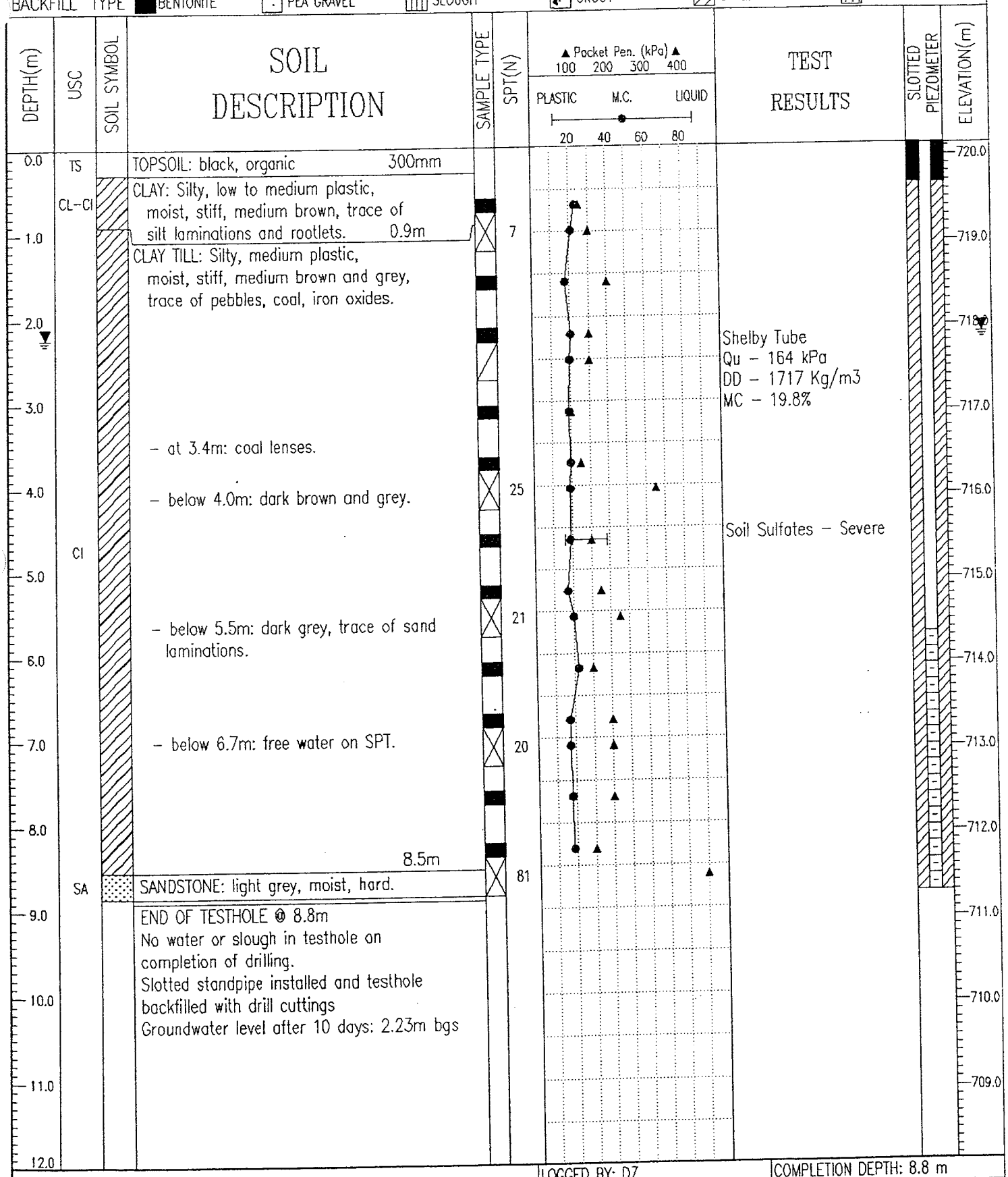
LOGGED BY: DZ	COMPLETION DEPTH: 8.8 m
REVIEWED BY: JS	COMPLETE: 01/07/99
Fig. No: 7	Page 1 of 1

99/09/13 04:55PM (ELEV12HP)

Project: Prop. Subd. NE1/4Sec28-25-W4M	Client: 570178AB. c/o LWS Group	TEST HOLE NO: 99-7
Location: middle of west side of 1/4 sec	Drill Method: Solid stem auger	PROJECT NO: 2706-15
Project Engineer: Fred Tully	PROJECT ENGINEER: JS	ELEVATION: 720.13 (m)

SAMPLE TYPE: Disturbed | Shelby Tube | SPT | Bulk

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



J.R. Paine & Associates Edmonton, Alberta	LOGGED BY: DZ REVIEWED BY: JS Fig. No: 8
	COMPLETION DEPTH: 8.8 m COMPLETE: 13/07/99

99/09/02 11:59AM (ELEV1 2HP)

Project: Prop. Subd. NE1/4Sec28-25-W4M	Client: 570178AB. c/o LWS Group	TEST HOLE NO: 99-8
Location: South asf SW corner of yard	Drill Method: Solid stem auger	PROJECT NO: 2706-15
Project Engineer: Fred Tully	PROJECT ENGINEER: JS	ELEVATION: 721.08 (m)

SAMPLE TYPE: Disturbed; Shelby Tube; SPT; Bulk

BACKFILL TYPE: BENTONITE; PEA GRAVEL; SLOUGH; GROUT; DRILL CUTTINGS; SAND

DEPTH(m)	USC	SOIL DESCRIPTION	SAMPLE TYPE	SPT(N)
0.0	TS	TOPSOIL: black, organic 300mm		
1.0	CL	CLAY SILTY: (very silty), damp, very stiff, trace of rootlets, medium to high plastic – at 1.1m: sand laminations. – at 1.4m: turning to till, trace of pebbles, coal. 1.8m		23
2.0	CI	CLAY TILL: Silty, sandy, medium plastic, moist, very stiff, medium brown and grey, trace of pebbles, coal, iron oxide and 20mm rock.		12
3.0				
4.0				
5.0		– below 4.6m: dark brown and grey.		
6.0	SH	5.8m SHALE: Moist, hard, light grey. – at 6.1m: auger refusal.		20 79
7.0		END OF TESTHOLE @ 6.6m No water or slough in testhole on completion of drilling. Slotted standpipe installed and testhole backfilled with drill cuttings Groundwater level after 10 days: 4.98m bgs		
8.0				
9.0				
10.0				
11.0				
12.0				

▲ Pocket Pen. (kPa) ▲
100 200 300 400

PLASTIC M.C. LIQUID
20 40 60 80

TEST RESULTS

Soil Sulfates – Nil.

Shelby Tube
Qu – 197 kPa
DD – 1757 Kg/m3
MC – 20.3%

SLOTTED PIEZOMETER

ELEVATION(m): 721.0, 720.0, 719.0, 718.0, 717.0, 716.0, 715.0, 714.0, 713.0, 712.0, 711.0, 710.0

J.R. Paine & Associates
Edmonton, Alberta

LOGGED BY: DZ	COMPLETION DEPTH: 6.6 m
REVIEWED BY: JS	COMPLETE: 13/07/99
Fig. No: 9	Page 1 of 1

99/09/13 04:55PM (ELEV12HP)

Project: Prop. Subd. NE1/4Sec28-25-W4M	Client: 570178AB. c/o LWS Group	TEST HOLE NO: 99-9
Location: South of middle of yard	Drill Method: Solid stem auger	PROJECT NO: 2706-15
Project Engineer: Fred Tully	PROJECT ENGINEER: JS	ELEVATION: 720.36 (m)

SAMPLE TYPE: Disturbed; Shelby Tube; SPT; Bulk

BACKFILL TYPE: BENTONITE; PEA GRAVEL; SLOUGH; GROUT; DRILL CUTTINGS; SAND

DEPTH(m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SPT(N)	▲ Pocket Pen. (kPa) ▲ 100 200 300 400 / PLASTIC M.C. LIQUID 20 40 60 80	TEST RESULTS	SLOTTED PIEZOMETER	ELEVATION(m)
0.0	TS		TOPSOIL: black, organic 300mm						720.0
	CL		CLAY SILTY: (very silty) moist, very stiff, medium brown, trace of rock and grey silt laminations. 0.9m				Soil Sulfates – Nil. Shelby Tube Qu – 378 kPa DD – 1829 Kg/m3 MC – 15.0%		
1.0			CLAY TILL: very silty, sandy, medium plastic, moist, hard, medium brown, trace of pebbles and coal.						719.0
2.0			– below 1.7m: very stiff.		16				718.0
3.0	CI		– below 2.6m: small fine grained sand lens. – below 3.1m: medium to dark brown and grey.				Soil Sulfates – Nil.		717.0
4.0					17				716.0
5.0			– below 4.6m: small sand laminations. – below 4.9m: dark grey. 5.5m						715.0
6.0	SA		SANDSTONE: Moist, hard, light grey. 7.0m		22		Sieve Analysis Gravel – 8.4% Sand – 45.0% Silt & Clay – 46.6%		714.0
7.0	SH		SHALE: Damp, very hard, light grey, free water on SPT.		87				713.0
8.0			END OF TESTHOLE @ 7.3m No water or slough in testhole on completion of drilling. Slotted standpipe installed and testhole backfilled with drill cuttings Groundwater level after 10 days: 1.66m bgs						712.0
9.0									711.0
10.0									710.0
11.0									709.0
12.0									

J.R. Paine & Associates
Edmonton, Alberta

LOGGED BY: DZ	COMPLETION DEPTH: 7.3 m
REVIEWED BY: JS	COMPLETE: 13/07/99
Fig. No: 10	Page 1 of 1

99/09/07 07:47PM (ELEV12HP)

Project: Prop. Subd. NE1/4Sec28-25-W4M	Client: 570178AB. c/o LWS Group	TEST HOLE NO: 99-10
Location: East side of yard	Drill Method: Solid stem auger	PROJECT NO: 2706-15
Project Engineer: Fred Tully	PROJECT ENGINEER: JS	ELEVATION: 719.71 (m)

SAMPLE TYPE: Disturbed; Shelby Tube; SPT; Bulk

BACKFILL TYPE: BENTONITE; PEA GRAVEL; SLOUGH; GROUT; DRILL CUTTINGS; SAND

DEPTH(m)	USC	SOIL DESCRIPTION	SPT(N)	TEST RESULTS	ELEVATION(m)
0.0	TS	TOPSOIL: black, organic 250mm			719.0
	CI	CLAY: Silty, medium plastic, very moist, stiff, medium brown. 0.9m			
1.0		CLAY TILL: very silty, medium plastic, very moist, stiff, brown and grey, trace of pebbles and coal.	6	Soil Sulfates - Nil.	718.0
2.0		- below 1.2m: firm.			
	CI		3	SPT: Poor Recovery Sloughing from silty clay layer noted	717.0
3.0		- below 3.4m: silt laminations, sandstone inclusions.			
4.0				Shelby Tube: Poor Recovery	716.0
		4.6m			
	SC SA	SAND: clayey, medium to fine grained, damp to moist, very dense, medium brown. 4.9m	30/25		715.0
5.0		SANDSTONE: Dry, hard, light grey. - at 4.9m: auger refusal.			
		END OF TESTHOLE @ 4.9m			714.0
6.0		No water or slough in testhole on completion of drilling.			
		Slotted standpipe installed and testhole backfilled with drill cuttings			713.0
7.0		Groundwater level after 10 days: 0.58m bgs			
					712.0
8.0					
					711.0
9.0					
					710.0
10.0					
					709.0
11.0					
					708.0
12.0					

Packet Pen. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID

20 40 60 80

SLOTTED PIEZOMETER

J.R. Paine & Associates
Edmonton, Alberta

LOGGED BY: DZ	COMPLETION DEPTH: 4.9 m
REVIEWED BY: JS	COMPLETE: 13/07/99
Fig. No: 11	Page 1 of 1

99/09/02 11:58AM (ELEV12HP)

Project: Prop. Subd. NE1/4Sec28-25-W4M	Client: 570178AB. c/o LWS Group	TEST HOLE NO: 99-11
Location: Middle of 1/4 sec S. of yard	Drill Method: Solid stem auger	PROJECT NO: 2706-15
Project Engineer: Fred Tully	PROJECT ENGINEER: JS	ELEVATION: 720.1 (m)

SAMPLE TYPE: Disturbed; Shelby Tube; SPT; Bulk

BACKFILL TYPE: BENTONITE; PEA GRAVEL; SLOUGH; GROUT; DRILL CUTTINGS; SAND

DEPTH(m)	USC	SOIL DESCRIPTION	SPT(N)
0.0	TS	TOPSOIL: black, organic 300mm	
	CI	CLAY: Silty, medium plastic, very moist, firm, medium brown and grey. 1.2m	7
1.0			
2.0		CLAY TILL: Silty, medium plastic, very moist, firm, brown and grey, trace of pebbles, coal and oxides.	
3.0		- below 2.7m: stiff, dark brown and grey, free water on auger.	
4.0	CI		19
		- below 4.3m: very stiff, dark grey, trace of 20mm rock.	
5.0			
6.0		6.4m	20
	SH	SHALE: Damp, very stiff, light grey. - below 6.7m: hard.	81
7.0			
8.0		END OF TESTHOLE @ 7.3m Trace of water, no slough in testhole on completion of drilling. Slotted standpipe installed and testhole backfilled with drill cuttings Groundwater level after 10 days: 0.80m bgs	
9.0			
10.0			
11.0			
12.0			

Pocket Pen. (kPa): 100 200 300 400

PLASTIC M.C. LIQUID

20 40 60 80

TEST RESULTS

Shelby Tube
Qu - 189 kPa
DD - 1656 Kg/m3
MC - 23.6%

Soil Sulfates - Nil.

Soil Sulfates - Moderate.

SLOTTED PIEZOMETER

ELEVATION(m): 720.0, 719.0, 718.0, 717.0, 716.0, 715.0, 714.0, 713.0, 712.0, 711.0, 710.0, 709.0

J.R. Paine & Associates
Edmonton, Alberta

LOGGED BY: DZ	COMPLETION DEPTH: 7.3 m
REVIEWED BY: JS	COMPLETE: 13/07/99
Fig. No: 12	Page 1 of 1

99/09/02 11:58AM (ELEV1 2HP)

B. Environmental Site Assessment
Phase 1 by Hoggan Engineering and Testing (1980) Ltd.
- August 1999

HOGGAN ENGINEERING & TESTING (1980) LTD.
An Affiliate of J. R. Paine & Associates Ltd.
17505 - 106 Avenue, Edmonton, Alberta T5S 1E7

17505-106 Avenue
EDMONTON, Alberta
T5S 1E7

August 6, 1999
File No. 6134-1

570178 Alberta Ltd.
c/o LWS GROUP LTD.
11420 142 STREET
EDMONTON, AB
T5M 1V1

ATTENTION: Mr. Harvey Leach, P. Eng.

Dear Sir:

Re: ENVIRONMENTAL SITE ASSESSMENT - PHASE I
Proposed Residential Neighbourhood
NE ¼ Section 28-49-25-W4M
LEDUC, ALBERTA

HOGGAN ENGINEERING AND TESTING (1980) LTD. has conducted an Environmental Site Assessment on the above noted property. The details of the assessment are included in the enclosed report.

We trust this information is satisfactory. If you should have any further questions, please contact our office.

Yours truly,
HOGGAN ENGINEERING AND TESTING (1980) LTD.

John Schroder, C.E.T., E.I.T.

FILE NO: 6134-1

ENVIRONMENTAL SITE ASSESSMENT - PHASE I
Proposed Residential Neighbourhood
NE ¼ Section 28-49-25-W4M
LEDUC, ALBERTA

Prepared by:

HOGGAN ENGINEERING AND TESTING (1980) LTD.
17505-106 Avenue
EDMONTON, Alberta
T5S 1E7

Phone: 489-0990 Fax: 489-0800

For:

570178 Alberta Ltd.
c/o LWS GROUP LTD.
11420 142 STREET
EDMONTON, AB
T5M 1V1

FILE NO: 6134-1

ENVIRONMENTAL SITE ASSESSMENT - PHASE I
LEDUC, ALBERTA

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

HOGGAN ENGINEERING AND TESTING LTD. has performed an Environmental Site Assessment - Phase I on the subject property as directed by Mr. Harvey Leach, P. Eng. of LWS Group Ltd. The subject property consists of the NE ¼ Section 28-49-25-W4M near Leduc, Alberta. The site is currently utilized as farmland with miscellaneous buildings and a house in the north-western portion of the subject property.

The ESA-Phase I research into available information revealed no significant environmental concerns with respect to the property itself, or contaminant migration from the surrounding area. A wellsite was previously located within the north-east corner of the property within legal subdivision 16. This wellsite was issued a reclamation certificate in July, 1975 and is therefore considered to have a low potential for environmental contamination. Typical environmental concerns associated with farmyard activities are expected. No above-ground fuel storage tanks were noted at the time of investigation. In discussion with the current landowner, a minor garbage disposal area exists within the farmyard, but is considered to pose a low concern for environmental contamination. No further environmental site assessment investigation is considered necessary.

2.0 INTRODUCTION

HOGGAN ENGINEERING AND TESTING (1980) LTD. has undertaken a Phase I, Environmental Site Assessment for the subject property. The work was undertaken in July/August, 1999 for LWS Group Ltd. The purpose of the ESA was to determine the potential for contamination at this site in the soil or groundwater. The Phase I ESA involves a review of the records and data pertaining to the site and adjacent properties in order to expose any environmental concerns related to contamination of the site. A Phase I assessment is a preliminary study which would indicate the potential for contamination. This assessment does not include any investigation procedures of sampling, monitoring, analyzing, and measuring as related to environmental testing at this site. If, through the findings of this assessment, concerns or suspicion for environmental contamination arise, additional Phase II or Phase III studies would become necessary. Phase II and III studies are beyond the scope of this report.

It is should be noted that the property which was assessed under this study is referred to interchangeably in this report as "the site", "the subject site", "the property" and "the subject property".

3.0 METHODOLOGY

The general approach utilized for this assessment was adopted from the CSA standard Z768-94 publication, "Phase I, Environmental Site Assessment". The topics covered within this report are summarized as follows:

a) Records Review
b) Site reconnaissance
c) Interviews
d) Evaluation and Conclusions

The findings of our research, as presented here-in, was sufficient for our firm to draw reasonable conclusions on the probable environmental conditions of the subject land.

4.0 RECORDS SEARCH

4.1 Property Description

The parcel of land under investigation has a legal description of the NE ¼ Section 28-49-25-W4M near Leduc, Alberta. The property is currently utilized as farmland with miscellaneous buildings and a house in the north-western corner of the property. The site is bounded by farmland and a railway right-of-way to the south, farmland to the west, Range Road 253 and residential development to the east and Highway 39 to the north. A drawing of the subject property is located in Appendix A.

4.2 Land Title Review

A historical land title search into the subject property revealed the following landowners for the site:

Party	Date Purchased	Property Description
Voris Ray Molsberry	September, 1985	NE ¼ 28-49-25-W4
Eldon Bienert	July, 1967	" "
Lydia Bienert, Herbert Bienert, Harry Bennie Bienert, Milton C. Hein (estate executors of Gustave J. Bienert)	January, 1960	" "
Gustave J. Bienert	September, 1943	North ½ 28-49-25-W4
Reinhold Sturtz	Novemner, 1926	" "
Wajciech Halwa	November, 1921	" "
Kitty Belle McRae (estate executor of Ferguhar J. McRae)	July, 1921	" "
Ferguhar J. McRae	December, 1909	" "
Karl Martin	March, 1905	NE ¼ 28-49-25-W4
Hugh Kennedy	February, 1900	" "

None of the above noted current and former property owners are of any environmental concern based on the nomenclature of the landowners.

4.3 Air Photo Review

Aerial photography coverage of the subject area was obtained and carefully reviewed for activities, within and surrounding the site, conducive to potential contamination. A total of 6 sets of air photos covering a time span from 1960 to 1998 were reviewed at the Information Management Division, Alberta Environmental Protection.

The photo coverage inspected is summarized as follows:

Year	Catalogue No.	Photo No.	Scale
1960	AS39	168	1:12000
1969	AS1006	225	1:31680
1979	AS1806	148	1:20000
1984	AS2836	63	1:5000
1987	AS3849	84	1:20000
1998	AS4986	26	1:30000

Laser copies of the area airphotos were obtained from the years 1969, 1979, 1984 and 1998 and are located in Appendix A.

The 1960 airphoto revealed the site to be undeveloped and used for agricultural purposes except for a farmyard in the north-west portion of the property. The site appeared to be used for crop production with some tree cover around the farmyard observed. The surrounding land was also all used for agricultural purposes. Highway 39 runs east-west along the northern boundary of the site with a Canadian Pacific Railway line running east-west along the southern edge of the site.

The 1969, 1979 and 1984 air photos were basically unchanged from the 1960 photo.

The 1987 air photo showed the site to continue to be undeveloped. Some residential development appears east of Range Road 253.

The 1998 airphoto showed the subject site to remain unchanged. Residential development appears all along the east edge of the property, east of Range Road 253.

No environmental concerns were observed in any of the reviewed airphotos.

5.0 SITE RECONNAISSANCE

5.1 Existing Site

The existing site and surrounding area were inspected for environmental concerns on July 1 and 13, 1999. The majority of the site was being used for farmland with miscellaneous buildings and a single family residence observed within the farmyard. At the time of the inspection, the buildings were not inspected. The site consists of fairly level terrain with drainage to low lying areas and miscellaneous sloughs throughout the site. Ground cover consisted of a dense grassy surface.

No above-ground storage tanks were noted at the time of the investigation. In discussion with the current landowner, a minor waste disposal area exists within the farmyard. Above-ground storage tanks and waste disposal areas are typically found in farmyard areas and is considered to pose a low concern for environmental contamination.

5.2 Surrounding Land

The land use of the surrounding properties was recorded as part of the site visit. The area to the south contained a railway right-of-way running east-west along the southern edge of the property and farmland beyond. West of the site is additional farmland. North of the site is Highway 39, with farmland further to the north. East of the site is Range Road 253 with residential development further to the east.

5.3 Geotechnical Investigation

Testholes advanced by our firm within the property, part of a geotechnical investigation conducted concurrently with the environmental assessment, revealed a surficial layer of topsoil underlain by glaciofluvial silt or clays, glacial clay till and bedrock. Care was taken during the testhole logging and sampling to note any hydrocarbon odours or contaminant staining in the soil and no such concerns were observed. The soils in the testholes were all clays which should have a relatively low permeability, which would limit contaminant transport.

6.0 INTERVIEWS

The following parties were interviewed by means of verbal contact or through written correspondence for their knowledge or for records pertaining to activities/usage associated with the potential for site contamination:

Party	Means of Contact	Contact	Date
PTMAA	Written/Fax	Joe Petrie	July 8, 1999
Environmental Law Center	Written/Fax	Iris Djurfors	July 8, 1999
Alberta Environmental Prot. Chemical Assessment and Management Division	Written/Fax	Della Gerbrandt	July 8, 1999
Capital Health Authority Environmental Health Division	Written/Fax	D. Langier-Blythe	July 8,1999
City of Leduc - Planning, Engineering, and Protective Services Departments	Written/Fax	Sandra Birkholz	July 8, 1999

The Petroleum Tank Management Association of Alberta (PTMAA) has no records of active or abandoned USTs within the subject property. The AEP Chemical Assessment and Management Division had no records of environmental concerns with respect to the subject site. The Capital Health Authority had no records of environmental concerns with respect to the subject site. The Strathcona Emergency Services Department had no records of environmental concerns with respect to the subject site.

The Environmental Law Office had no records of environmental concerns for the past landowners of the site. However, a search of the Wellsite Reclaimation Historical Search Service indicated that a reclaimation certificate was issued for a site in legal subdivision 16. The fact that this certificate was issued indicates a low potential for contamination.

Copies of written correspondence sent and received are included in Appendix B.

7.0 CONCLUSIONS

The land title search and air photo review revealed no environmental contamination concerns for the subject site. The airphoto review showed the site relatively unchanged in each photo. The site reconnaissance encountered minor environmental concerns associated with an agricultural setting.

The Canadian Pacific Railway line present on the southern boundary and the highway present on the northern boundary of the subject site are potential environmental concern. The potential for environmental contamination from the highway is considered to be low and negligible from the railway.

Based on the research conducted and data reviewed, the overall potential for environmental contamination at this site is considered to be low, and no further environmental site assessment work is considered necessary.

8.0 CLOSURE

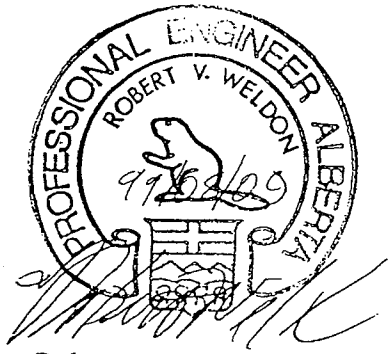
It should be noted that no environmental site assessment can completely reveal all the actual contaminants which may be present on a property. The findings and conclusions stated in this report are based upon generally accepted environmental engineering practices. No other warranty expressed or implied is given. This Report is limited for use by 570178 Alberta Ltd. and LWS Group Ltd. only. The Report only applies to the subject property at the time of the assessment.

We trust this information is satisfactory. If you should have any questions or comments, please contact our office.

Yours truly,

APPROVED BY:

HOGGAN ENGINEERING AND TESTING (1980) LTD.

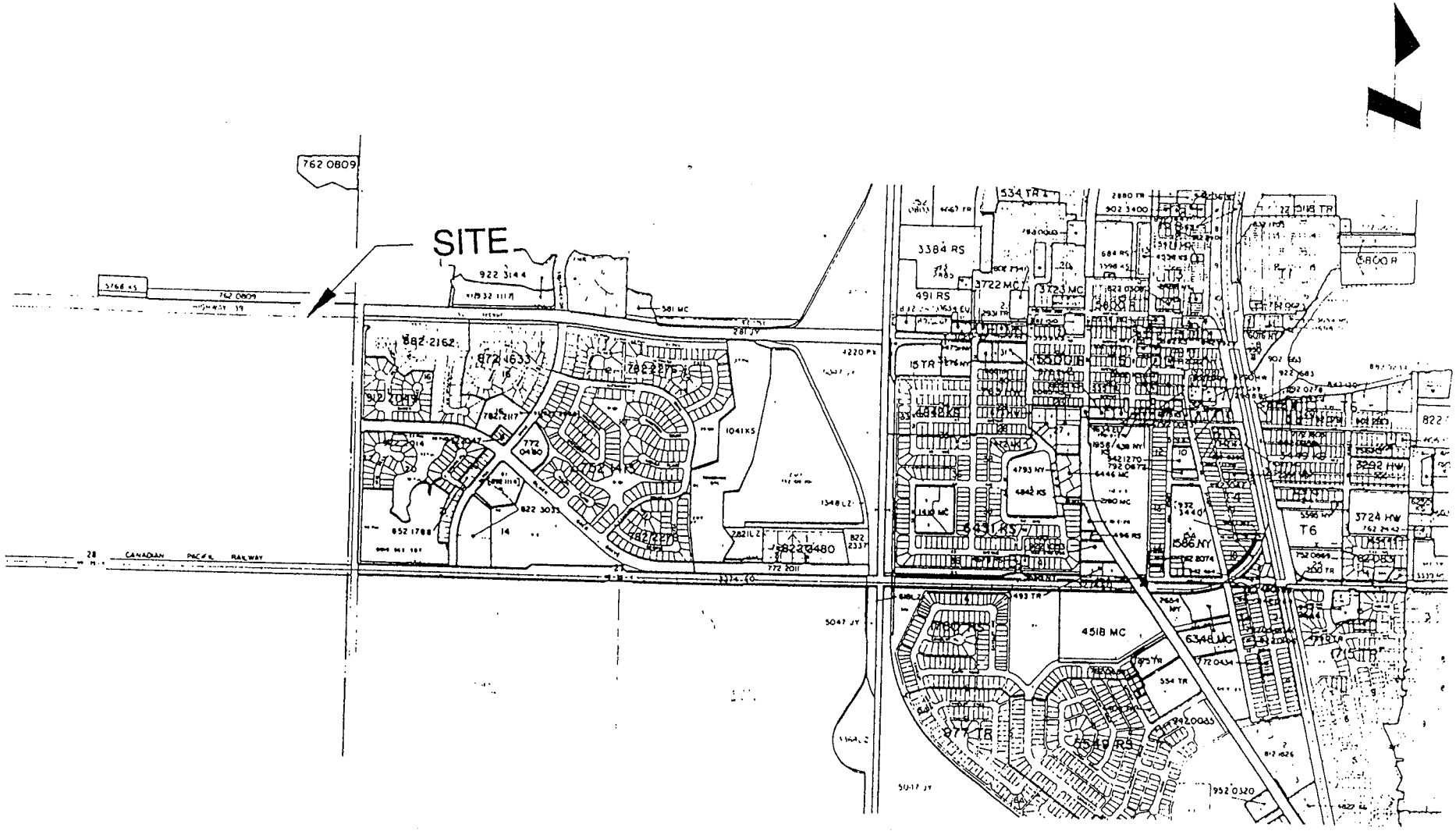


Robert Weldon, P. Eng.

John Schroder, C.E.T., E.I.T.

E:\6134 - LWS Group\6134-1 - Leduc Subdivision ESA Phase 1\r0783lws.doc

APPENDIX A

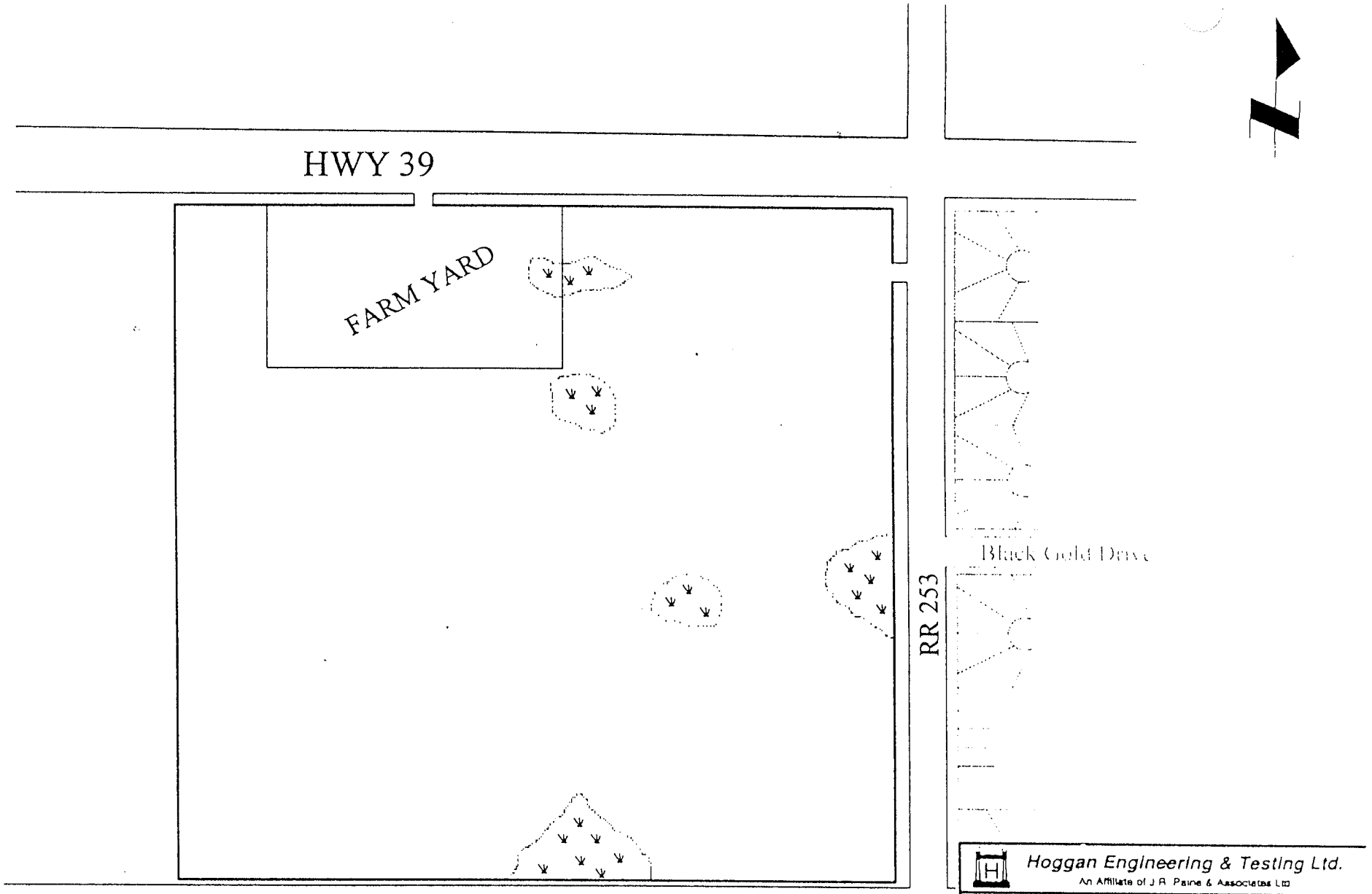


Hoggan Engineering & Testing Ltd.
An Affiliate of J.R. Paine & Associates Ltd.

Local Land Usage and Key Plan - Phase I
NE 1/4 Sec 28-49-25-W4M
LEDUC, ALBERTA

570178 Alberta Ltd. c/o LWS Group Ltd.

SCALE: NTS	FILE # 6134-1
DRAWN BY: DZ	DATE 05/08/99



Hoggan Engineering & Testing Ltd.
An Affiliate of J.R. Paine & Associates Ltd

Environmental Site Assessment - Phase I
NE 1/4 Sec 28-49-25-W4M
LEDUC, ALBERTA

570178 Alberta Ltd. c/o LWS Group Ltd.

SCALE: NTS	FILE # 6134-1
DRAWN BY: DZ	DATE 05/08/99

-097A 98/06/24 1:30,000 LN 42

AIR PHOTO SERVICES (403) 427-3520

Hoggan Engineering & Testing Ltd.
An Affiliate of J.R.Paine & Associates

1998 AIRPHOTO
ESA PHASE I
NE 1/4-28-49-25-W4M
LEDUC, ALBERTA

Drawn By: Schroder	Drawing No.: 1
Scale: NTS	Date: July, 1999

Hoggan Engineering & Testing Ltd.
An Affiliate of J.R. Paine & Associates

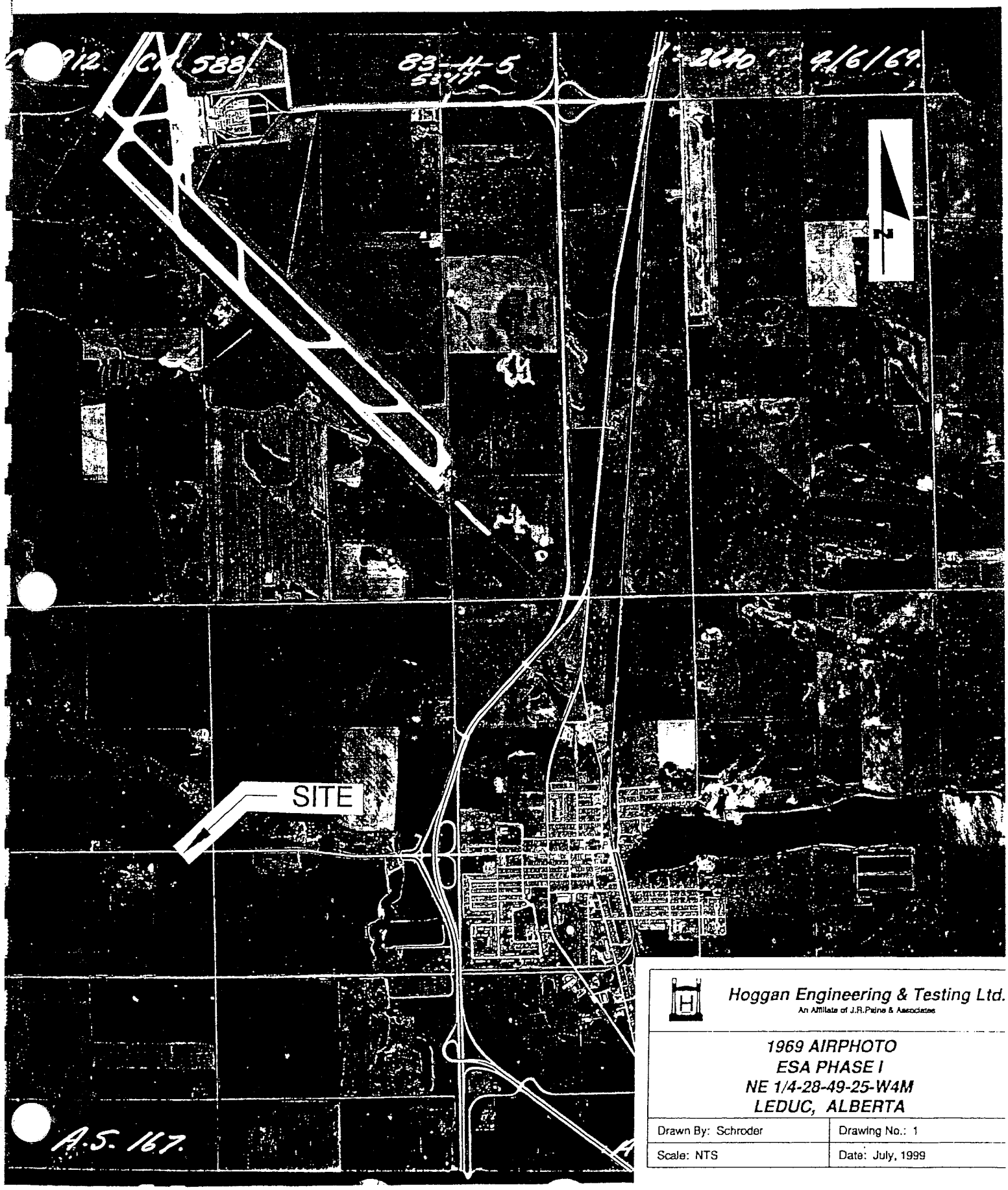
1979 AIRPHOTO
ESA PHASE I
NE 1/4-28-49-25-W4M
LEDUC, ALBERTA

Drawn By: Schroder	Drawing No.: 1
Scale: NTS	Date: July, 1999

Hoggan Engineering & Testing Ltd.
An Affiliate of J.R.Paine & Associates

1984 AIRPHOTO
ESA PHASE I
NE 1/4-28-49-25-W4M
LEDUC, ALBERTA

Drawn By: Schroder	Drawing No.: 1
Scale: NTS	Date: July, 1999



Hoggan Engineering & Testing Ltd.
An Affiliate of J.R.Paine & Associates

1969 AIRPHOTO
ESA PHASE I
NE 1/4-28-49-25-W4M
LEDUC, ALBERTA

Drawn By: Schroder	Drawing No.: 1
Scale: NTS	Date: July, 1999

HOGGAN ENGINEERING & TESTING (1980) LTD.
An Affiliate of J. R. Paine & Associates Ltd.
17505 - 106 Avenue, Edmonton, Alberta T5S 1E7

July 8, 1999
File No. 6134-1

PETROLEUM TANK MANAGEMENT
ASSOCIATION OF ALBERTA
Suite 1560, 10303 Jasper Avenue
Edmonton, Alberta
T5J 3N6

RE: Information Request
Environmental Site Assessment - Phase I
NE ¼-28-49-25-W4M
Highway 39 and Range Road 253
LEDUC, Alberta

HOGGAN ENGINEERING & TESTING (198O) LTD., an affiliate company of J. R. PAINE & ASSOCIATES LTD., is presently conducting an Environmental Site Assessment - Phase 1 on the above noted property on behalf of our client for a pending purchase of the property. Could you please forward any information regarding any past or present underground storage tanks associated with the afore noted legal description. The street address is unknown at this time, however the site is located on the south side of Highway 39, and west of Range Road 253, on the west side of Leduc. Any information relevant to this site would be appreciated.

Thank-you in advance for any assistance supplied. If you should have any questions or comments, please contact the undersigned. Our phone number is 489-0990 and our fax number is 489-0800.

Yours truly,
HOGGAN ENGINEERING AND TESTING LTD.

John Schroder, C.E.T., E.I.T.

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Petroleum Tank Management Association of Alberta
Suite 1560, 10303 Jasper Avenue
Edmonton, Alberta T5J 3N6
PH: (780)425-8265 FAX: (780)425-4722

July 8. 1999

John Schroder
Hoggan Engineering & Testing
17505 106 Avenue
Edmonton, AB
T5S 1E7

Dear John Schroder:

As per your request, the PTMAA has checked the registration of active tank sites and inventory of abandoned tank sites and there are no records for the property with the legal land description:

NE-28-49-25-W4M
Highway 39 and Range Road 253
Leduc, AB

Please note that both databases are not complete. The main limitation of these databases is that they only include information reported through registration and a survey of abandoned sites completed in 1992 and should not be considered as a comprehensive inventory of all past or present storage tank sites. The PTMAA cannot guarantee that tanks do not or have not existed at this location. Information on storage tanks or on past or present contaminant investigations may be filed with the local Fire Department or the Pollution Control Division, Alberta Environmental Protection.

Effective July 1, 1995 the PTMAA has implemented a $10 Administration Fee to complete a file search. An invoice for file search(s) performed by your company will follow at month end.

Yours truly,

Joe Petrie, P.Geol.
Environmental Coordinator

HOGGAN ENGINEERING & TESTING (1980) LTD.
An Affiliate of J. R. Paine & Associates Ltd
17505 - 106 Avenue, Edmonton, Alberta T5S 1E7

July 8, 1999
File No. 6134-1

ENVIRONMENTAL LAW CENTRE
204, 10709 Jasper Ave.
Edmonton, Alberta
T5J 3N3

Attention: Iris Djurfors

Dear Madame:

Re: Information Request
Environmental Site Assessment - Phase I
Highway 39 and Range Road 253
NE ¼- 28-49-25-W4M
LEDUC, Alberta

HOGGAN ENGINEERING & TESTING (1980) LTD. is in the process of conducting an environmental site assessment on the above noted property. The work is being done on behalf of the present owner of the land. The purpose of the assessment is to determine the potential for contamination on the site. Any information which you can forward regarding potential or actual contamination in the area of the site would be appreciated. Please bill our firm's credit card on record.

The lot in question has been owned by the following parties:

- 570178 Alberta Limited
- Voris Ray Molsberry
- Eldon Bienert

Thank you in advance for any assistance supplied. If you should have any questions or comments, please contact the undersigned.

Yours truly,
HOGGAN ENGINEERING & TESTING (1980) LTD.

John Schroder, C.E.T., E.I.T.

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ENVIRONMENTAL LAW CENTRE

204, 10709 Jasper Avenue
Edmonton, Alberta T5J 3N3 TEL: (780)424-5099 FAX: (780)424-5133
Alberta Toll Free: 1-800-661-4238 E-Mail: elc@elc.ab.ca Home Page: http://www.elc.ab.ca

Jul 9, 1999

Our File: P-96-787B &
12369-440-Z98
9:42 am

Mr. John Schroder
Hoggan Engineering & Testing (1980) Ltd
17505 - 106 Avenue
Edmonton, AB T5S 1E7

Dear Mr. Schroder:

RE: Search Performed - 570178 Alberta Limited

In response to your request of Jul 8, 1999, we have searched the Environmental Enforcement Historical Search Service data base ***for an exact match*** with respect to the above referenced company or individual and can advise that as of today's date, there have been no Tickets, Prosecutions, Administrative Penalties, Warnings, Enforcement Orders, Enforcement Orders Concerning Waste, Environmental Protection Orders, Emergency Environmental Protection Orders, Emission Control Orders, Chemical Control Orders, Water Quality Control Orders, and Stop Orders issued pursuant to the Alberta *Environmental Protection and Enhancement Act* and its predecessor legislation, the *Hazardous Chemicals Act*, *Agricultural Chemicals Act*, *Clean Water Act* and *Clean Air Act* since 1971.

This search does not include Clean Up Orders issued under the *Litter Act* or Environmental Protection Orders respecting unsightly property under the *Environmental Protection and Enhancement Act*; this information may be available from the local municipality.

Enforcement actions are entered in the data base following: (1) the decision date, for prosecutions; (2) the date an administrative penalty was paid or due (30 days after issuance), whichever is sooner; and (3) the date the document was issued for all other enforcement actions.

These search results are based on information provided by Environmental Service, Alberta Environmental Protection ("AEP"). AEP advises that they try to provide the best information possible. However, AEP advises that it cannot guarantee that the information provided is complete or accurate and that any person relying on these search results does so at their own risk.

Yours sincerely,

Iris Djurfors
Enforcement Search Service Coordinator

/id

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Jul 9, 1999

Our File: P-96-787B &
12370-440-Z98
9:42 am

Mr. John Schroder
Hoggan Engineering & Testing (1980) Ltd
17505 - 106 Avenue
Edmonton, AB T5S 1E7

Dear Mr. Schroder:

RE: Search Performed - Voris Ray Molsberry

In response to your request of Jul 8, 1999, we have searched the Environmental Enforcement Historical Search Service data base ***for an exact match*** with respect to the above referenced company or individual and can advise that as of today's date, there have been no Tickets, Prosecutions, Administrative Penalties, Warnings, Enforcement Orders, Enforcement Orders Concerning Waste, Environmental Protection Orders, Emergency Environmental Protection Orders, Emission Control Orders, Chemical Control Orders, Water Quality Control Orders, and Stop Orders issued pursuant to the Alberta *Environmental Protection and Enhancement Act* and its predecessor legislation, the *Hazardous Chemicals Act*, *Agricultural Chemicals Act*, *Clean Water Act* and *Clean Air Act* since 1971.

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Jul 9, 1999

Our File: P-96-787B &
12371-440-Z98
9:42 am

Mr. John Schroder
Hoggan Engineering & Testing (1980) Ltd
17505 - 106 Avenue
Edmonton, AB T5S 1E7

Dear Mr. Schroder:

RE: Search Performed - Eldon Bienert

In response to your request of Jul 8, 1999, we have searched the Environmental Enforcement Historical Search Service data base ***for an exact match*** with respect to the above referenced company or individual and can advise that as of today's date, there have been no Tickets, Prosecutions, Administrative Penalties, Warnings, Enforcement Orders, Enforcement Orders Concerning Waste, Environmental Protection Orders, Emergency Environmental Protection Orders, Emission Control Orders, Chemical Control Orders, Water Quality Control Orders, and Stop Orders issued pursuant to the Alberta *Environmental Protection and Enhancement Act* and its predecessor legislation, the *Hazardous Chemicals Act*, *Agricultural Chemicals Act*, *Clean Water Act* and *Clean Air Act* since 1971.

This search does not include Clean Up Orders issued under the *Litter Act* or Environmental Protection Orders respecting unsightly property under the *Environmental Protection and Enhancement Act*; this information may be available from the local municipality.

Enforcement actions are entered in the data base following: (1) the decision date, for prosecutions; (2) the date an administrative penalty was paid or due (30 days after issuance), whichever is sooner; and (3) the date the document was issued for all other enforcement actions.

These search results are based on information provided by Environmental Service, Alberta Environmental Protection ("AEP"). AEP advises that they try to provide the best information possible. However, AEP advises that it cannot guarantee that the information provided is complete or accurate and that any person relying on these search results does so at their own risk.

Yours sincerely,

Iris Djurfors
Enforcement Search Service Coordinator

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Jul 9, 1999

Our File: P-97-830B &
R98-1837/440/Z99

9:58 am

Mr. John Schroder
Hoggan Engineering & Testing (1980) Ltd
17505 - 106 Avenue
Edmonton, AB T5S 1E7

Dear Mr. Schroder:

RE: Search Requested - NE1/4-28-49-25-W4M

In response to your request of Jul 8, 1999, we have searched the Wellsite Reclamation Historical Search Service data base for the following quarter section of land:

W.4 - 25 - 49 - 28 - NE1/4

and we can advise that as of today's date, the reclamation actions listed in the attached report have been issued under the Alberta *Environmental Protection and Enhancement Act* and its predecessor legislation, the *Land Surface Conservation and Reclamation Act*, and the *Surface Reclamation Act* since 1963. This search is limited to the following reclamation actions: Reclamation Certificates (applied for, issued and cancelled), Environmental Protection Orders, Emergency Environmental Protection Orders, Enforcement Orders, Reclamation Orders and Conservation and Reclamation Notices.

Information offered by the Wellsite Reclamation Historical Search Service is limited to wellsites, oil production sites, pipelines, compressor sites and some sand and gravel operations on Alberta private land. Special Areas Board land constituted under the *Special Areas Act* and Metis Settlements established under the *Metis Settlements Act*. Not included are coal or oil sands mines or exploration sites.

These search results are based on information provided by Alberta Environmental Protection ("AEP"). AEP advises that they try to provide the best information possible. However, AEP advises that it cannot guarantee that the information provided is complete or accurate and that any person relying on these search results does so at their own risk.

Yours sincerely,

Iris Djurfors
Wellsite Reclamation Search Service Coordinator

/id
Encl.

ENVIRON NTAL LAW CENTRE
204, 10709 Jasper Avenue, Edmonton, AB T5J 3N3
Ph: (403) 424-5099 Fax: (403) 424-5133

WELLSITE RECLAMATION HISTORICAL SEARCH SERVICE
Land Summary Report

Legal Description	Reclamation Action	Description	Company/Operator	Date Received	Date Issued/ Resolved
W. 4 - 25 - 49 - 28 - NE1/4 - 16	Certificate No: 54 - 14673	MIAMI AMOCO LEDUC 16-28-49-25 WELL	Miami Oil Producers, Inc.	. .	1975.07.29

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July 9, 1999
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RECLAMATION ACTION CODES:
CERTIFICATE: Reclamation Certificate
APPEAL: Appeal Before the Environmental Appeal Board

ENFORCEMENT:
EPO - Environmental Protection Order
EEPO - Emergency Environmental Protection Order
EO - Enforcement Order
ORDER - Reclamation Order
C/R - Conservation and Reclamation Notice

HOGGAN ENGINEERING & TESTING (1980) LTD.
An Affiliate of J. R. Paine & Associates Ltd
17505 - 106 Avenue, Edmonton, Alberta T5S 1E7

July 8, 1999
File No. 6134-1

ALBERTA ENVIRONMENTAL PROTECTION
Chemical Assessment and Management Division
5th floor, Oxbridge Place
9820 - 106 Street
Edmonton, Alberta
T5K 2J6

Attention: Della Gerbrandt

Dear Madame:

Re: Information Request
Environmental Site Assessment - Phase I
NE ¼-28-49-25-W4M
Highway 39 and Range Road 253
LEDUC, Alberta

HOGGAN ENGINEERING & TESTING (1980) LTD. Is in the process of performing an environmental site assessment on the above mentioned property.

Could you please forward any information, past or present, regarding the environmental condition of the site subsoil or groundwater. This includes any records of environmental contamination or remediation. Please check for any records at the Groundwater Protection Branch as well.

Please fax any information to our firm at 489-0800. If no government information exists to the best of your knowledge, then could you please fax us a letter stating such.

Thank you in advance for any assistance supplied. If you should have any questions or comments, please to contact the undersigned.

Yours truly,

HOGGAN ENGINEERING & TESTING (1980) LTD.

John Schroder, C.E.T., E.I.T.