Aurum Industrial Business Park Area Structure Plan

Office Consolidation September 2017

Prepared by:

Planning and Policy Services Branch
Planning and Development Department
City of Edmonton

Bylaw 9809 was adopted by Council in October 1991. In September 2017, this document was consolidated by virtue of the incorporation of the following bylaws:

Bylaw 9809	Approved October 8, 1991 (to adopt the Aurum Industrial ASP)
Bylaw 15108	Approved March 23, 2009 (to reconfigure the land use patterns and road network, resulting in reduced Heavy and Light Industrial land uses, and increased Medium Industrial land uses)
Bylaw 18131	Approved September 11, 2017 (to allow for the development of a stormwater management facility, the relocation of a lift station and the preservation of environmental lots)

Editor's Note:
This is an office consolidation edition of the Aurum Industrial Business Park Area Structure Plan, Bylaw 9809, as approved by City Council on October 8, 1991. This edition contains all amendments and additions to Bylaw 9809.

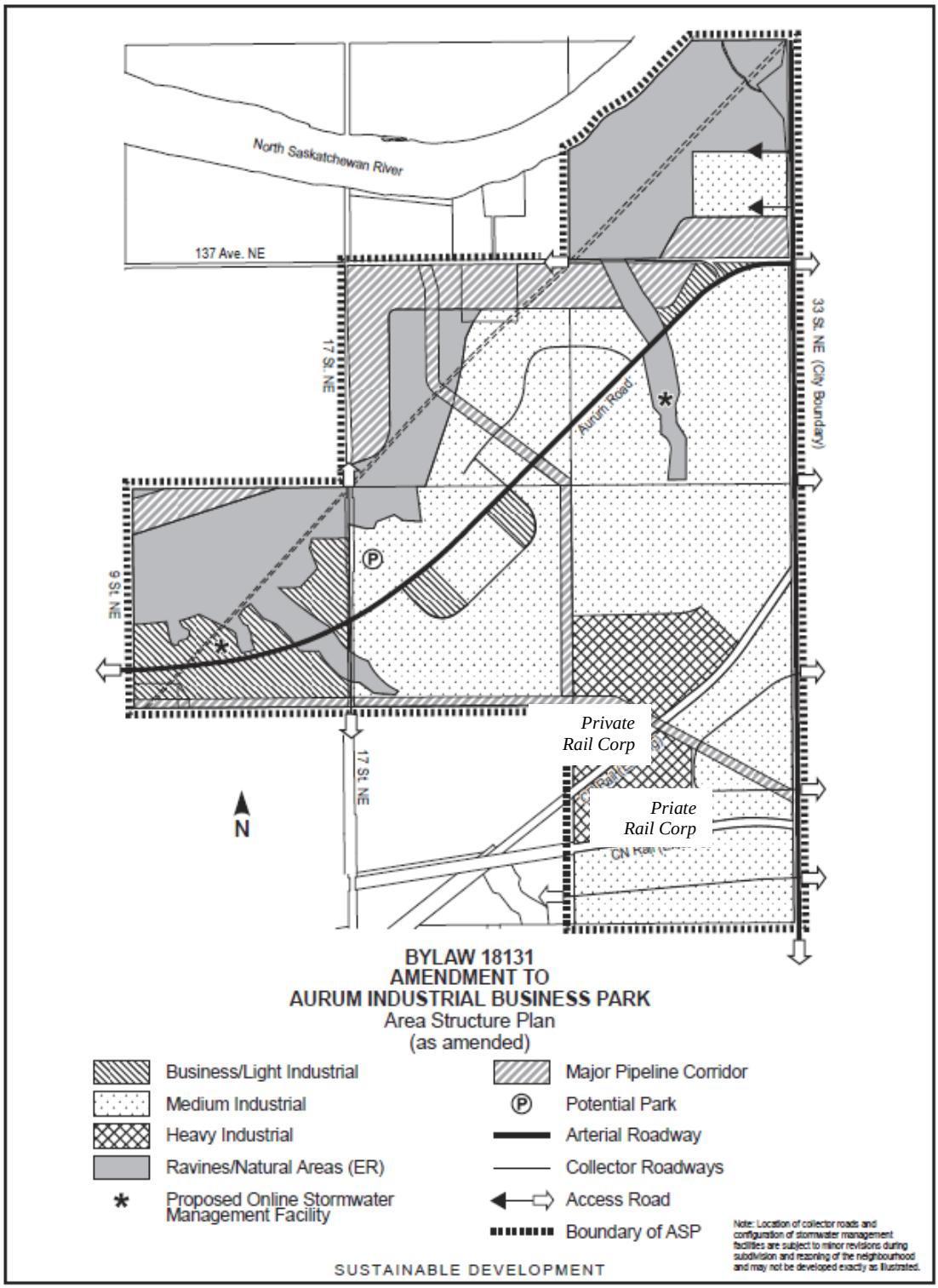
For the sake of clarity, new maps and a standardized format were utilized in this Plan. All names of City departments have been standardized to reflect their present titles. Private owners' names have been removed in accordance with the Freedom of Information and Protection of Privacy Act. Furthermore, all reasonable attempts were made to accurately reflect the original Bylaws. All text changes are noted in the right margin and are italicized where applicable.

This office consolidation is intended for convenience only. In case of uncertainty, the reader is advised to consult the original Bylaws, available at the office of the City Clerk.

City of Edmonton
Planning and Development Department

Aurum Industrial Business Park Area Structure Plan*

Bylaw 18131
September 21, 2017



*Amended by Editor

TABLE 1
AURUM INDUSTRIAL BUSINESS PARK AREA STRUCTURE PLAN
LAND USE AND POPULATION STATISTICS
BYLAW 15108
(Amended by Editor)

	Area (ha)	**% of GDA**
Gross Area	444.10	
Arterial (137 Avenue – if 4 lanes)	11.17	
Pipeline & Utility Rights-of-Way	37.46	
Private railway Rights-of-Way	5.96	
Environmental Reserve (ER)*	93.66	
Online Stormwater Management Facility (ER)	3.61	
Gross Developable Area	**292.26**	**100.0%**
Circulation (3%)**	8.76	3.0
Net Developable Area (Industrial)	**283.50**	**97.0 %**
Business / Light Industrial	27.07	
Medium Industrial	221.08	
Heavy Industrial	35.35	

* Exact ER area to be determined by legal survey and endorsed by the City of Edmonton
** Circulation includes roadways, rail lines and other miscellaneous rights-of-way

NOTE: Municipal Reserves are owing for much of this area, and at the time of subdivision will be taken as land, cash in lieu, Deferred Reserve Caveat or a combination thereof, as shown on Figure 5 – Development Concept.

area structure plan

CITY OF EDMONTON

AURUM INDUSTRIAL BUSINESS PARK

for

A PRIVATE OWNER

Stanley

Amended by Editor

AURUM INDUSTRIAL BUSINESS PARK
AREA STRUCTURE PLAN

Prepared for:
A private consulting firm
on behalf of *a private owner*

Prepared by:
Stanley Associates Engineering Ltd.

June, 1984

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List of Figures

(Bylaw 15108, March 23, 2009)

Editor's Note: *The Edmonton – Fort Saskatchewan Restricted Development Area (RDA) was a Provincial designation on properties adjacent to the River that has since been removed. It is not to be confused with the existing Transportation and Utility Corridor (TUC).*

1.0 INTRODUCTION

Bylaw 15108
March 23, 2009

1.1 PURPOSE

As established under Section 633 of the Municipal Government Act, the purpose of this Area Structure Plan is to establish a framework for future land use planning, and the provision of municipal infrastructure, services and amenities in conformance with established planning policies, objectives and requirements of the City of Edmonton and based on the characteristics and opportunities contained within the site.

1.2 PLAN AREA AND LOCATION BOUNDARIES

The Aurum Industrial Business Park Area Structure Plan ("ASP") is situated in the northeast section of the City of Edmonton (see *Figure 1.0 – Location Plan* & *Figure 2.0 – Context Plan*). The Aurum lands are located within the entire Section 22-53-23-W4M, SE¼ 21-53-23-W4M, NE¼ 15-53-23-W4M and a portion of the SE¼ 27-53-23-W4M and consists of approximately 444.12 hectares (1,097.44 acres).

The lands are situated within the following boundaries:

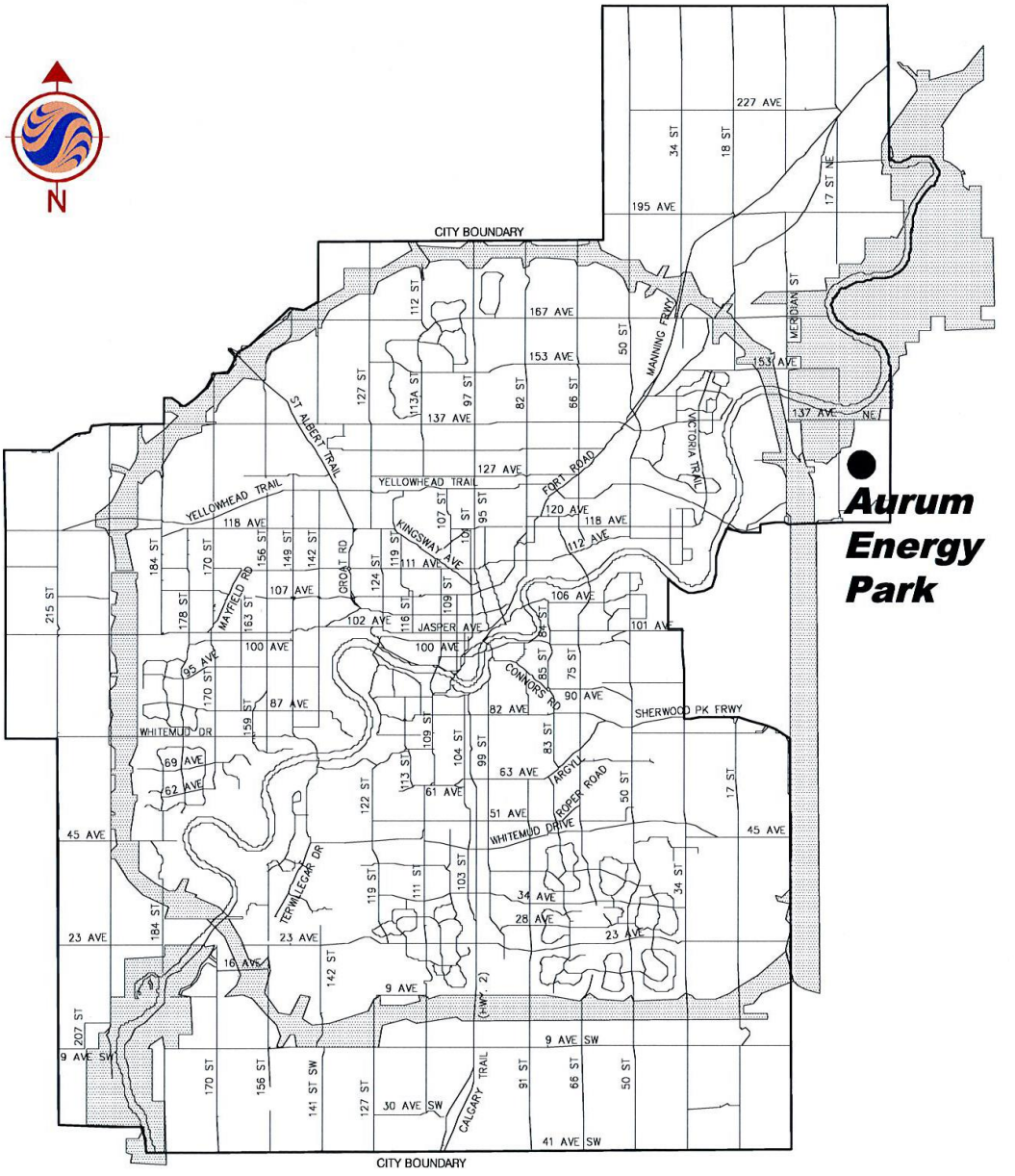
a) South of North Saskatchewan River;

b) North of Clover Bar Industrial area;

c) West of 33 Street NE/Range Road 232 (City of Edmonton / Strathcona County Boundary);

d) East of 9th Street NE and the North Saskatchewan River Valley top-of-bank.

Figure 1.0 Location Plan* (Bylaw 15108, March 23, 2009)



Client *Private Corporation*

AURUM ENERGY PARK
AREA STRUCTURE PLAN AMENDMENT

Figure No. **1.0**

Title **Location Plan**

OCTOBER 2008
1161 86700 RH

Stantec

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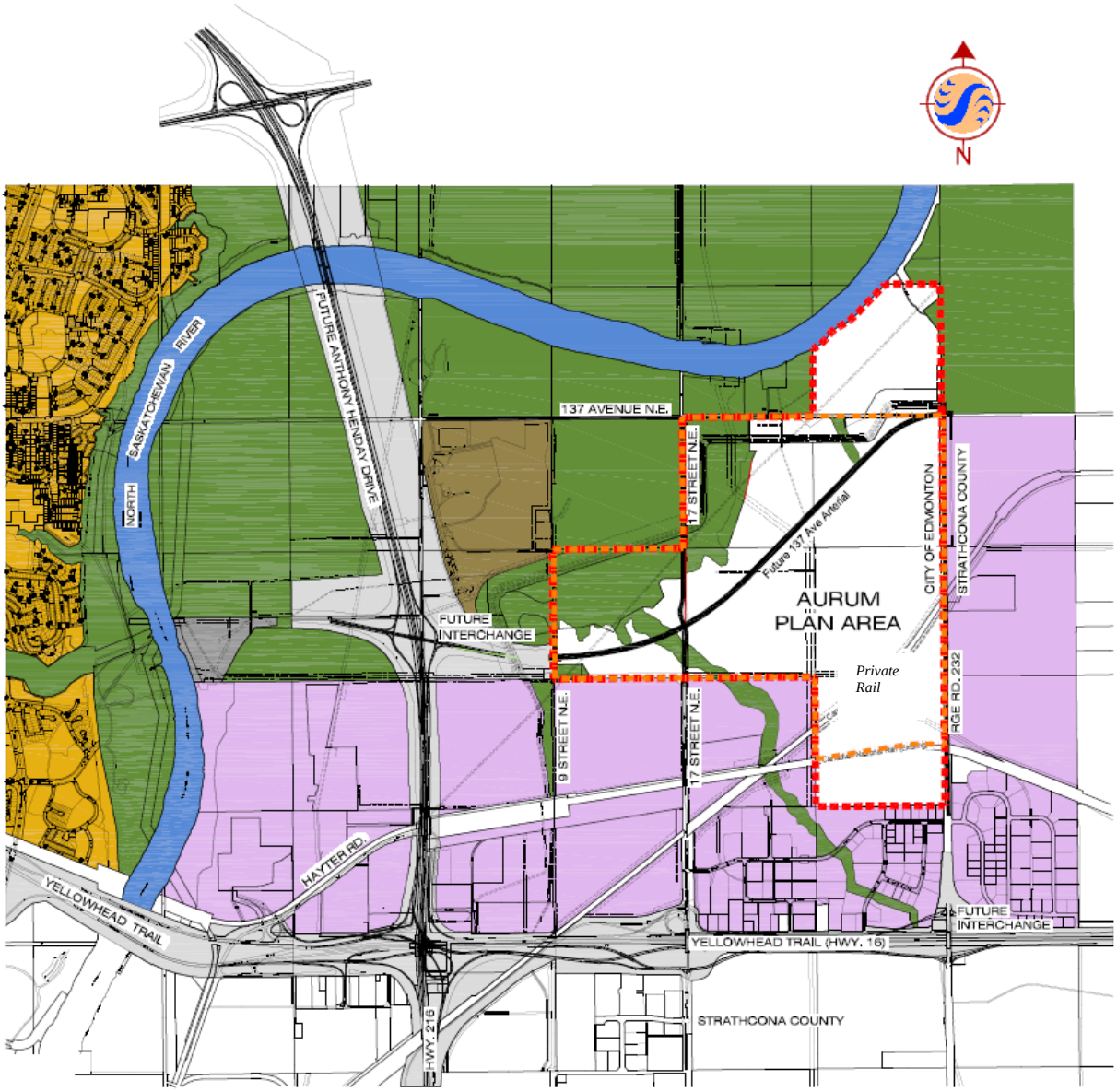
* Amended by Editor

Figure 2.0 Context Plan* (Bylaw 15108, March 23, 2009)



NOT TO SCALE

Legend

- Industrial
- Waste Management Facility
- Agricultural/Metropolitan Recreational Zone
- Residential
- Public Utility
- Major Transportation Corridor
- North Saskatchewan River
- Aurum Industrial ASP Boundary
- Aurum Industrial ASP Amendment Boundary

Stantec

Client: *Private Corporation*

AURUM ENERGY PARK
AREA STRUCTURE PLAN AMENDMENT

Figure No. **2.0**

Title: **Context Plan**

February 2009
1161 86700 FE

* Amended by Editor

1.3 BACKGROUND

1.3.1 Planning History of the Aurum Industrial Business Park Area Structure Plan

The Aurum Industrial Business Park Area Structure Plan (Bylaw 7586) was originally approved by City Council in June 1984. Bylaw 7586 allowed for the development of a variety of light, medium and heavy industrial uses adjacent to major roadways and railway corridors.

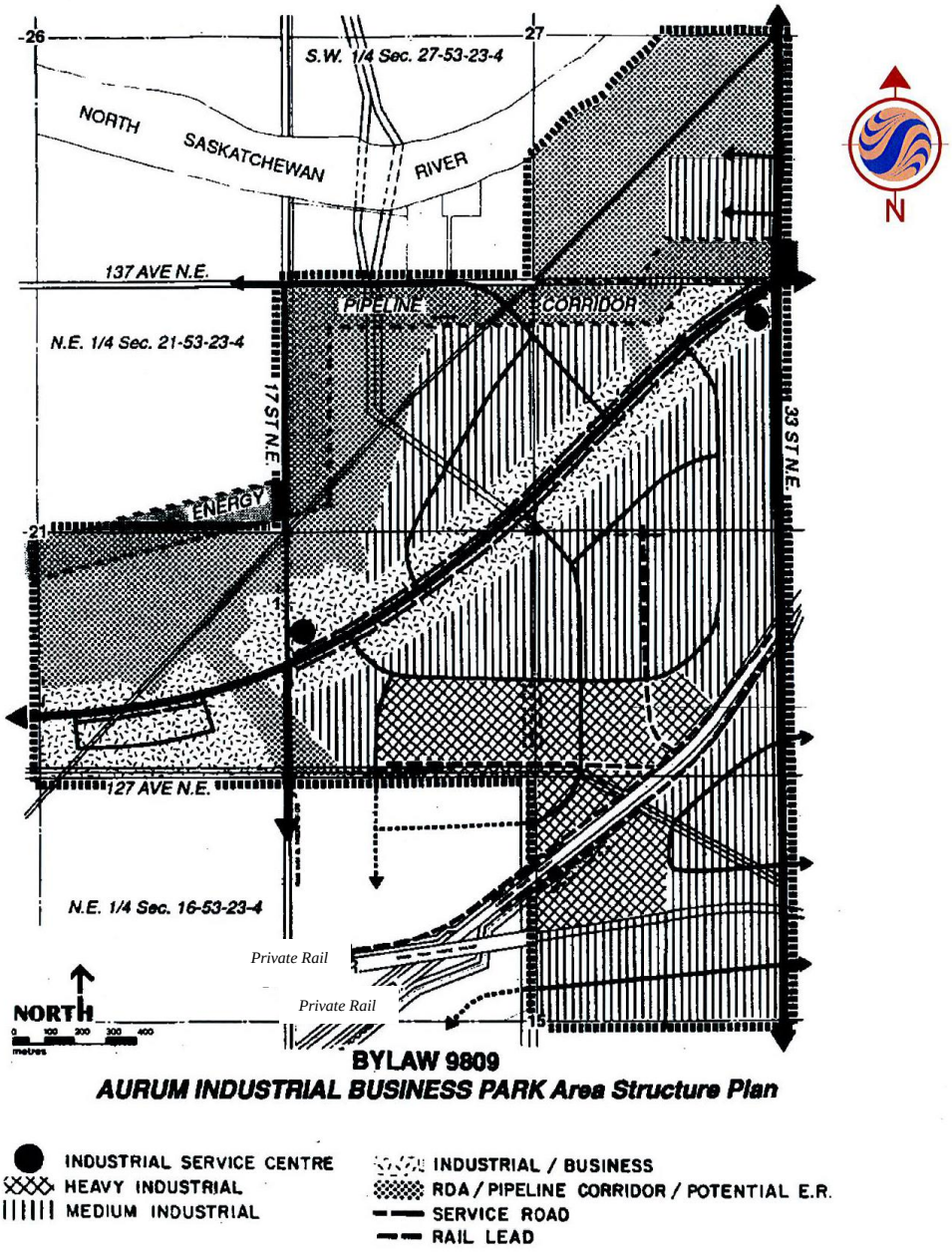
In 1990, Council approved Bylaw 9495, which contemplated the development of the City's proposed landfill.

In September 1991, Council repealed Bylaw 9495 after the Edmonton Board of Health refused to support the landfill proposal. Bylaw 9809 adopted a new Aurum Industrial ASP, which included a variety of light, medium and heavy industrial uses (see *Figure 3.0 – Existing Bylaw 9809*).

It should be noted that the southeast portion of the ASP has experienced development activity since 2006 (the area outside of our amendment area) *in compliance with* the existing ASP (Bylaw 9809), and no change to land use designation or zoning is proposed in Blocks 1 to 3, Plan 8920191.

The Aurum Industrial Business Park Area Structure Plan has undertaken some adjustments to the overall development concept, servicing strategies and transportation system in an effort to rationalize their development efficiency and applicability to current market demands. The net effect of these changes and new development objectives reinforces the need to amend the ASP as presented in this document.

Figure 3.0 Existing Bylaw 9809* (Bylaw 15108, March 23, 2009)



* Amended by Editor

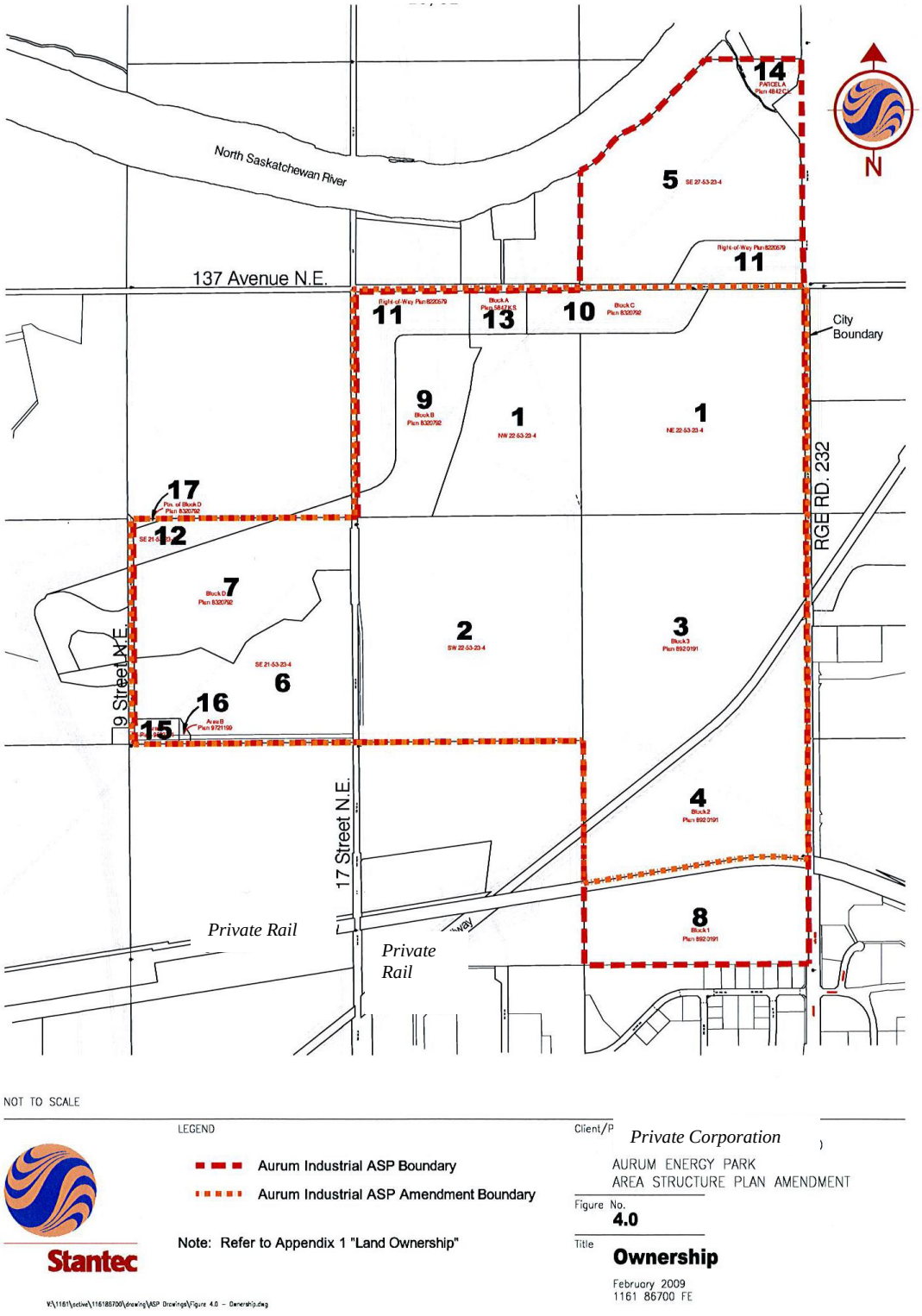
1.4 LAND OWNERSHIP

Ownership of the lands within the Plan boundaries are listed in Table 1 - *Land Ownership*, and illustrated on *Figure 4.0 – Land Ownership*.

TABLE 1 (Amended by Editor) LAND OWNERSHIP			
	Private / Public Owner	Legal Description	Area (ha)
1	*Private Corporate (*Private Corporation*)	NE / NW ¼ 22-53-23-W4M	86.3
2	*Private Corporate (*Private Corporation*)	SW ¼ 22-53-23-W4M	64.6
3	Private Corporate	Block 3 Plan 8320191	61.2
4	Private Corporate	Block 2 Plan 8920191	36.9
5	Private Non-Corporate	SE ¼ 27-53-23-W4M	33.06
6	*Private Corporate (*Private Corporation*)	SE ¼ 21-53-23-W4M	29.651
7	Government	Block D Plan 8320792	27.1
8	Private Corporate	Block 1 Plan 8920191	25.8
9	Government	Block B Plan 8320792	16.4
10	Government	Block C Plan 8320792	9.39
11	Government	Right-of-Way Plan 8220579	6.62
12	Government	Part of SE ¼ 21-53-23-W4M	4.28
13	Government	Block A Plan 5847 K.S.	3.36
14	Private Non-Corporate	Parcel ‘A’ Plan 4842 C.L.	2.629
15	Private Corporate	Area ‘A’ Plan 9523711	1.45
16	Private Corporate	Area ‘B’ Plan 9721199	0.257
17	Government	Ptn. of Block D Plan 8320792	0.211
18	Miscellaneous	N/A	34.91
		TOTAL AREA	444.12

Names in parenthesis indicate the subject lands are under option to purchase or beneficial ownership

Figure 4.0 Land Ownership* (Bylaw 15108, March 23, 2009)



* Amended by Editor

2.0 DEVELOPMENT CONCEPT IMPLEMENTATION

Bylaw 15108
March 23, 2009

2.1 INDUSTRIAL DEVELOPMENT

Objective: The Aurum Industrial ASP provides a framework for accommodating a variety of industrial users serving Edmonton, the Capital Region and beyond.

Objectives	Policies	Implementation*
2.1.A Provide parcels of varying sizes to accommodate an array of industrial uses and activities.	To ensure industrial development utilizes the lands as designated in the ASP.	The land designated for industrial uses is illustrated on Figure 5.0 - Development Concept and in the Land Use Statistics Table (*TABLE 1*).
	To allow flexibility in the size of parcels in order to accommodate the space requirements of respective users.	The size of the parcels to accommodate user demands shall be pursued at the rezoning and subdivision phases.
	To provide industrial and business opportunities to serve the employment needs of Edmonton and the Capital Region.	A variety of uses are permitted within the existing and proposed respective (IB) Business Industrial, (IM) Medium Industrial and (IH) Heavy Industrial zoned lands.
2.1.B Locate and orient industrial parcels along arterial roadways to take advantage of the high visibility and convenient access opportunities.	To take advantage of major roadways to increase visibility and provide appropriate accesses to the industrial parcels.	The development concept has provided a number of industrial parcels with access and frontage along the internal collectors and arterial roadways (e.g. 137 Avenue NE and 33 Street NE/Range Road 232).
2.1.C To sensitively integrate existing industrial development with newer industrial development.	To ensure that the impact of industrial development on adjacent land uses are minimized through the use of setbacks/ buffering as required by the City of Edmonton.	Appropriate buffers, setbacks and landscaping requirements will be determined at the subdivision or development permit stage at the discretion of the Development Officer.

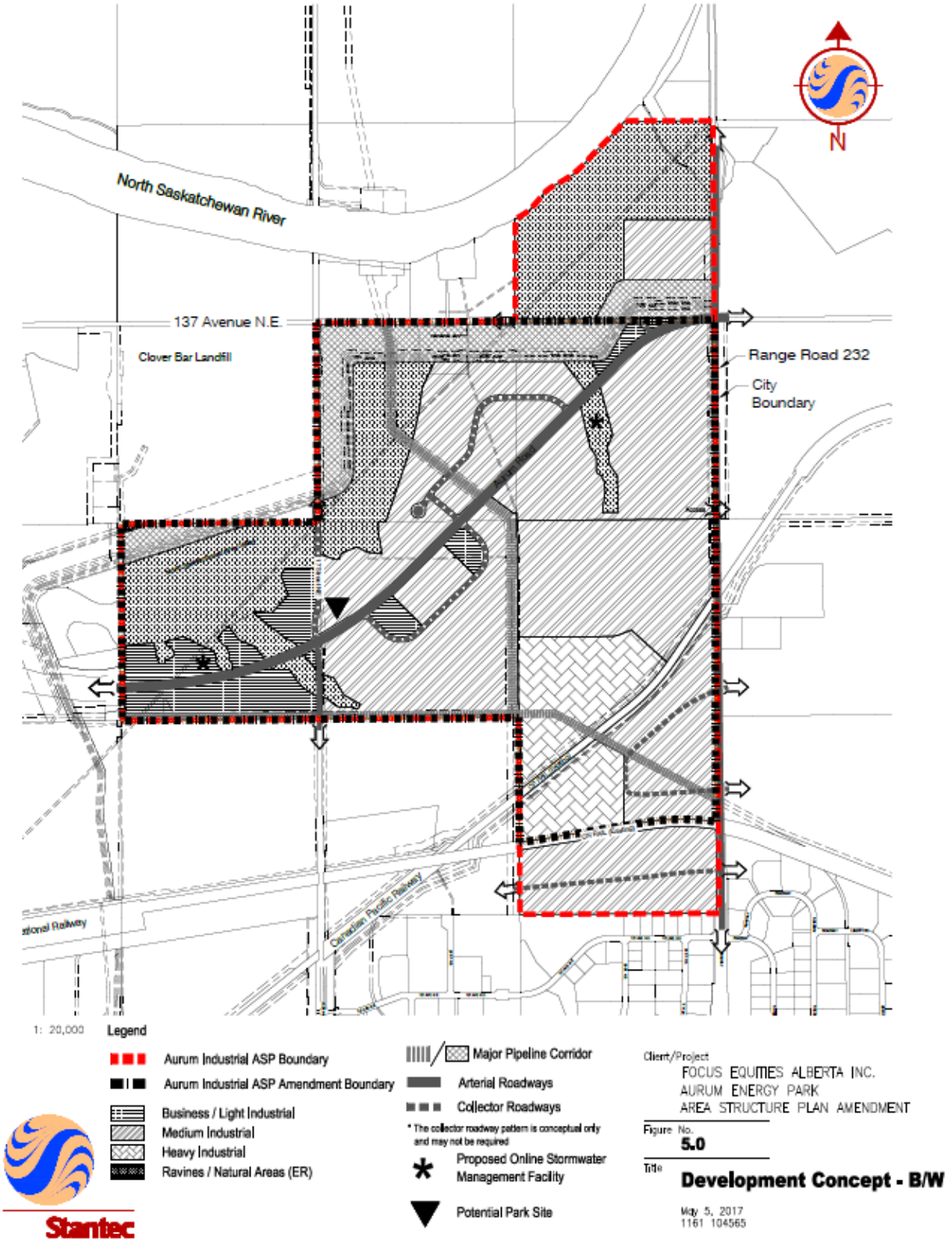
* Amended by Editor

The Aurum Industrial ASP will encourage further economic development, diversification, and employment by accommodating business enterprises in need of large-scale facilities with extensive transportation infrastructure (see *Figure 5.0 – Development Concept*).

The Aurum Industrial ASP responds to existing and emerging industrial markets, economic growth and construction of new transportation facilities (Anthony Henday Drive) within the region. The location and configuration of industrial land uses take advantage of existing and planned transportation infrastructure (Anthony Henday Drive, Yellowhead Trail, 137 Avenue NE, and 33 Street NE/Range Road 232). The ASP provides the opportunity to develop rail to end-users. The extension of rail spurs will be dependant upon demand from respective users. Depending on the rate of absorption in this area, the ASP will be phased in as demand warrants. Alternatively the lands proposed for rail spurs may be uses for access roads, utility right-of-ways or incorporated within developable land parcels. Detailed land use information is outlined in the *TABLE 1 – Land Use Statistics.*

Amended by Editor

Figure 5.0 Development Concept* (Bylaw 18131, September 11, 2017)



* Amended by Editor

2.2 TRANSPORTATION AND CIRCULATION

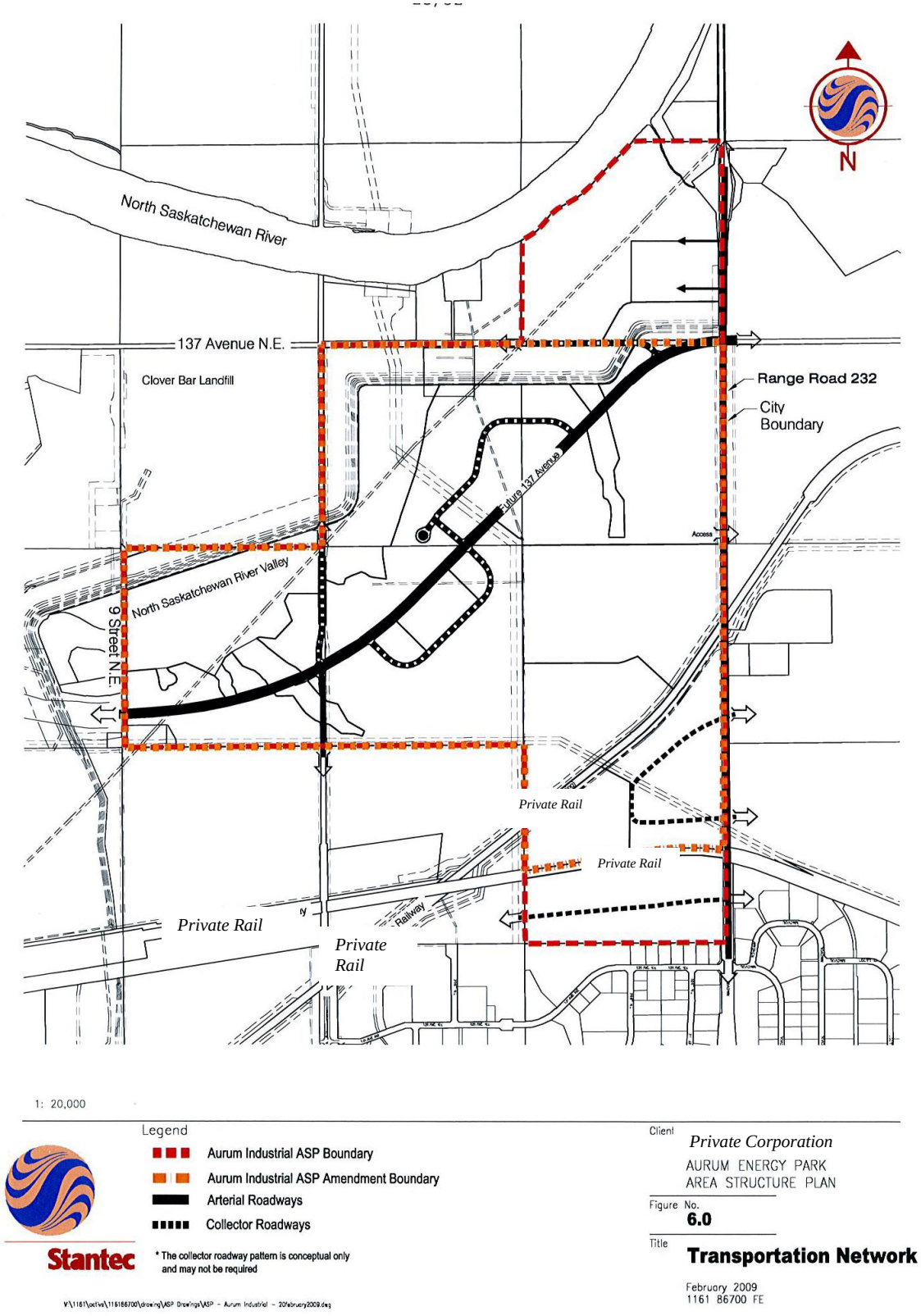
Objective: The Aurum Industrial ASP promotes the safe, efficient and on-going movement of automobiles, trucks, and trains.

Objectives	Policies*	Implementation
2.2.A Utilize the existing and planned transportation network to help facilitate traffic movement within and through the Aurum ASP.	Provide a logical, safe and efficient transportation system within the plan area to address the transportation needs of the Aurum area.	Construction and upgrades to the roadways shall be developed to the standards accepted by the City of Edmonton. The Transportation Department will evaluate each development application to ensure projected traffic volumes do not exceed the capacity on adjacent roadways.
	Individual accesses from the parcels shall be adequately spaced along the internal collectors and major arterial roadways (137 Avenue NE and 33 Street NE/Range Road 232).	Access to each parcel from the collector and arterial roadways shall be established and constructed to the standards established by the Transportation Department.
2.2.B Integrate the existing railway facilities with urban development.	Ensure development adheres to the guidelines established by *two private railway corporations* and Transport Canada regarding the provision of separation spaces, berms and buffers.	Industrial parcels adjacent to railway corridors shall be developed to ensure they do not interfere with the movement of rail traffic.

*Amended by Editor

The transportation network within the Aurum Industrial ASP will safely accommodate the efficient movement of automobiles, trucks and rail traffic (see *Figure 6.0 – Transportation Network*).

Figure 6.0 Transportation Network* (Bylaw 15108, March 23, 2009)



* Amended by Editor

137 Avenue NE, 33 Street NE/Range Road 232 and 17 Street NE are the major roadways that serve the Aurum plan area. These roadways will be constructed and / or upgraded in phases in accordance with the advancement of development and as demand warrants. These roadways will be ultimately developed to carry traffic to the major highways (future Anthony Henday Drive, Yellowhead Trail) and adjacent communities (Strathcona County).

137 Avenue NE is planned to be developed as a major east-west arterial providing a connection to the future Anthony Henday Drive to the west and Strathcona County to the east. The City of Edmonton has agreed to develop 137 Avenue NE in stages, with the first stage to be developed to a two lane cross section. At the present time, the City of Edmonton is protecting 137 Avenue NE road right-of-way for a four lane arterial cross section. However, Strathcona County has requested that the City of Edmonton review traffic volume projections on 137 Avenue NE and determine if the road right-of-way should be protected for an ultimate six lane arterial cross section. A decision on whether the road right-of-way for a six lane arterial should be protected will be made in early 2009.

The first four lanes of 137 Avenue NE are included in the Arterial Roadway Assessment (ARA) Bylaw and will subsequently be developed according to the bylaw. The City of Edmonton will construct a crossing in the Clover Bar Ravine in the southwest portion of the plan area through the ARA program.

33 Street NE/Range Road 232 is a north-south roadway under the jurisdiction of Strathcona County. It provides access to the Aurum lands and adjacent industrial areas to the south and east. A portion of 33 Street NE/Range Road 232 adjacent to the Aurum lands is constructed as a rural cross-section. The roadway is to be ultimately developed as a four lane arterial roadway with limited access opportunities from individual parcels (approximately four shared-access points).

17 Street NE is a major north-south arterial roadway connecting the industrial areas to the north of the Yellowhead and suburban areas to the south in Sherwood Park (Strathcona County). The roadway north of the Yellowhead is currently developed as a rural cross section. An all-directional interchange exists at the Yellowhead Trail, which is planned to undergo future upgrades. This roadway provides important access to the Aurum lands and the Yellowhead Trail.

The future Anthony Henday Drive will be developed as a major limited-access highway facility providing easy access to and from the Aurum plan area. A future interchange is planned at 137 Avenue NE, which will provide access to the Aurum Energy Park.

The transportation network for the Aurum Industrial ASP will be provided in accordance with the requirements of the City of Edmonton's Transportation Department. The roads identified on the Development Concept are conceptual and their exact location will be determined at the subdivision stage, as determined and in conjunction with the Transportation Department.

2.3 ENVIRONMENTAL

Objective: The Aurum Industrial ASP shall promote the preservation of the North Saskatchewan River Valley, ravines and natural areas.

Objective	Policies	Implementation
2.3.A To ensure lands within the ASP are clear of contamination.	Phase 1 Environmental Site Assessments will be required at the rezoning and/or subdivision stage.	Appropriate environmental review will be required at the rezoning and/or subdivision stage to ensure the lands are suitable for development.
2.3.B Ensure urban development respects the top-of-bank and other ravine areas.	Respect the policies and regulations identified in the North Saskatchewan River Valley ARP and North Saskatchewan River Valley Bylaw at the zoning and/or subdivision stage.	The Planning and Development Department will assess all proposed developments adjacent to the top-of-bank and ravine areas to ensure they comply with the appropriate bylaws and policy plans at the zoning and/or subdivision stage.
2.3.C Promote environmental protection and conservation.	Protect significant natural features when designing and planning facilities and services.	Natural areas and identified significant / sensitive environmental areas should be protected.

The Aurum Industrial ASP will encourage on-site stormwater management facilities with naturalized landscaping to minimize environmental and economic costs associated with their maintenance. All development adjacent to ravines will incorporate a minimum 7.5m development setback, pending a detailed geotechnical study.

A Top- of-Bank survey will be conducted and determined by the owner in association with the City of Edmonton for lands legally described as portions of NW 22-53-23-4, SW 22-53-23-4 and SE 21-53-23-4 at the time of subdivision or any Development Permit Application on any one of the above – mentioned parcels, or by September 2009, whichever comes first.

In the event that the Top-of-Bank survey line does not conform with the zoning boundary, and rezoning is required, then the owner will submit an application to rezone the land to ensure compliance.

Further, at the time of subdivision, the conditions and methods for any crossing of the natural watercourse at the southern boundary of NE 22-53-23-W4M will be determined in consultation with the Parks Branch of the Asset Management and Public Works Department and Alberta Environment.

2.4 DEVELOPMENT STANDARDS

Objective: The Aurum Energy Park ASP will provide a well-planned industrial area in the Greater Edmonton region, while fitting in harmoniously with adjacent industrial uses.

Objective	Policies	Implementation
2.4.A To ensure industrial development is planned and developed in a manner that maintains an efficient operating industrial park.	▪ Promote design standards to ensure industrial uses and activities along arterial and major roadways are planned to ensure efficient future development.	▪ The development shall provide a comprehensively planned transportation and servicing systems that will be completed over time to create an industrial area that will be both attractive and operationally efficient for the users.

The Aurum Industrial ASP will strive to promote high quality industrial development. Tree planting, berming and screen fencing along the major roadways (137 Avenue NE, 33 Street NE/Range Road 232, 17 Street NE) shall be incorporated to the standards established by the City of Edmonton. On-site stormwater management facilities will be positioned adjacent to roadways (where possible) to improve physical aesthetics and provide a setback between industrial development and the roadways. These SWMFS may include various landscaping elements (trees, native plant species) to improve its overall physical appearance and quality of storm run-off.

3.0 SERVICING CONCEPT

Bylaw 15108
March 23, 2009

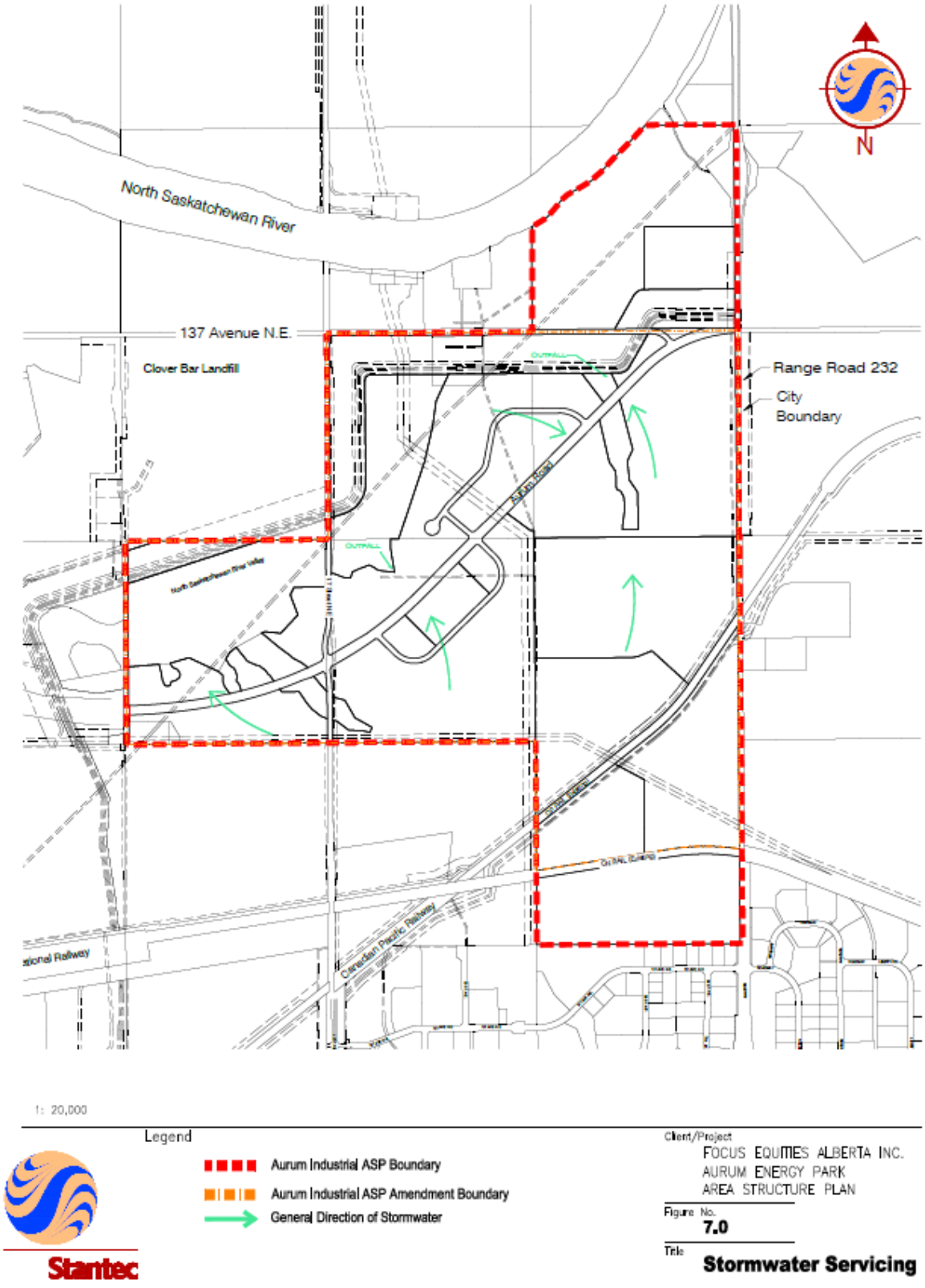
3.1 STORMWATER NETWORK

There are two watersheds that accommodate natural drainage from the lands into the North Saskatchewan River. The Clover Bar Creek basin conveys drainage from south to north across the lands to the North Saskatchewan River. A second watershed, an unnamed creek, conveys drainage in a northwesterly direction across the land into the North Saskatchewan River. The northern portion of the Aurum Area contains two additional creeks/drainage channels which contribute to the watersheds of the North Saskatchewan River Valley and Ravine System.

Stormwater will be controlled by a combination of on and offsite stormwater management facilities (see *Figure 7.0 – Storm Servicing*). There is one online stormwater management facility located in the northern portion of the ASP adjacent to 137 Avenue NE. The online Stormwater Management Facility (SWMF) will be designed as a naturalized wetland to enhance the treatment of water entering the drainage channel and to increase the quality of stormwater through bioretention. The online SWMF design concept integrates wetland and marsh areas with upland vegetation to create a wetland complex of improved habitat value by integrating the different habitat structures into a cohesive unit.

Drainage for the lands will be provided in accordance with the standards as prescribed by the Drainage Services Branch, City of Edmonton and any SWMFs will be sized to accommodate flows based on the on-lot development characteristics. These ponds will be constructed with an orifice to restrict discharge rates at a level determined by the detailed stormwater management analysis and to the standards accepted by the respective governing agencies. Onsite SWMFs shall include erosion and sedimentation control measures as well as a control structure to regulate the discharge to the common ditches or pipes. Storm sewers and drainage ditches throughout Aurum Energy Park will be sized to convey restricted flows from the lots and unrestricted flows from the roadways to the existing drainage channels. This servicing option results in smaller diameter storm sewers allowing for flexibility in the stormwater management design and will eliminate the construction of unnecessary infrastructure.

Figure 7.0 Stormwater Servicing* (Bylaw 18131, September 11, 2017)



* Amended by Editor

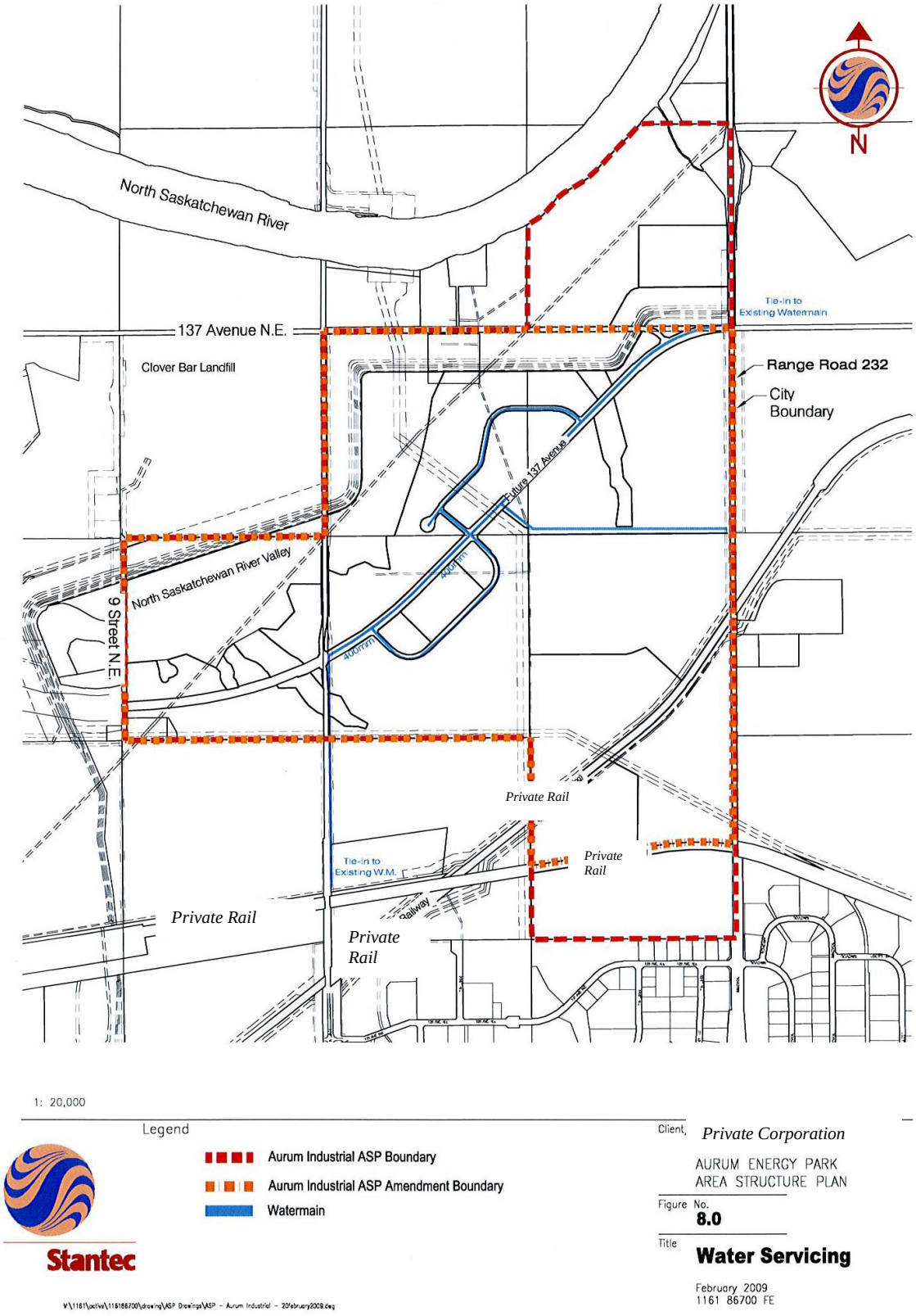
3.2 WATER NETWORK

Each lot in the Aurum Energy Park will be provided with a 250mm water service (see *Figure 8.0 – Water Servicing*). The watermain constructed must form a loop in order to provide adequate pressure and flow. The watermain distribution system is designed to provide fire protection to all parcels within the ASP plan area.

A 400mm watermain will be constructed along the future 137 Avenue NE right-of-way. It will tie into the existing watermain located on 33 Street NE/Range Road 232 on the north end and to the existing watermain at the intersection of 17 Street NE and the *private railway* on the south end. It should be noted that the watermain located on 33 Street NE/Range Road 232 is owned and operated by Strathcona County. The watermains will be constructed along the entire length of the internal roadways. This will create a looping configuration and will be required to service each lot with adequate pressure and fire protection. To accommodate staging and provide a superior system, the watermain will loop back to the existing watermain located on 33 Street NE/Range Road 232 approximately 800m south of 137 Avenue NE.

Amended by Editor

Figure 8.0 Water Servicing* (Bylaw 15108, March 23, 2009)



* Amended by Editor

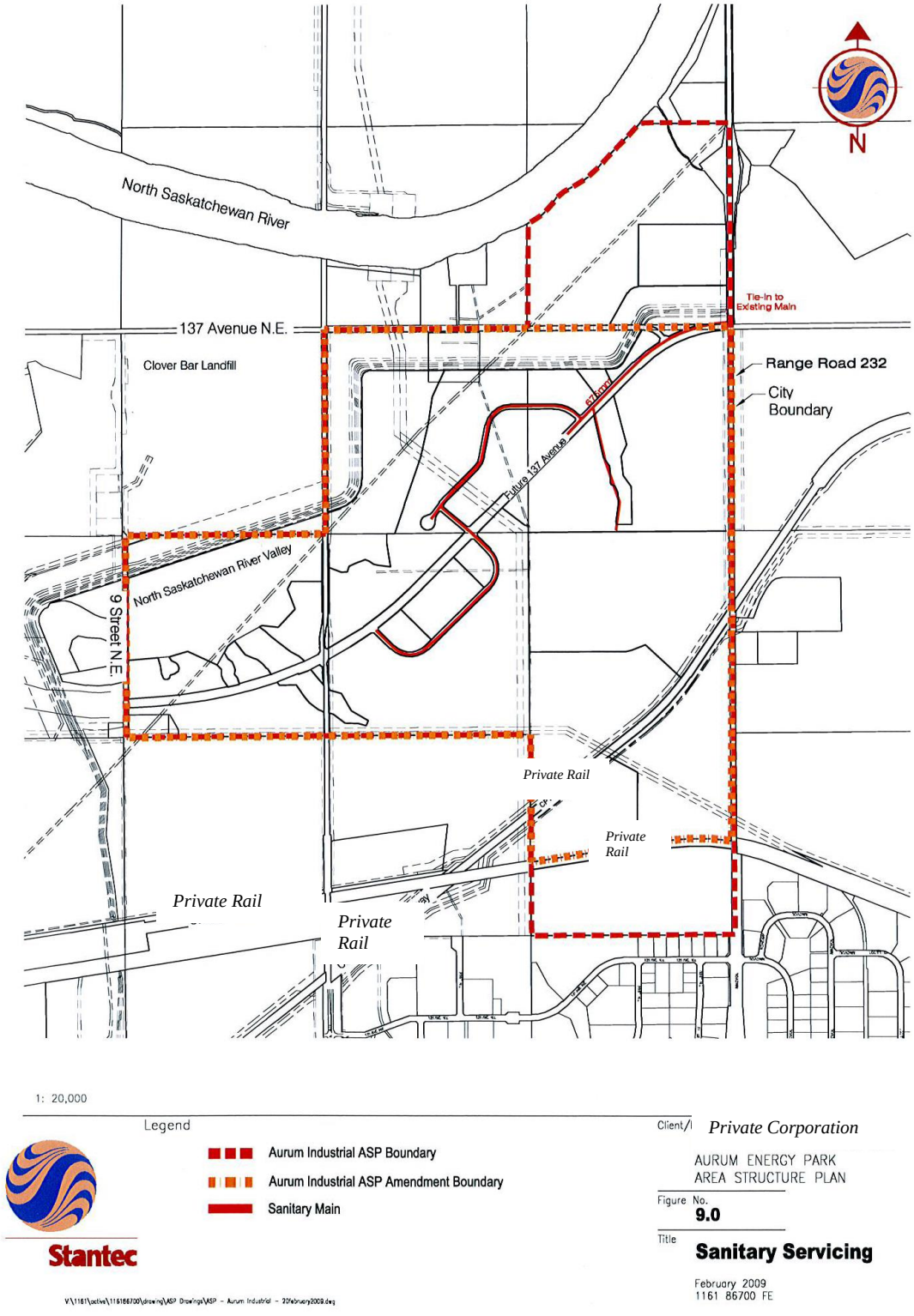
3.3 SANITARY SERVICING

Sanitary service to the Aurum Energy Park will involve tying into the existing regional trunk that parallels the 33 Street NE/Range Road 232 right-of-way (see *Figure 9.0 – Sanitary Servicing*). The trunk is 1200mm in diameter at this point and terminates at the Capital Regional Sewage Treatment Plant, which is situated north of the Aurum Lands. According to the City of Edmonton, the addition of sanitary services will not create capacity issues, as there is more than adequate capacity in the receiving trunk.

The current servicing concept provides sanitary servicing to each lot within the Aurum Energy Park. The sanitary sewer will be sized to accommodate flows based on City of Edmonton standard land area and zoning. This will provide a standard level of service to all lots."

Sanitary sewer will be constructed along the proposed 137 Avenue NE and will tie into the existing regional trunk at the intersection of 137 Avenue NE and 33 Street NE/Range Road 232. Sanitary sewers will be constructed along the entire length of the internal roads in order to provide sanitary service to each individual lot.

Figure 9.0 Sanitary Servicing* (Bylaw 15108, March 23, 2009)



* Amended by Editor

Bylaw 15108
March 23, 2009

4.0 DEVELOPMENT CONCEPT

4.1 DEVELOPMENT AUTHORITIES

Legislative or Statutory Document	Designations, Provision, Direction or Impact
Municipal Government Act	Municipalities in Alberta may acquire, as "environmental reserve", lands that are: ▪ Part of a swamp, gully, ravine, coulee or natural drainage course; ▪ Subject to flooding or instability: or ▪ Abutting the bed and shore of any lake, river, or stream. (Section 664) Municipalities in Alberta may acquire, without compensation, land for roads and public utilities, and land, or money-in-lieu of land, for "municipal reserves" (Section 661). Subject to any other enactment, a municipality has the direction, control and management of the rivers, streams, watercourses, lakes and other natural bodies of water within the municipality, including the air space above and the ground below. (Section 60)
Public Lands Act	The title to the beds and shores of all permanent and natural occurring bodies of water, and all natural occurring rivers, streams and watercourses is vested in the Crown of Alberta (Section 3).
Water Act	The Government of Alberta requires municipalities to address the quality of stormwater discharged to watercourses. The Province has accepted stormwater retention as a means of improving the quality of runoff water.

Legislative or Statutory Document	Designations, Provision, Direction or Impact
Plan Edmonton – Municipal Development Plan	The Aurum lands are designated as "Business/ Employment" area. All ravines are to be protected as part of the North Saskatchewan River Valley and Ravine System (Section 1.6.2) The preservation of natural areas is to be considered through the planning process (Sec 1.6). Urban design principles and guidelines are to be promoted to enhance the quality of the urban environment (Sec 1.1.3). The integrity of pipeline and utility corridors is to be maintained while planning for growth and development (Sec 1.1.14). Intensification of development is to be promoted around transportation corridors and employment areas (Sec 1.3.4). The supply of industrial land is to be ensured (Sec 1.1.5). Address adequate separation distances between heavy industry and other uses through a risk management approach (Sec 1.1.6). Opportunities for clustering compatible development in economic activity centers are to be provided (Sec 1.1.7). The Aurum Industrial ASP area is located within the Intermunicipal Planning boundaries and is subject to consultation and review by Strathcona County (Section 6.4.5).
Strathcona County Municipal Development Plan	Industrial land uses within the ASP amendment area are subject to review through the Heavy Industrial Transition Overlay to ensure risk to adjacent properties is minimized. (Sec. 9.0 – Industrial Development)
North Saskatchewan River Valley Area Redevelopment Plan	Development adjacent to the North Saskatchewan River will be subject to the policies and regulations as stipulated within the ARP.
Natural Area Systems - Policy C 531	Natural areas identified in the City of Edmonton inventory of natural sites, shall be assessed as to their value and sustainability and a decision rendered on their future retention. Four designated natural areas (NE 272, 274, 283 and 284) are located within the Aurum Industrial ASP.
Alberta Energy Utilities Board Policy and Guidelines	The City of Edmonton's Policy Guidelines for the Integration of Transmission Pipelines and Urban Development (1985), Planning for the Interface of Pipeline Right-of-ways and the Subdivision of Land (2003), Alberta Energy and Utilities Board policies and any other relevant policies affecting lands abutting pipeline rights-of-way will be addressed at the subdivision planning stage.

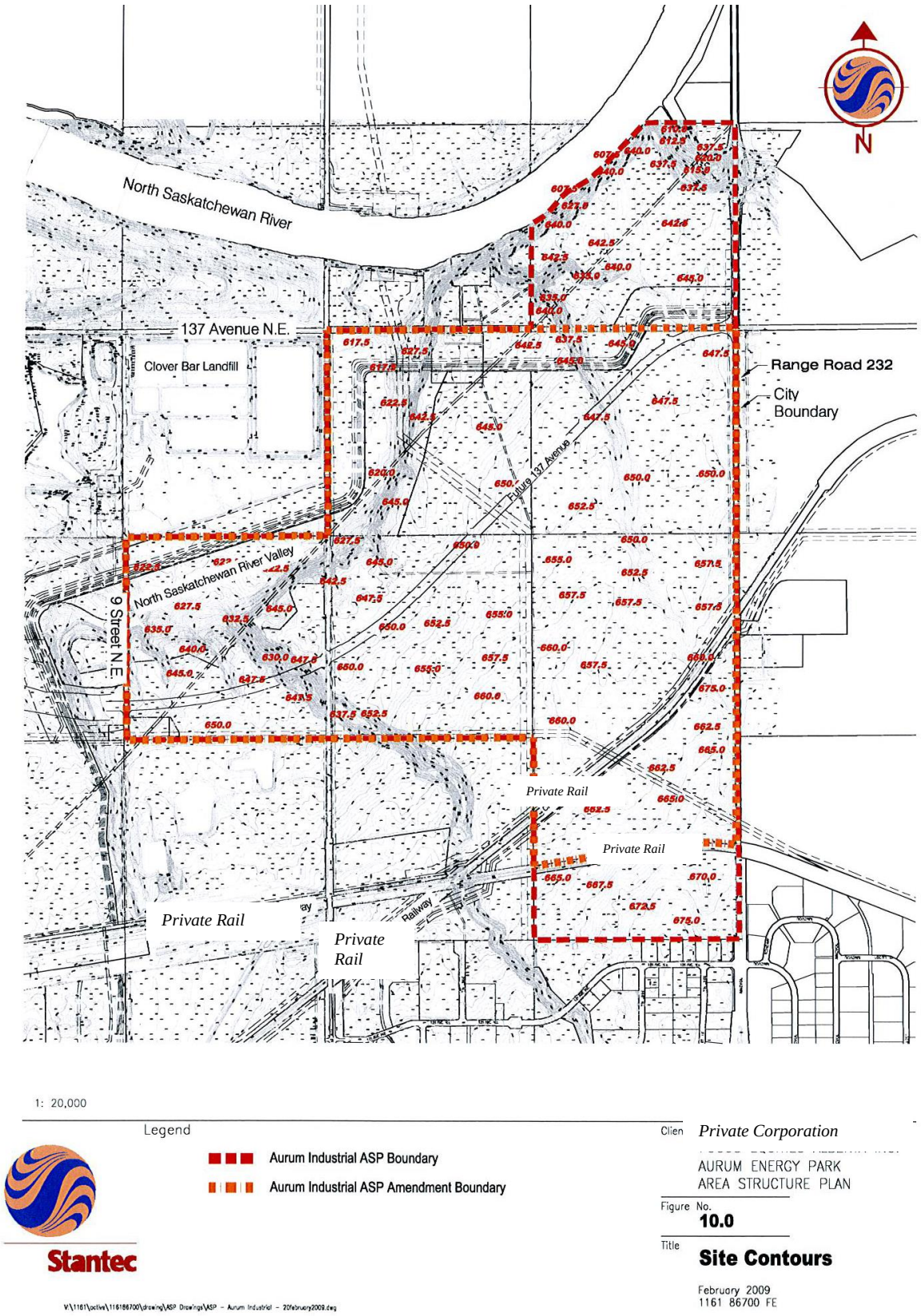
4.2 PHYSICAL SITE CONDITIONS

4.2.1 Topography and Soils

The land within the Aurum Industrial ASP is level to slightly undulating and gently slopes toward the North Saskatchewan River Valley (see *Figure 10.0 - Site Contours*). The highest elevation point is 675m located at southeast corner of the plan area.

Soils within the Aurum Industrial ASP are primarily comprised of the Chernozemic Order as identified in the Alberta Soil Survey. This type of soil develops mainly in grassland and parkland regions and is initially fertile. Parent material ranges from coarse textured outwash material in the northwest to fine textured, lacustrine material in the southeast. As such, the soil conditions pose no impediment to urban development.

Figure 10.0 Site Contours* (Bylaw 15108, March 23, 2009)



* Amended by Editor

4.2.2 Existing Land Uses

The Aurum Industrial ASP contains a number of existing land uses as shown on *Figure 11.0 – Site Features*. The majority of the plan area is comprised of agricultural uses and vacant open space. A number of existing industrial uses are situated east of the plan area, across 33 Street NE/Range Road 232 (within Strathcona County).

The remainder of the lands are cleared and under cultivation. None of these uses pose any particular constraints to future urban development. However, future development of any and all properties within the Plan area is the option of the respective landowners.

4.2.3 Surrounding Land Uses

The ASP area is bound by the North Saskatchewan River on the north, 33 Street NE/Range Road 232 on the east, the existing Clover Bar Industrial area to the south, and 9 Street NE and the North Saskatchewan River Ravine top-of-bank on the west. Immediately south of the Clover Bar Industrial area is Highway 16 (Yellowhead Trail). East of 33 Street NE/Range Road 232, within the Intermunicipal Fringe Area, lies Strathcona County and a number of industrial uses (*three private corporations*). To the west lies the Clover Bar Waste Management Facility and the associated landfill.

Amended by Editor

Strathcona County is currently reviewing the North of Yellowhead Area Concept Plan, which will consult relevant stakeholders to identify key land use issues, opportunities and constraints, and develop a preferred concept that will guide development over the next 20 years.

4.3 ENVIRONMENTAL RESOURCES

The City of Edmonton Table Lands Inventory of Environmentally Sensitive and Significant Natural Areas (1993) identifies five environment resources within the Aurum ASP area (see *Figure 11.0 – Site Features*). These include the North Saskatchewan River Valley and four natural areas (NE 272, 274, 283 and 284).

4.3.1 North Saskatchewan River Valley and Associated Ravines

The North Saskatchewan River Valley borders the north and a portion of the western boundary of the Aurum Industrial ASP. The area within the river valley is relatively flat and composed of discontinuous lengths of floodplains and terraces. Relatively large undisturbed forest composed of aspen, balsam poplar and birch support a wide diversity of plant species contributing to this site's self-sustainability. A well-developed understory provides wildlife habitat and movement corridor linking local natural areas. The majority of the lands identified above have been previously dedicated as Environmental Reserve (ER) which will ensure they are preserved. However, as noted in the North Saskatchewan River Valley and Ravine System Protection Overlay, “the boundary is a general boundary and is subject to more precise location where such location is established through the approval of Plans of Subdivision or survey plans of the top-of-the-bank.” Additional natural areas may be identified at the time of rezoning, subdivision or development permit for dedication as ER.

4.3.2 Natural Areas

The Aurum Industrial ASP is predominantly agricultural land with the exception of a vacated farmstead. Natural areas present within the ASP are identified by the City of Edmonton Table Lands Inventory of Environmentally Sensitive and Significant Natural Areas (1993). This document, in conjunction with Development Setbacks from River Valley/Ravine Crests (2002), shall provide additional information regarding potential environmental resources.

4.4 ENVIRONMENTAL SITE ASSESSMENTS

Phase 1 Environmental Site Assessments have been completed for the NE / NW ¼ 22-53-23-W4M, SW ¼ 22-53-23-W4M and Block 3, Plan 8320191. Two sites within the Phase 1 area require additional review. Prior to any rezoning, subdivision and/or development permit, the two sites identified on Appendix V must be confirmed by the Environmental Planning group as appropriate for the proposed development.

Other Phase 1 ESA's will be required at the rezoning stage in order to ensure the lands are cleared of potential environmental contamination, as shown on the attached Appendix V. The Appendix is deemed to be updated as the sites are reviewed and cleared.

4.4.1 Non-Participating Land Owners

No other Phase I or Phase II Environmental Site Assessments have been undertaken on the remaining lands within the ASP. (as shown on Appendix V) The Environmental Planning Group of the Planning & Development Department will require that outstanding ESA's or disclosure statements are provided by the minority land owners at the rezoning or subdivision stage.

4.5 ENERGY AND NATURAL RESOURCES

Oil and gas activity in Aurum Energy Park ASP remains significantly limited reflecting the relatively small size and productivity of oil and gas reserves in the area.

In accordance with the City of Edmonton policies, adoption of this ASP Amendment will provide clear direction for the development of lands and discourage further oil and gas exploration.

4.5.1 Pipeline Rights-Of-Way and Facilities

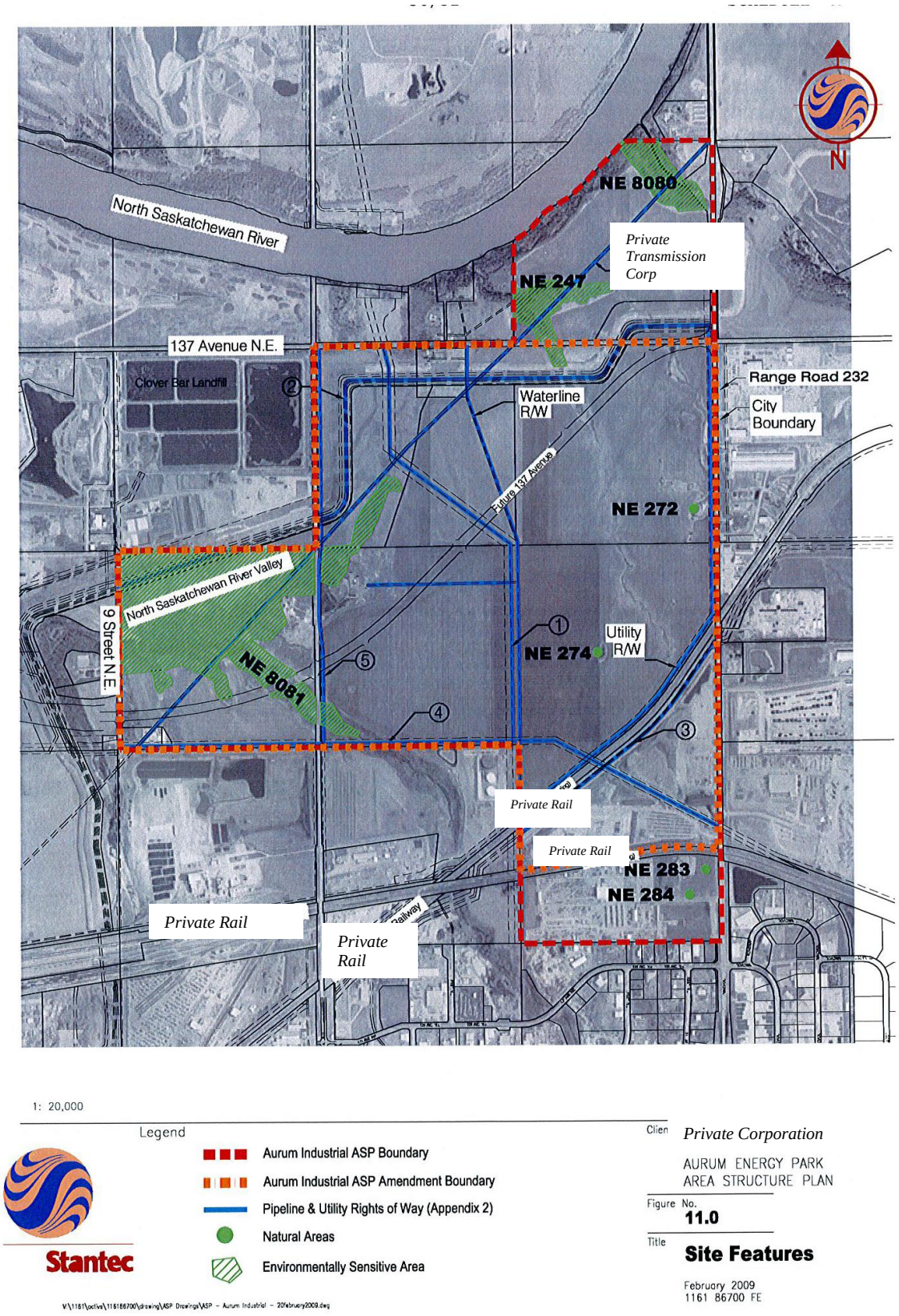
A review of information provided by the Alberta Energy & Utilities Board (AEUB) has indicated that a number of pipeline transmission facilities are located within the Aurum Industrial ASP.

A number of major pipeline corridors are situated within the plan area. One major corridor runs through the central portion of the ASP in a north-south fashion, entering Section 22-53-23-W4M in the south, traveling in a northwesterly direction across the NW¼ 22-53-23-W4M, and eventually exiting towards the North Saskatchewan River Valley. A second major pipeline corridor runs through the northern portion of the ASP in an east-west direction through the NE and NW¼ 22-53-23-W4M, NE¼ 21-53-23-W4M and a portion of the SE ¼ 21-53-23-W4M. A third major pipeline corridor crosses through the southern portion of the plan area from 33 Street NE and crossing parts of the NE¼ 15-53-23-W4M, SE and SW¼ 22-53-23-W4M, and SE ¼ 21-53-23-W4M and exiting at 9 Street NE.

The Alberta Energy and Utilities Board Pipeline License Register identifies the pipeline transmission licenses within the Aurum Industrial ASP boundary (see *Figure 11.0 – Site Features* & Appendix IV - Existing Pipeline Transmission Facilities). Since these pipeline corridors travel within the central and northwestern portions of the ASP, any future development will have to be integrated.

The City of Edmonton's Policy Guidelines for the Integration of Transmission Pipelines and Urban Development (1985) and any other relevant Provincial legislation will be employed when considering rezoning and subdivision applications near or adjacent to the above noted pipelines.

Figure 11.0 Site Features* (Bylaw 15108, March 23, 2009)



* Amended by Editor

5.0 IMPLEMENTATION

Bylaw 15108
March 23, 2009

5.1 DEVELOPMENT PHASING

The Aurum Industrial ASP area is expected to develop in phases over a 3 to 5-year time frame. Initial stages of development are intended to occur in the southern portion of the ASP, immediately north of the *private railway* right-of-way adjacent to 33 Street NE/Range Road 232. Depending on the demands of the market and aspirations of the respective landowners, development will generally proceed in a north and west direction.

Amended by Editor

5.2 RISK MANAGEMENT FOR HEAVY INDUSTRIAL DEVELOPMENT

New development and expansion of existing heavy industrial uses within the Aurum area will be assessed to ensure adequate separation and transition between incompatible uses utilizing the principles of Industrial Risk Management relative to the Major Industrial Accidents Council of Canada (MIACC) guidelines.

Heavy Industrial development proposals shall be assessed for compliance with safety, separation and siting considerations relative to surrounding uses, in accordance with City Policy, to ensure proper integration of various land uses. Safety, risk (of fire, explosion and toxic release), and nuisance and environmental assessment are integral components of the industrial development review process. The Development Officer may require all new heavy industrial development and expansion of existing heavy industrial development to retain a qualified professional acceptable to the Development Officer to prepare a quantitative risk assessment. No new heavy industrial development or expansion to heavy industrial development shall present an annual individual fatality risk in excess of the maximum risk of incident of:

a. 1:100,000 beyond the nearest IH property boundary at a distance of 1.5 km.
b. 1:1,000,000 beyond the nearest IH property boundary at the City of Edmonton boundary.

Where there are potential effects or risks associated with the proposed development the Development Officer shall impose any conditions necessary to mitigate the risk or environmental nuisances and health impacts identified in the assessment.

As the Aurum Industrial Business Park ASP area shares a common boundary with Strathcona County, cumulative risk review and analysis will be undertaken as part of the Joint Planning Study entered into by the City of Edmonton and Strathcona County. Upon completion of this collaborative venture to address land uses (including risk) along the common boundaries, applicable policy changes and an amendment to the Aurum Industrial Business Park ASP may be required to implement the Joint Planning Study recommendations. The City commits to undertaking those Plan amendment applications as required.

5.3 REZONING AND SUBDIVISION

The majority of land within the Aurum Industrial ASP is currently zoned for a variety of industrial uses under Bylaw 9809. Rezoning and subdivision of the land to conform to the proposed land uses designated in the ASP shall be undertaken as necessary.

5.4 SUMMARY

Given current and projected economic growth in the petroleum and petrochemical sector, a high concentration of industry in neighbouring Counties, and stable oil prices, Edmonton will continue to face high demand for industrial land for the foreseeable future.

The 444.12 hectare (1,097.44 acre) Aurum Industrial ASP offers approximately 295 hectares (729 acres) of perimeter and fully-serviced land to meet the enormous need in the region's industrial real estate sector. The development offers access for road and rail transport in close proximity to the High Load Corridor that services the petrochemical companies located in Alberta's Industrial Heartland and Fort McMurray.

The Aurum Industrial ASP is critical to Edmonton's continued growth and prosperity and will assist with maintaining its leading position on the Canadian and North American economic landscape.

APPENDIX I

LETTER OF AUTHORIZATION*

THE CITY OF Edmonton

13th Floor
Phipps McKinnon Building
10020 - 101A Avenue
Edmonton, Alberta
T5J 3G2

PLANNING

1982 03 23

Mr. Don Drackley
Manager, Urban Planning
Stanley Associates Engineering Limited
10512 - 169 Street
EDMONTON, Alberta
T5P 3X7

Dear Mr. Drackley:

RE: Proposed Area Structure Plan: *Private Owner* Industrial Area

Thank you for your letter of 1982 03 05 outlining your intention to prepare the above area structure plan. We confirm that City Council has formerly authorized preparation of area structure plans for the area, and that nothing more is required.

We will be happy to receive your proposal whenever it is ready. Upon receipt, we will first review the plan for conformity with the Revised Area Structure Plan Terms of Reference (copy enclosed) adopted by Council at its meeting of 1982 02 23. If the proposal is found to be complete, we will circulate it to our usual agencies for comment and recommendation.

On the question of boundaries, we recommend that you include in your area the SE¼-27-53-23-W4. This would more closely conform to the major employment area identified in Phase 1 of the Urban Growth Strategy.

Also on the question of boundaries, note that the NE¼-15-53-23-W4 is within the Yellowhead Corridor study area. *Private Owner*, of the Yellowhead Corridor study group, says that this shouldn't hold up your plan, but that he would like to be kept informed. You can reach him at 428-2666. If you have not already done so, we also recommend that you contact K. Singh of the Urban Growth Strategy team at 428-3110.

I understand Dale Knowlan has already contacted you about meeting on this area structure plan. In addition, Jack Stirling at 428-3116 is available to discuss any concerns you may have.

Yours truly,

B. Duncan
MANAGER
LAND USE PLANNING BRANCH
PLANNING DEPARTMENT

AD/mt/1X3

Enclosure

c.c. K. Singh, Urban Growth Strategy

*Amended by Editor

APPENDIX II

TRANSPORTATION IMPACT

ANALYSIS FOR THE

CLOVERBAR INDUSTRIAL AREA

APPENDIX II

TRANSPORTATION

II.1 THE DEVELOPMENT AREA

11.1.1 General

This section of the report deals with existing and planned future transportation services and requirements for the proposed Aurum Industrial Business Park Area Structure Plan. During preliminary discussions with the City of Edmonton Transportation Management Department, it was requested that the transportation component of this report deal not only with the Area Structure Plan itself, but with the entire 6.4 square kilometre area within the City of Edmonton north of Highway 16 and east of *Anthony Henday Drive*. By incorporating this entire area, referred to as the Clover Bar Industrial Area, the transportation analysis could then demonstrate the compatibility of the proposed roadway network within the Area Structure Plan with existing and possible future external roadway links in the vicinity of the development site.

Amended by Editor

The following sections summarize the transportation analysis and the roadway network requirements for the entire Clover Bar Industrial Area as requested. The transportation network and impacts of the Aurum Area Structure Plan contained within this area is, as a result, evaluated within the context of the 6.4 square kilometre area.

11.1.2 Existing External Roadway Network

The Aurum Area Structure Plan is located in close proximity to existing major regional transportation facilities which will provide excellent approach routes to the development area. Leading from these regional roadways and providing local access, the development area is currently serviced by four rural standard roadway facilities. A brief description of these roadway facilities follows:

External Regional Roadways

- Highway 16 - This facility is a major component of the highway system in the Province of Alberta and is located just south of the development area. As such, it

is designed to very high geometric standards with controlled access and a rural cross-section. This facility is designed to accommodate high traffic volumes under freeflow conditions and as such, functions as a freeway facility.

Currently, full access is available from the development area to Highway 16 at First Street (Meridian Street) and 17 Street N.E. (Broadmoor Boulevard - Rge. Rd. 231) while partial access (right-turn only) is available at 33 Street N.E. (Sherwood Drive -Rge. Rd. 232).

- Highway 16 provides an excellent connection from the City of Edmonton and the County of Parkland via Yellowhead Trail, Fort Saskatchewan via Highway 21, and rural areas in the *Strathcona County*. Adjacent to the development site, Highway 16 currently consists of four 3.75 m travel lanes and a 17 m centre median. Amended by Editor

- Highway 21 - This facility, located 3.2 kilometres east of the development area, functions as a rural arterial facility connecting urban and rural areas within the *Strathcona County* to Highway 16. Access is provided to Highway 16 via an interchange. Amended by Editor

  In terms of its importance to the development area, Highway 21 provides regional access from the Town of Fort Saskatchewan and municipalities within the M.D. of Sturgeon. Local access from Highway 21 is provided from Sherwood Drive and Broadmoor Boulevard via Highway 16 or Twp. Rd. 534. Highway 21 is currently a 7.5 m two-lane paved roadway facility with a rural cross-section.

- Highway 16A - This roadway facility serves a rural arterial function providing an extension of First Street south of Highway 16 to Baseline Road and Highway 14X. It provides regional access to the development area from South Edmonton and the *Leduc County* via the Sherwood Park Freeway and other rural collector roadways. Amended by Editor

  Highway 16A is currently a four-lane divided freeway facility with a rural cross-section and interchanges located at Highway 16, Baseline Road, and the Sherwood Park Freeway. A railway grade separation is provided at the crossing of the *private corporation rai*l line just south of Highway 16.

  Amended by Editor

External Arterial Roadways

- First Street (Meridian Street) - This facility connects Highway 16, as an extension of Highway 16A, to Twp. Rd. 534 located 3.2 kilometres north. This roadway currently provides access to local industry, an Edmonton Power site, an Edmonton landfill site, and the Clover Bar Lagoon.

  The roadway currently consists of a two-l ane 7.0 m travel surface with 0.9 m shoulders and a rural cross-section.

- 17 Street N.E. (Broadmoor Boulevard - Rge. Rd. 233) - This roadway facility provides a direct connection from Sherwood Park into the development area. An overpass and partial cloverleaf interchange is provided at Highway 16. The roadway extends to Twp. Rd. 534 and, within the development area, consists of a 6.0 m two-lane travel surface with a rural cross-section on a 20.0 m right-of-way.

- 33 Street N.E. (Sherwood Drive - Rge. Rd. 232) - Unlike Broadmoor Boulevard, this roadway facility does not currently provide a direct connection south to Sherwood Park due to its discontinuity at Highway 16. The roadway does provide right-turn ingress and egress to Highway 16 and to the 17 Street N.E. (Broadmoor Boulevard) and 49 Street N.E. (Glen Allen Boulevard)/Highway 16 interchanges via an east-west service road adjacent to the highway.

  33 Street N.E. north of Highway 16 currently consists of a two-lane 5.5 m travel surface with a rural cross-section on a 20.0 m right-of-way. It extends north beyond Twp. Rd. 534.

- 49 Street N.E. (Glen Allen Boulevard - Rge. Rd. 231) - Provides similar functions a- 17 Street N.E. (Broadmoor Boulevard) with an interchange at Highway 16 and connections from Sherwood Park to Twp. Rd. 534. This roadway, north of Highway 16, consists of a two-lane, 5 m travel surface with a rural cross-section on 20 m right-of-way.

  49 Street N.E., as with 33 Street N.E., is located outside the current City of Edmonton boundaries and extends north beyond Twp. Rd. 534.

- Twp. Rd. 534 - This roadway facility, located 3.2 km north of Highway 16, currently connects Highway 21 with First Street. At present, it consists of a two-lane, 6 m travel surface with a rural cross-section on a 20 m right-of-way.

II.1.3 Existing Traffic Conditions

Traffic data in the vicinity of the development area is limited. Existing Average Weekday Traffic Volumes (AWDT) were available for Highway 16 in the vicinity of the site from Alberta Transportation, based on a portable machine count undertaken in May 1981. The traffic volumes are summarized below:

	AWDT (vpd)	A.M. Peak Hoar (vpd)	P.M. Peak Hour (vpd)
Highway 16 -- Westbound	8,200	1,000	600
Eastbound	9,100	500	900
TOTAL	17,300	1,500	1,500

The A.M. peak hour on Highway 16 generally occurs between 0700 hours and 0800 hours while the P.M. peak hour takes place between 1600 hours and 1700 hours.

Traffic data was also available for other roadways in the vicinity of the development area and is summarized below:[1]

	AWDT (vpd)	Average Peak Hour (vpd -- two-way)
First Street (north of Highway 16)	6,800	690
Broadmoor Boulevard (south of Highway 16)	13,000 *	1,300
Sherwood Drive (south of Highway 16)	2,700 *	270
Glen Allen Boulevard (south of Highway 16)	70 *	70

*** Estimated using a peak hour factor of 10 percent.**

[1] County of Strathcona No. 20, Transportation Study, Technical Report, The GCG Engineering Parternship, November 21, 1980.

North of Highway 16, First Street currently carries a high volume of truck traffic with approximately 70 percent trucks over a ten-hour period. This reflects its function as an access road for local industrial development and the Edmonton landfill site. This roadway has been recommended for improvement as a result.[2]

11.1.4 Future External Roadway Network

In describing the future 2001 roadway network for the development area, the County of Strathcona Transportation Study and the City of Edmonton Draft Transportation Systems Plan were used for source information. Briefly the proposed changes and improvements for the long term roadway network planned for the next 20 year period are described below. All regional and arterial roadway facilities are proposed to form part of a truck route system.

External Regional Roadways

- Highway 16 - Current plans are to upgrade this facility to a 6-lane divided freeway standard with a new interchange located at 33 Stret N.E. (Sherwood Drive).

- Highway 21 - The 20 year plan call for twinning the facility to a 4-lane divided roadway with new interchanges located at Baseline Road and Wye Road.

- *Anthony Henday Drive* (Highway 16A/First Street) - In the future, First Street will become part of the regional roadway network. As part of the City of Edmonton's priority scheme for the *Anthony Henday Drive*, First Street would be upgraded to a 4-lane roadway between Highway 16 and Highway 15 with a new bridge crossing of the North Saskatchewan River. The initial stages of the facility are currently identified as part of the City's 5 year roadway program and will provide a good regional link, not only for bypass traffic, but for traffic destined to the development area from the M.D. of Sturgeon and St. Albert as well.

Amended by Editor

[2] County of Strathcona No. 20, Transportation Study, Technical Report, The GCG Engineering Parternship, November 21, 1980.

External Arterial Roadways

- 17 Street N.E. (Broadmoor Boulevard) - This roadway is currently planned to be constructed to an urban 4-lane divided arterial from Basline Road to Twp. Rd. 534.

- 33 Street N.E. (Sherwood Drive) - A 4-lane divided urban arterial is currently planned between Baseline Road and Twp. Rd. 534 with a new interchange at Highway 16.

- 49 Street N.E. (Glen Allen Boulevard) - This roadway is also currently planned for construction as a 4-lane divided arterial from Baseline Road to Twp. Rd. 534. The portion north of Highway 16 is planned to be constructed to rural standards.

- 137 Avenue N.E. (Twp. Rd. 534) - This roadway is planned to be constructed to 4-lane divided urban arterial standards from the Ring Road (First Street) to 33 Street N.E. (Sherwood Drive). From 33 Street N.E. to Highway 21, a 2-lane rural standard arterial is planned. Future alternative alignment plans for this facility show it diverting south of the existing road allowance somewhere near 33 Street N.E. and eventually connecting with the *Anthony Henday Drive*.

Amended by Editor

11.1.5 Future Traffic Conditions

Projected background traffic volumes for the purpose of this report were unavailable from the City of Edmonton *Transportation Department.* However, some traffic forecasts were available in the *Strathcona County* Transportation Study report but only in terms of total screenline volumes. In addition, the County study results were based on the assumption that a major residential development would take place in Ardrossan. As the expected 20 year population growth for Ardrossan has now reduced drastically, the projected 2001 screenline traffic volumes presented in the County Study are no longer relevant.

Amended by Editor

As a result of the above and due to the lack of information available, future background traffic volumes were not considered in detail for the transportation analysis. However, projected 2001 background link traffic volumes were estimated from *Anthony Henday Drive* screenline data available and adjusted to account for a population reduction in

Amended by Editor

Ardrossan. The volumes were then considered in evaluating the suitablity of proposed roadway standards and access for the development area.

The estimated 2001 background traffic volumes used in this report were as follows:

		Total AWDT (vpd)	**A.M. Peak Hour (vpd)**	**P.M. Peak Hour (vpd)**
Highway 16	Westbound	21050	2300	1400
	Eastbound	20150	1200	2100
	Total	40300	3500	3500
137 Avenue N.E. (Twp. Rd. 534)	Westbound	5750	650	400
	Eastbound	5750	350	600
	Total	11500	1000	1000

Background traffic volumes on 17 Street N.E. and 33 Street N.E. north of Highway 16 were assumed to be negligible due to the local access functions of these facilities within the 20 year period.

II.2 TRANSPORTATION DEMAND ANALYSIS

II.2.1 General

As part of the Area Structure Plan information requirements of the City of Edmonton, this section of the report presents the assumptions and procedures used to determine the potential transportation demands generated by the development. As previously discussed, this analysis deals with not only the lands within the Area Structure Plan boundaries, but potential development within the Clover Bar Industrial Area as a whole - the 6.4 square kilometre area east of the proposed *Anthony Henday Drive* and north of Highway 16 within the revised 1982 City of Edmonton boundaries. An analysis of this entire area was requested by the City of Edmonton *Transportation Department.*

Amended by Editor

For determining the transportation requirements of the area, P.M. peak hour was used as this normally represents, for industrial development, the period of highest traffic demands. In addition to the P.M. peak hour, the daily traffic generation was estimated.

II.2.2 Employment Forecasts

In order to provide a basis for estimating potential future traffic demands, the total employment potential is summarized in Table II.1.

Briefly, approximately 7,740 employees are expected to be eventually accommodated in the Clover Bar Industrial Area. Of this, about 5,000 employment opportunities would be available in the lands currently contained within the Aurum Industrial Business Park Area Structure Plan.

I1.2.3 Trip Generation

Vehicle trip data for the Nisku Industrial Area was obtained from Alberta Transportation and used for the analysis in this report. The Nisku Study indicated that about 4.5 vehicle trips per employee were made during a typical 24 hour period. Of the total daily traffic, about 12 percent or 0.54 vehicle trips per employee were made during the P.M. peak hour. On a daily basis, about 15 percent of the total traffic consisted of truck traffic.

Table II.2 summarizes the 24 hour traffic volumes expected to be generated by the Clover Bar lands. As indicated, about 34,830 vehicle trips are expected to be generated by the area. Of this total, about 5,225 trips are truck trips. The Aurum Park site will generate about 64% of the total number of trips within the Clover Bar Industrial Area. Assuming an average vehicle occupancy of about 1.3 persons per vehicle, a total of about 45,300 person trips per day would be generated by the 6.4 square kilometre area. On a daily basis, approximately 30 percent of the total trips generated are expected to be internal to the development area.

TABLE 11.1**

EMPLOYMENT POTENTIAL ESTIMATE
CLOVER BAR INDUSTRIAL AREA
CITY OF EDMONTON

	Area	Description	Gross lnd. Development Area	(Apprise) Employment Estimate*	Status
Clover Bar Lands defined as major employment area Phase I - Urban Growth Strategy Study	I. Aurum Park Structure Plan Site	Sec. 22, SE¼ 21, N.E.1/4. 15, and Pt. SE¼ 27-53-23-W4	295 ha	5,000	- Revised Area Structure Plan being prepared for submission to City - Lands zoned industrial
	2. Strathcona 16 Industrial Park	SE¼ 15-53-23-W4	34 ha	680	- Approved Subdivision Plan - Serviced - Lots available
	3. Clover Bar Industrial Park	SW¼ i5-53-23-W4	32 ha	640	- Lots available
	4. *Private Paving Corporation*	NW¼ 15-53-23-W4	37 ha	370	- Lands zoned Agricultural General Industrial Reserve - Dec. 1980 Area Structure and subsequent Rezoning application rejected by ERPC
	5. *Private Cement Corporation*	NE¼ 16-53-23-W4	50 ha	500	- Lands zoned industrial and Metropolitan Recreation - No formal development plans to date - Existing industrial use
	6. *Private Railway* Yards and *Pirvate Transport Corporation*	SE¼16-53-23-W4	55 ha	550	- Lands zoned industrial No formal Development plans to date - Existing storage and rail yard uses
	Long Term Employment Potential - Clover Bar Area		**500 Gross Ha**	**7,740**	

*** Average employment estimates based on 20 emp/ha - mixed industry**
10 emp/ha - heavy industry

****Amended by Editor**

TABLE II.2*

DAILY TRIP GENERATION

Area No.	Vehicle Trips Employment	Vehicle Trips (vpd)	Auto Trips (vpd)	Truck Trips (vpd)
1 *	5000	22500	19125	3375
2	680	3060	2600	460
3	640	2880	2450	430
4	370	1665	1415	250
5	500	2250	1910	340
6	550	2475	2105	370
Total	**7740**	**34830**	**29605**	**5225**

Note; Based on 4.5 vehicle trips/employee. For area description refer to Table II.1*
*** Denotes Aurum Industrial Business Park Area Structure Plan**

Table II.3 shows the P.M. peak hour vehicle trip estimates for the Aurum Park Area Structure Plan site and the entire Clover Bar Area. In total, about 4,180 vehicle trips are estimated to be generated during the P.M. peak hour. Of this total, about 830 trips are expected to have both origins and destinations within the area. The remaining trips (80 percent or 3,350 vehicles) are trips with origins or destinations outside the area. Approximately 2,700 vehicle trips (64%) are generated by the Aurum Park site.

II.2.4 Trip Distribution

In order to determine the orientation of travel desires within and external to the development area (used for determining a desirable roadway network and testing its feasibility), the P.M. peak hour trips generated by the area were distributed using the following assumptions:

- Internal trips were distributed in direct proportion to the employment in the Clover Bar Area.

- External trips were distributed on the basis of the expected future 1991 population in external areas[2]. Unlike the internal trips, external trips were not distrubuted proportionally, but the relative future attractivity and accessibility of major residential areas in Fort Saskatchewan, Sherwood Park, the City of Edmonton, the M.D. of Sturgeon, the *Leduc County* and the *Parkland County* was considered.

Amended by Editor

Table II.4 shows the distribution assumptions used for external trips generated by the Clover Bar Industrial Area. The distribution method used reflects the fact that the majority of the external trips generated during the P.M. peak hour would be of the home-based work type. The internal trips would primarily consist of business trips.

TABLE II.3

P.M. PEAK HOUR TRIP GENERATION

(Vehicles per hour)

Area No.	Employment		External	Internal		Total	
	In		Out	In	Out	In	Out
1*	5000	270	1890	270	270	540	2160
2	680	40	*255*	35	35	75	290
3	640	35	240	35	35	70	275
4	370	20	140	20	20	40	160
5	500	30	190	25	25	55	215
6	550	30	210	30	30	60	240
Total	**7740**	**425**	**2925**	**415**	**415**	**840**	**3340**

Based on 0.54 vehicle trips per employee, and an 80/20 directional split.
Approximately 20% of the total trips are assumed to be internal. For area description refer to Table II.I
* Denotes Aurum Park Area Structure Plan

[2] M.D. of Sturgeon Transportation Study, Working Paper No. 2 – Population Employment Projections, Stanley Associates Engineering Ltd., February 1982.

TABLE II.4*

EXTERNAL TRIP DISTRIBUTION ASSUMPTIONS

External Zone	Description	Percent
A	Fort Saskatchewan	6
B	Sherwood Park	11
C	*Strathcona County* (rural)	3
D	*Leduc County*	3
E	St. Albert	3
F	*Parkland County*	2
G	M.D. of Sturgeon	3
H	City of Edmonton North	41
I	City of Edmonton South	28
	TOTAL	**100**

*** Amended by Editor**

The City of Edmonton s expected to be the major external origin or destination for trips. However, the Town of Fort Saskatchewan and Sherwood Park attract a greater disproportionate share of the external trips.

Table II.5 shows the resulting vehicle trip table following the distribution process.

II.2.5 Roadway Network Development

In developing the transportation network within the Clover Bar Area in general, and the Aurum Park Area Structure Plan specifically, it was necessary to consider the following:

- The roadway system should reflect a hierarchical pattern of arterial collector and local roadways.

- The arterial roadways should conform in principal to the long term external transportation network for the area as this system was developed based on regional traffic considerations. This will ensure that the arterial network is functional.

- The roadway system should provide good accessibility to the City of Edmonton both northwest and southwest of the area, to Fort Saskatchewan to the northeast and to Sherwood Park to the south.

- The roadway system should be sensitive to the numerous natural and man made physical barriers in the area by minimizing the land requirements for roadways and by limiting the number of pipeline, creek, ravine and railway crossings.

- The collector and local roadway network should be logical and simple by avoiding numerous tertiary and quarternary loops. This is important in an industrial/business development where numerous business trips occur and driver unfamiliarity is common.

TABLE II.5

CLOVER BAR INDUSTRIAL AREA

P.M. PEAK HOUR VEHICLE TRIP TABLE

Origin/ Destination Zane	I*	2	3	4	5	a	A	B	C	D	E	F	G	H	1	TOTAL
1*	170	25	25	15	13	20	115	200	60	60	60	35	60	775	525	2160
2	25	5	0	5	0	0	15	25	5	10	10	5	10	105	70	290
3	25	0	5	5	0	0	15	30	5	5	5	5	10	100	65	275
4	10	5	5	0	0	0	10	15	5	5	5	0	0	60	40	160
5	15	0	0	0	5	5	10	20	5	5	5	5	5	80	55	215
6	20	0	0	0	5	5	15	25	5	5	5	5	5	85	60	240
A	15	0	5	0	5	0	-	-	-	-	-	-	-	-	-	25
B	30	5	5	5	0	5		-	-	-	-	-	-	-	-	50
C	10	5	0	0	0	0	-	-	-	-	-	-	-	-	-	15
D	10	5	0	0	0	0	-	-	-	-						15
E	10	0	0	0	0	0	-	-	-	-	-	-	-	-	-	10
F	10	0	0	0	5	0	-	-	-	-	-	-	-	-	-	I5
G	10	0	0	0	0	0	-	-	-		-	-	-	-	-	10
H	110	15	IS	5	10	15	-	-	-	-		-	-	-	-	170
1	70	10	10	5	10	10	-	-	-	-		-	–	-	-	115
TOTAL	**540**	**75**	**70**	**00**	**55**	**60**	**180**	**315**	**85**	**90**	**90**	**35**	**90**	**1205**	**815**	**3765**

Note: Refer tp Tab;es 1 and 4 for zone description

*** Denotes Aurum Industrial Business Park**

- The number, spacing and location of intersections should be sensitive to criteria such as roadway function and classification, provision of adequate sight distance, provision of adequate intersection grades, proximity of railway crossings and adequate intersection storage.

- The roadway system should complement existing approved subdivisions and roadway patterns.

Figure II.1 shows the planned roadway system for the Aurum Park Area Structure Plan. In addition it shows existing and possible roadway network extensions for the entire Clover Bar Area.

Briefly, the major feature in the proposed plan involves the development of 137 Avenue N.E. as an east-west arterial. The proposed roadway extends from the existing road allowance of Twp. Rd. 534, east of the City limits, southward to bisect the Business Park development and connect with the *Anthony Henday Drive* at a location about 1.6 kilometres north of Highway 16. This alignment offers the following:

Amended by Editor

- It provides for an east-west arterial link for regional traffic movements as required based on the *Strathcona County* Transportation Study and the City of Edmonton Transportation Systems Plan.

Amended by Editor

- The southward shift in the alignment enables the arterial to be efficiently and effectively used to service future developing lands in the Corporate Business Park.

- The roadway provides east-west arterial continuity in the Clover Bar Area and, as such, provides a good distribution link for local traffic destined for Highway 21, north-south arterials leading to Highway 16 and Sherwood Park and the City of Edmonton.

- In short, the indicated east-west arterial alignment provides both access to the Clover Bar Area for local traffic and east-west continuity from Highway 21 and points east to the City of Edmonton.

The proposed collector roadway system for the Area Structure Plan has the following characteristics:

- The layout is simple and logical with sufficient arterial access locations to enable easy addressing and ease in locating addresses.
- The layout minimizes pipeline crossings and eliminates rail crossings.
- The collector access points on the arterial are a minimum of 200 m spacing ensuring good arterial operations. Between 17 Street N.E. and 33 Street N.E. five collector access points are proposed, each being "T" intersections.
- A minimum of two access points are provided to all areas.

Figure II.1 also shows future possible collector and arterial roadways for the remaining lands within the Clover Bar Industrial Area. Also shown are existing collector links in approved subdivisions. The figure indicates locations where proposed collectors will tie into existing or possible future roadways.

II.3 EVALUATION OF ROADWAY REQUIREMENTS AND TRAFFIC IMPACTS

II.3.1 General

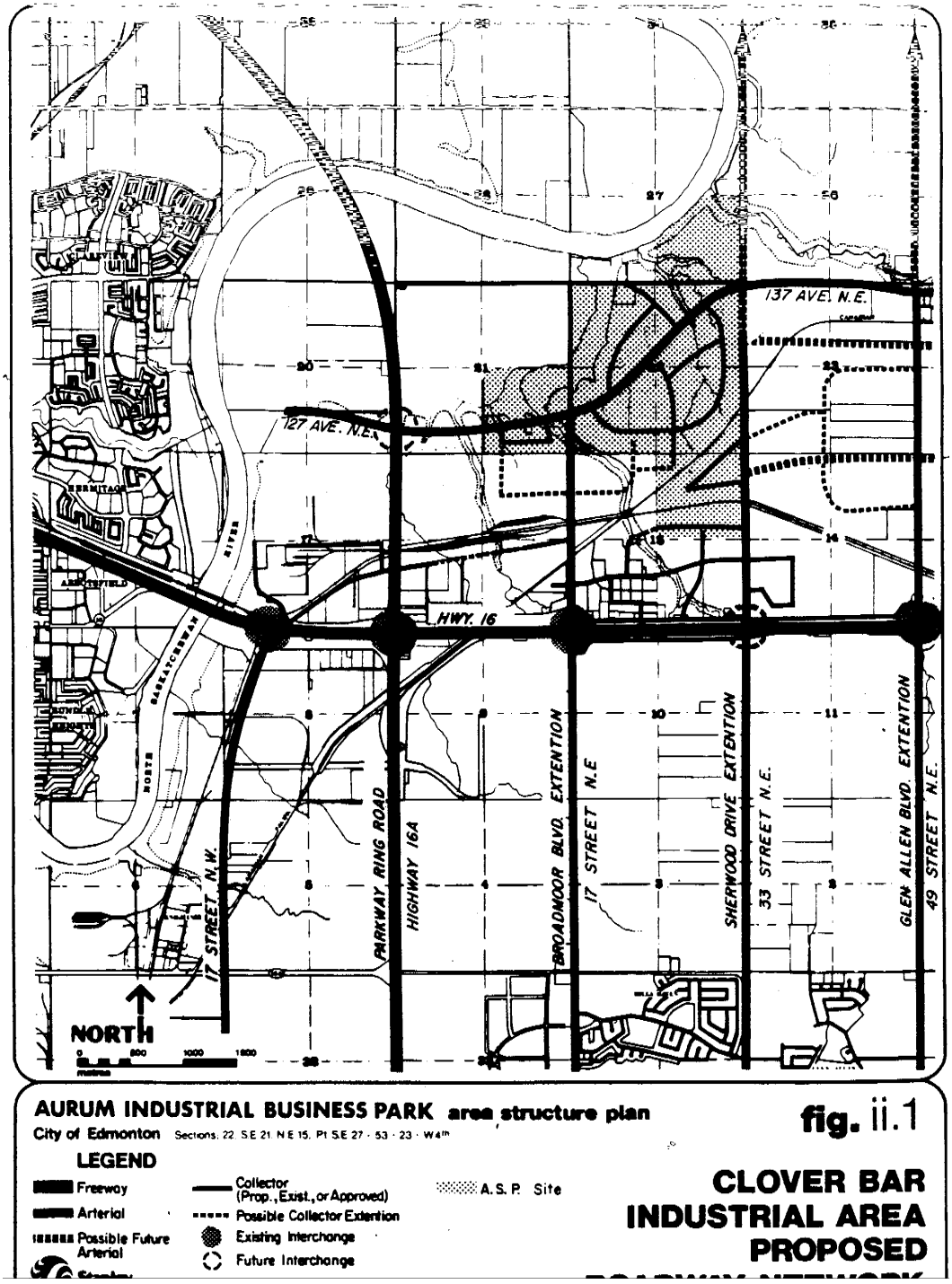
The roadway requirements were determined based on the roadway classification proposed and the potential for future increases in through traffic. Roadway right-of-way, pavement width and cross-section depend upon the number of travel lanes required as well as the roadway function. In order to determine this, various capacity techniques were used to demonstrate the feasibility of the proposed roadway network.

The internal and external roadway provisions are described below for those roadways which are impacted by the Aurum Park Area Structure Plan.

I1.3.2 Internal Roadway Requirements

Collector roadways within the Area Structure Plan are generally proposed to be constructed to 2-lane urban collector undivided standards (2 UCU) on a 24 m right-of-way. A 13.5 m pavement surface (curb face to curb face) is proposed consistent with City of Edmonton industrial collector standards. This provides sufficient width to permit large

Figure ii.1 – Clover Bar Industrial Area Proposed Roadway Network
(Bylaw 9809, October 8, 1991)



trucks to turn with minimum interference. It is recommended that the curb to curb width be increased to about 15 m at critical collector approaches to the proposed east-west arterial in order to develop a centre median.

Local industrial roadways are proposed to be constructed to 2-lane urban industrial standards (2 ULU) on a right-of-way of 20 m. A 11.5 m pavement surface (curb face to curb face) is proposed. Ths represents a slightly lower standard than proposed for collector facilities and reflects its lower movement function.

Temporary turnarounds are provided in situations where possible collector extensions are envisioned.

The proposed 137 Avenue N.E. east-west arterial is planned to be constructed to 4-lane divided urban arterial standards; (4 UAD) on a right-of-way of 37 m.

II.3.3 External Roadway Requirements

External roadway facilities impacted by the Area Structure Plan include 17 Street N.E. and 33 Street N.E. These roadways currently exist on 20 metre right-of-ways.

As discussed previously, these roadways are planned to be constructed ultimately to 4-lane divided urban arterial standards (4 UAD). Roadway right-of-ways for both streets have been established at 40 metres during subdivison approvals south of the Aurum Industrial Business Park. As a result, 10 metre widening is being provided within the Area Structure Plan to provide for a consistent right-of-way of 40 metres for both roadways. Only the portion of 17 Street N.E. north of the proposed 137 Avenue N.E. arterial will not require additional right-of-way as its future function will be that of a minor collector. As a result, the present 20 m right-of-way in this area is expected to be more than sufficient.

The pavement width (curb to curb) for both 17 Street N.E. and 33 Street N.E. south of 137 Avenue N.E. is expected to be 21.5 m. The collector portion of 17 Street N.E. may have a pavement width of about 13.5 m with either an urban or rural cross-section.

II.3.4 Adequacy of Proposed Roadway Facilities

A capacity analysis was undertaken to determine the future operating characteristics of the proposed roadway facilities with future development of the entire Clover Bar

Industrial Area. The analysis demonstrated the adequacy of the planned roadway - system in accommodating the expected development.

In undertaking the capacity analysis, it was recognized that specific intersections would require signalization as a result of traffic demands as follows:

- 137 Avenue N.E./17 Street N.E. - This intersection would eventually be signalized as is the case with most arterial/arterial intersections.
- 137 Avenue N.E./33 Street N.E. - This intersection, as a junction of two arterials, would also be signalized.

II.3.5 External Roadway Impacts

Traffic generated by the Clover Bar Industrial Area is estimated to cause traffic increases on external roadway facilities as follows:

	Increase (vpd)	P.M. Peak 'Hour Capacity*	Increase Capacity	Daily Volume Increase (Two-Way)
Highway 16	935	5100	18%	11700
Highway 16A	660	3400	19%	8250
17 Street N.E.	220	1500	15%	2750
33 Street N.E.	115	1500	8%	1450
Twp. Rd. 534 (137 Avenue N.E.)	175	1500	12%	2190
Anthony Henday Drive	490	3400	14%	6150
1st Street	245	1500	16%	3060

* Assumes 1700 vph/lane for freeways, 750 vpd/lane for arterials and ultimate cross-section, refers to peak directional of travel only.

The above table indicates that the Clover Bar Area could contribute traffic volumes on external facilities which represent from 14% to 19% of their ultimate carrying capacities. The greatest impact is on Highway 16 and Highway 16A. However, with respect to Highway 16 where 2001 background traffic estimates were available, the Clover Bar area generates traffic in the off-peak direction. As a result, peak direction volumes including the site-generated traffic are estimated at about 2400 vph by the year 2001. This is well within the capacity of the 6-lane freeway facility as indicated in the previous table.

External intersections are planned as interchange facilities and would appear to have capacities which are more than sufficient to accommodate projected traffic.

APPENDIX 111

DRAINAGE STUDY

Aurum Industrial Business Park

Area Structure Plan

SECTION I

INTRODUCTION

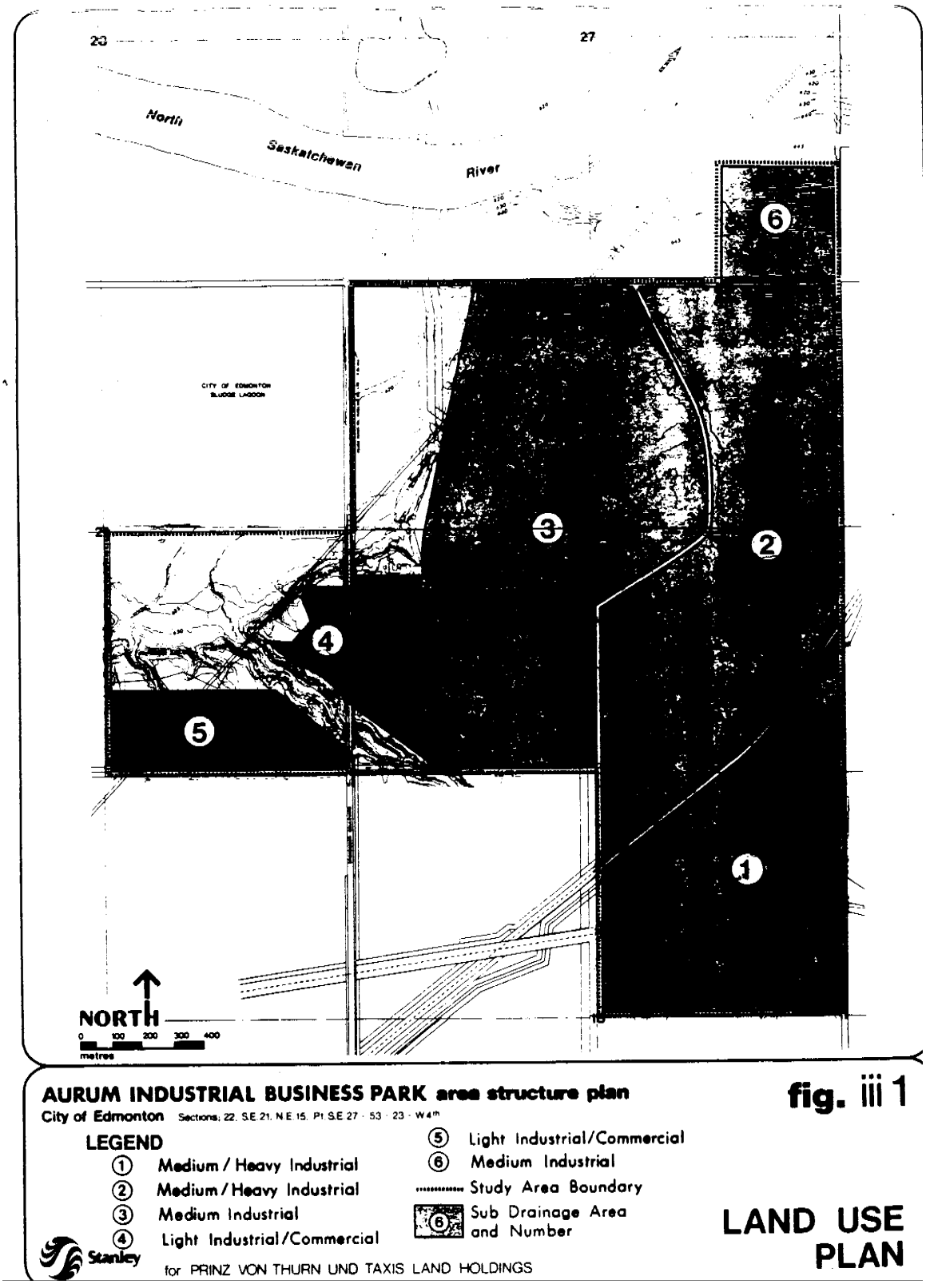
It is proposed to develop 297 ha of land 4 km north of Sherwood Park (Baseline Road) for medium and heavy industrial purposes (Figure III.1). Stanley Associates Engineering Ltd. has been commissioned to undertake a drainage study pertaining to this development. This study was requested by the City's *Asset Management and Public Works* Department to support an Area Structure Plan which has been prepared for the site (Stanley Associates Engineering Ltd.). The objective of the study is to evaluate two storm drainage alternatives and to determine the most suitable alternative and its associated cost.

Amended by Editor

The study includes a delineation of the drainage boundary; a summary of the hydrologic and hydraulic conditions and the constraints applicable to the watershed contributing to the study area. It also includes hydrologic and hydraulic analyses to reduce post-development runoff rates to those of pre-development conditions by means of stormwater detention ponds. Direct discharge of stormwater through piping from the development in the North Saskatchewan River s also considered as an alternative means of runoff control.

The Storm Water Management Model (SWMM) and the Hydrologic Model (HYMO) are used to simulate the rainfall - runoff process in the study area for the post-development and pre-development conditions respectively. Inflow hydrographs for the study area were developed and hydraulically routed through proposed stormwater detention ponds by the discharge directly to the North Saskatchewan River was determined by applying the rational method as documented in the City of Edmonton Standards and the Manning's equation.

Figure iii.1 – Land Use Plan
(Bylaw 9809, October 8, 1991)



SECTION 2

ASSESSMENT OF CLOVER BAR CREEK AND UNNAMED CREEK WATERSHEDS

2.I GENERAL

Study of the available 1:25000 topographic mapping and recent air photos indicates there are two watersheds which convey natural runoff from the study area to the North Saskatchewan River (Figure 1II.2). The watersheds are referred to as the Clover Bar Creek and Unnamed Creek drainage basins for the purpose of this study. The two basins are divided into sub drainage basins. The existing land use within the basins is predominately agricultural with some industrial development.

The Clover Bar Creek drainage basin drains an area of 22 km2. The basin drains from south to north across the study area into the North Saskatchewan River. The overall slope of this basin from the headwaters to the mouth is 0.008. Just before the creek reaches the floodplain of the North Saskatchewan River the watercourse becomes poorly defined and the flow of water appears to infiltrate into the ground. Based on topographic mapping of the area, there is no defined streamcourse for the flat lands west of 17 Street N.E. (NE Section 21). The creek emerges to drain this flat area before the river.

The Unnamed Creek drainage basin drains an area of 7 km2, flowing in a northwesterly direction across the study area into the North Saskatchewan River. The overall slope of this basin is 0.009. Near the river, the streamcourse cuts through the North Saskatchewan River escarpment into which it has developed a deep ravine.

2.2 HYDRAULIC AND HYDROLOGIC ANALYSIS

2.2.1 Crossing Inventory and Flow Determination

A field survey was conducted to establish the hydraulic properties of all the existing crossings within the Clover Bar Creek and Unnamed Creek drainage basins. The

Figure iii.2 – Clover Bar and Unnamed Creek Watershed Area
(Bylaw 9809, October 8, 1991)

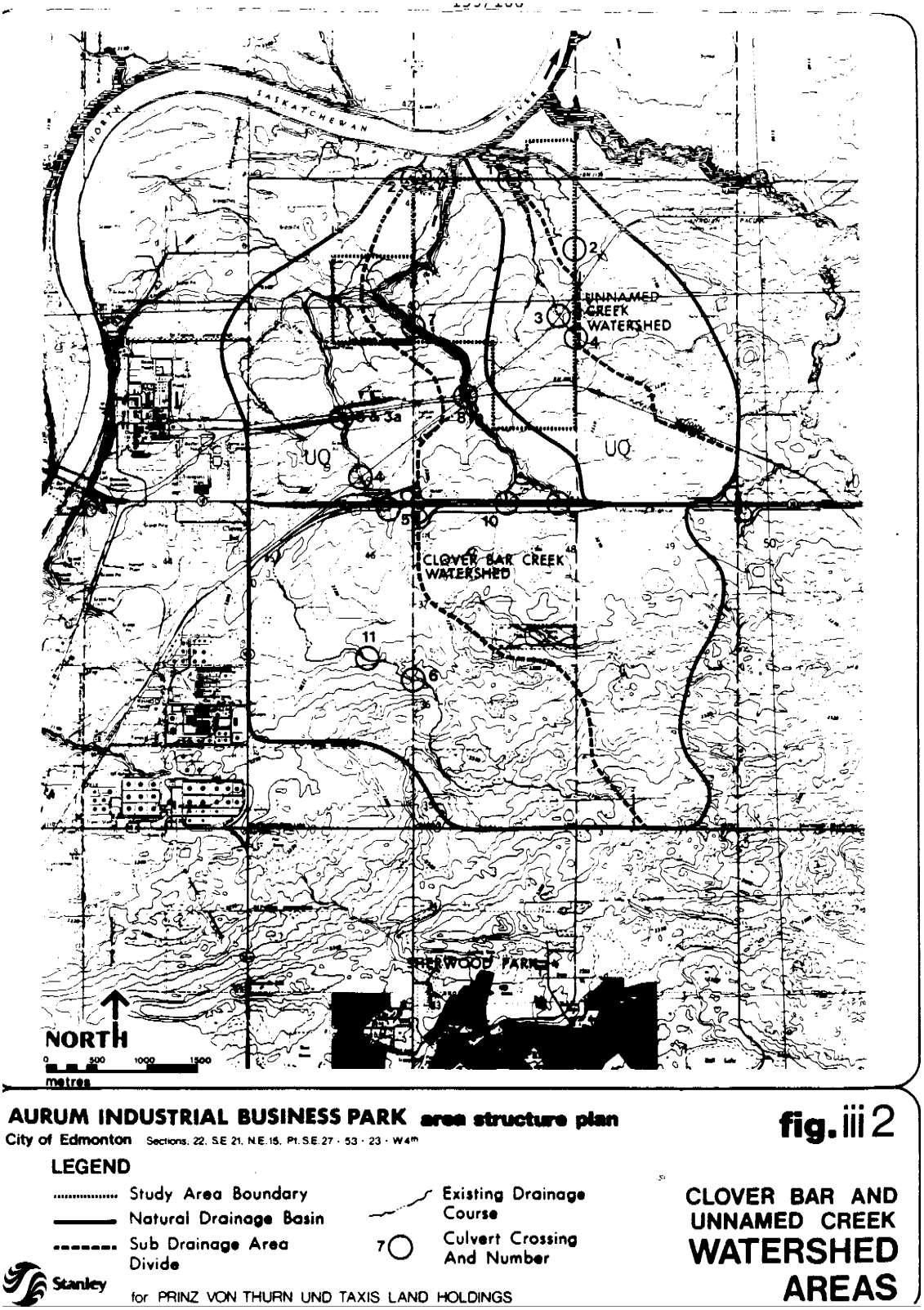


Table 1 – Clover Bar Creek – Crossing Inventory*

Crossing No.	Location	Tributary Area (km^2)	Type	Size (m)	Length (m)	Slope (%)	Surcharge Height (m)	Full Flow Capacity (m^3/s)	Surcharge Capacity (m^3/s)	Comments
1		22.00	CSP	1.90	10.0	1.28	2.74	5.4	9.6	mitred
2		NA	3-CSP	0.90	14.3	-0.24	1.00	1.0	1.1	drainage for
				0.90	14.3	0.47	1.00	1.0	1.1	highway ditches
				0.60	10.6	2.16	1.00	0.4	0.5	only
3	*Railway* Yard	8.70	CSP	1.50	600	N / A	2.00	3.7	4.7	
3a		8.20	Pipe-Arch	2-1.20x0.80	N/A	NIA	NIA	2.0	NIA	
4	*Railway*	*7.70*	Pipe-Arch	1.20x0.80	N/A	NIA	NIA	1.0	N/A	
	Crossing		CSP							
5	HWY #16	7.49	2-CSP	0.90	69.5	NIA	2.50	1.0		In series
	Crossing			1.10	89.6	N/A	N/A	1.6	N/A	mitred
6		1.53	CSP	0.65	17.0	1.60	2.50	0.4	0.9	
7		7.56	CSP	0.90	13.0	1.00	10.00	1.0	4.8	mitred
8	*Two private railways*	7.16	Concrete	1.50x1.50	50.0		13.0	1.3	4.0	in series
	Crossing		Box							box has
			CSP	0.75	total		13.0	N/A	NIA	wingwalls
			CSP	0.90	NIA	NIA	13.0	1.3	8.0	
9	HWY .16	5.31	CSP	0.90	NIA	NIA	5.76	1.0	3.5	mitred
	Crossing									
10	HWY N16	0.73	CSP	0.90	N/A	NIA	2.67	1.0	2.3	in series
	Crossing		Concrete	0.75	N/A	NIA	1.77	0.6	1.6	mitred
11		1.53	CSP	0.65	N/A	N/A	1.8	0.3	0.7	

Notes:

1. Surcharge heights are taken from invert elevation.
2. CSP - Corrugated Steel Pipe.

*Amended by Editor

Table 2 – Unnamed Creek – Creek Crossing*

Crossing No.	Location	Tributary Area (km^2)	Type	Size (m)	Length (m)	Slope (%)	Surcharge Height (m)	Full Flow Capacity (m^3/s)	Surcharge Capacity (m^3/s)
1		3.21	CSP	1.20	16.0	1.00	4.5	1.9	5.4
2	Sherwood Drive Crossing	2.05	CSP	0.60	14.5	N/A	1.0	0.4	0.5
3	*Rail* Crossing	2.20	CSP	0.90	NIA	N/A	3.0	0.9	2.3
4	Sherwood Drive Crossing	1.58	CSP	0.45	14.5	N /A	1.0	0.2	0.3

Notes:

1. Surcharge heights are taken from invert elevation.
2. SCP – Corrugated Steel Pipe.

* Amended by Editor

information obtained for the crossings includes the type, size and length, slope and surcharge height of the crossing. The results of the field survey are given in Tables 1 and 2. The tables also contain calculated information for the crossings which include the tributary drainage area and the crossing capacities at full flow and at the fully surcharged conditions. The capacity calculations were based on inlet control considerations and as a result, would be liberal in their estimates of crossing capacity if tailwater conditions exist.

Detailed simulations of the Clover Bar Creek and Unnamed Creek drainage basins were carried out using the HYMO model. Flows were computed at several points within each drainage basin for the 5, 25, 100 year return period events. The results of the simulations are summarized and shown in Tables 3 and 4.

2.2.2 Clover Bar Creek Drainage Basin

There are two main arms of Clover Bar Creek draining north from Highway 16. The easterly arm has two culvert crossings under Highway 16. Further downstream there are two more culvert crossings, both of which have significant heights of fill above them. There is no evidence of erosion upstream or downstream of the crossing or in the channels. There is significant flow capacity in this reach.

Upstream of Highway 16 on the western arm of Clover Bar Creek the channel has flatter slopes and is not incised. Except for a ditch parallel with Highway 16 the channel is not well defined.

The western arm of Clover Bar Creek has a well defined drainage course downstream of Highway 16. The *private railway corporation* yard crossing (crossing 3), although it is not the smallest crossing in this reach, poses a significant barrier to flows along the creek. The existing culvert capacity determines the upper limit of the flow which can be conveyed in this arm of the creek before flooding occurs.

Amended by Editor

After the confluence of the two arms of Clover Bar Creek, just before the creek reaches the floodplain of the North Saskatchewan River, the watercourse becomes ill-defined and the flow of water appears to infiltrate into the ground. The surf icial material in this area consists of a well graded alluvial gravel. On topographic maps

Table 3 - Clover Bar Creek - Flow Summary

Crossing No.	Tributary Area km^2	Capacity m^3/s	Surcharge Capacity m^3/s	Peak Discharge 5 year m^3/s	25 year m^3/s	100 year m^3/s
1	22.00	5.4	9.6	0.3	1.7	3.3
5	*7.49*	1.0	N/A	0.8	3.8	7.2
6	1.53	0.4	0.9	0.5	2.5	4.9
7	7.56	1.0	4.8	0.8 -	1.7	2.4
8	7.16	4.4	19.8	1.0	3.0	5.5
9	5.31	1.5	N/A	0.7	3.3	6.2-
10	0.73	1.0	N/A	0.2	1.2	2.5
11	1.53	0.3	0.7	0.5	2.5	2.6

Notes:

The Clover Bar Creek flow summary is extracted from the County of Strathcona No. 20, Central Area Drainage Study.

Table 4 – Unnamed Creek – Flow Summary

Crossing No.	**Tributary Area km^2**	**Capacity m^3/s**	**Surcharge Capacity m^3/s**	**5 year m^3/s**	**25 year m^3/s**	**100 year m^3/s**
1	3.21	1.9	5.4	0.5	2.4	4.8
2	2.05	0.4	0.5	0.3	1.5	3.1
3	2.20	0.9	2.3	0.3	1.6	3.2
4	1.58	0.2	0.3	0.2	1.2	2.4

for the area and during field visits this poorly defined channel extends for about 500 m before 17 Street N.E. However, some distance away on the other side of the road, the stream re-emerges to drain a small area downstream of 17 Street N.E. and conveys any upstream overflow from Clover Bar Creek the; remaining 500 m to the North Saskatchean River.

The eastern arm of Clover Bar Creek, has adequate crossing capacities. All crossings will pass the 1 in 5 years return event without any surcharge and can also pass in 1 in 100 year event utilizing the available surcharge heights.

Crossing capacities are more restrictive in the west arm of Clover Bar Creek. The capacities are sufficient to convey the 1 in 5 year event without utilizing the available surcharge, however, flooding will occur during the 1 in 25 year event. Highway 16 and the *private corporation rail* line may overtop but the *private corporation* railyard and the car storage area located downstream (crossing 3) should not he inundated. During the 1 to 100 year event, flooding could occur at Highway 16 and the *private railway corporation* crossing. The *private corporation* railyard and car storage area may be inundated.

Amended by Editor

Development of an agricultural area for industrial use increases the amount of impermeable surface area, thereby leading to an increase in runoff volume as well as in the downstream end near 17 Street N.E. where there is presently no defined drainage course and consequently no flow capacity.

2.2.3 Unnamed Creek Drainage Basin

The Unnamed Creek drainage basin is located adjacent to the Clover Bar Creek drainage basin and to the north of Highway 16. It is approximately one third the size of the Clover Bar Creek drainage basin, and contains 4 existing crossings within its basin. All the crossings will pass the 1 in 5 year return event without any surcharge. Crossings 1 and 3 can pass the 1 in 25 and 1 in 100 year event respectively utilizing the available surcharge height. Crossing capacities are less at locations 2 and 4. The capacities are sufficient at these locations to convey the 1 in 5 year event without utilizing the available surcharge, however, flooding will occur during the 1 and 25 year event.

Unnamed Creek is a relatively well defined natural drainage course. It flows across the study area in a northwaesterly direction and drops approximately 30 m through a ravine into the North Saskatchewan River. The ravine is treed, well vegetated and relatively stable. There is no sign of major bank and bed erosion. Industrial development upstream

of the ravine will increase peak runoff and thus will have an adverse effect on the ravine in terms of erosion. Stormwater management for any development upstream of this ravine is necessary. This will eliminate any adverse effects of development by limiting the post-development runoff to pre-development runoff rates before discharging into this ravine and to the North Saskatchewan River.

SECTION 3

HYDROLOGIC ANALYSIS OF STUDY AREA

3.1 ENVIRONMENTAL. SETTING

The study area is situated to the east side of Edmonton and 4 km north of Sherwood Park (baseline Road). It contains a total of 432 has of which 297 ha are proposed for industrial business, medium and heavy industrial development. The North Saskatchewan River is situated immediately north of the proposed development. Clover Bar Creek and Unnamed Creek flow in a northerly and northwesterly direction across the study area to the North Saskatchewan River. Natural drainage of the study area is generally in a northerly and northwesterly direction. The study area is divided into 6 sub-basins are shown in Figure III.1.

3.2 PRE-DEVELOPMENT RUNOFF

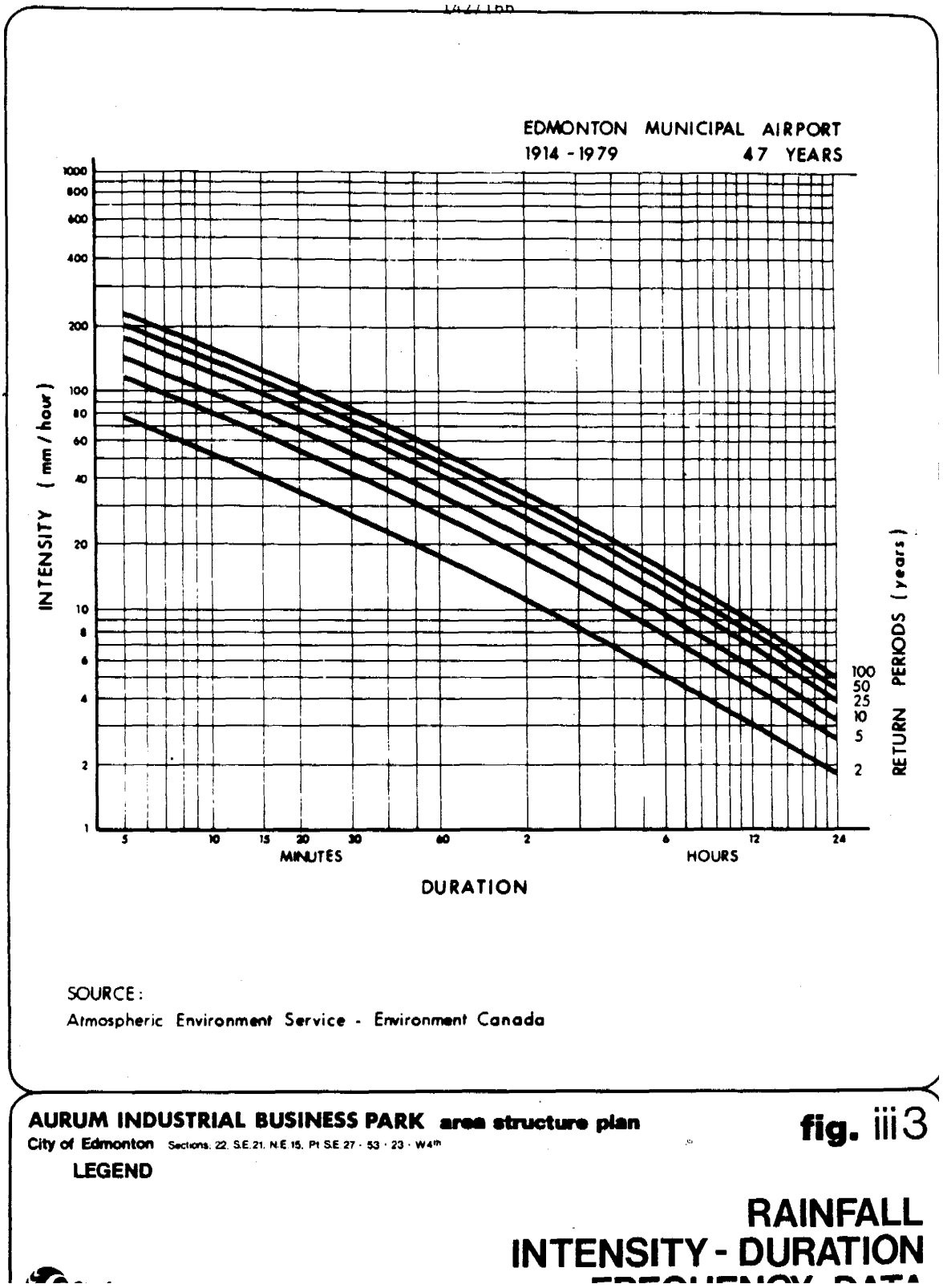
The pre-development runoff conditions of the proposed development are determined by applying the United States Department of Agriculture Hydrologic Model (HYMO). HYMO is designed for modelling surface runoff and sediment yield from watersheds, and planning flood prevention projects, forecasting floods, and research studies. HYMO was also designed to transform rainfall data into runoff hydrographs and to route these through streams and valleys or reservoirs. HYMO has been widely used for preliminary assessment of hydrologic impact due to urbanization such as the comparison of pre-development and post-development flows and the design of detention storage facilities.

The model uses the instantaneous unit hydrograph approach to generate a hydrograph given the input of various parameters describing the catchment to be modelled as shown below:

1. A design storm,
2. Height, length, area of each sub-catchment,
3. Curve number of each sub-catchment.

A curve number of 60 is used in the analysis to reflect the pre-develoment agricultural land use of the study area. The rainfall data applied in the HYMO analysis is based upon the rainfall intensity - duration - frequency relationship of Edmonton Municipal Airport

Figure iii.3 – Rainfall Intensity-Duration Frequency Data
(Bylaw 9809, October 8, 1991)



(1914 to 1979) provided by the Atmospheric Environment Services of Environment Canada (Figure III.3). Rainfall event of 24 hours duration and a time interval of 10 minutes were used in the simulation of the 1 in 5, 1 in 25 and 1 in 100 year event and the specific results on HYMO runoff analysis are shown in Table 5.

3.2 POST-DEVELOPMENT RUNOFF

Development of the study area from agricultural land into industrial property will result in increased peak runoff rates. This post-development runoff rate is determined by applying the United States Environmental Protection Agency Storm Water Management Model (SWMM). SWMM is a comprehensive model designed to allow for simulation of both water quantity and quality aspects associated with urban runoff and combined sewer systems. The program consists of an Executive (control) block, and four computational blocks, namely Runoff, Transport, Storage/Treatment and Receiving Waters for dealing with runoff generation, hydraulic routing, quality simulation and effects on a receiving water body.

The Runoff block, which accounts for the basic runoff phenomena of the proposed development area, was used in this study. The Runoff block in the model will generate a hydrograph given the input of various parameters describing the catchment to be modelled as shown below:

1. A design storm,

2. Slope, area, width and percent imperviousness of each sub-catchment,

3. Infiltration parameters for Horton's equation,

4. Depression storage values for pervious and impervious areas,

5. Percent of impervious are with zero depression storage.

Input parameters used in the SWMM model for the present analysis are shown in Table 6. Symmetrical Chicago-type synthetic rainfall events of 24-hour duration and a time interval of 10 minutes were used in the simulation of the 1 in 5, 1 in 25, and 1 in 100 year return period events. These synthetic rainfall events are based upon the intensity - duration -frequency relationships for Edmonton Municipal Airport (1914 to 1979}

provided by Atmospheric Environment Services of Environment Canada. Specific results of the SWMM runoff analysis are shown in Table 5.

Table 5 - Pre-development and Post Development

Peak Runoff Rates of Study Area

Sub Basin No.	Peak Discharges 5 Year m^3/s		25 Year m^3/s		100 Year m^3/s	
	pre	post	pre	post	pre	post
1	0.19	7.16	1.14	12.46	2.37	17.47
2 & 3	0.50	24.05	2.85	41.52	5.85	57.93
4	0.03	0.48	0.11	0.84	0.22	1.17
5	0.06	2.17	0.36	3.55	0.76	5.27
6	0.03	1.58	0.14	2.68	0.30	3.67

TABLE 6 - SWMM Parameters

1.	Size of catchment area for lumped SWMM	up to 115 ha (285 ac)
2.	Percent imperviousness	60% (medium industrial) 65% (heavy industrial)
3.	Width of overland flow	98 m/ha (130 ft/ac)
4.	Percentage of impervious area with zero detention	25%
5.	Detention Storage	
	- impervious area	1.6 mm (0.062 in)
	- pervious area	76.2 mm (3.00 in)
6.	Resistance Factor	
	- impervious area	0.013
	- pervious area	0.750
7.	Infiltration Rate	
	- maximum	76.2 mm/hr (3.00 in/hr.)
	- minimum	13.2 mm/hr (0.52 in/hr.)
8.	Decay Rate for Infiltration	0.029 mm/hr (0.00115 in/hr.)

Note: Item 4 to 8 are SWMM default values.

SECTION 4

STORMWATER MANAGEMENT ALTERNATIVES

4.1 GENERAL

Two stormwater management alternatives have been investigated and their estimated cost including engineering and contingency are included. The first alternative is to provide stormwater detention ponds within the development to control post development discharges to those of pre-development runoff rates-up to the 1 in 100 year storm return period (Figure 1I1.4). The controlled runoff from the ponds will then be discharged into the ravine immediately north of the development to the North Saskatchewan River. The second alternative is to provide piping to convey the 1 in 5 year post development runoff from the development through the existing ravine to the North Saskatchewan River (Figure I1I.5). This alternative will include oversizing of the minor system within the development (E14-22) relative to the minor system in alternative 1.

Both alternatives 1 and 2 will provide a 450 mm and 750 mm diameter storm sewer to convey the 1 in 5 year post development runoff from SE 21 because sub basins 4 and 5 are relatively small and to provide stormwater ponds in these basins is impractical from an economic, development and maintenance standpoint.

Both alternative 1 and 2 will provide a 900 mm diameter storm sewer to convey the 1 in 5 year post develoment runooff from SE 27 (sub basin 6) to a tributary of Unnamed Creek without detention facilities. This is possible because the area of sub basin 6 is relatively small and it is located at the furthest downstream end of Unnamed Creek. Also, it is due to the lag time between the peak flow from Unnamed Creek drainage basin and sub basin 6. In addition, Unnamed Creek downstream of sub-basin 6 is well defined and it has sufficient channel capacity to convey the post development runoff from this basin without causing adverse effect to its downstream channel.

4.2 ALTERNATIVE 1 - STORMWATER POND

This alternative involves a natural surface drainage concept which provides a continuous gradient of drainage channel toward planned storage detention areas. The detention areas will accomodate stormwater runoff up to the 1 in 100 year storm return period. Outflows

Figure iii.4 – Stormwater Management Alternative No.1
(Bylaw 9809, October 8, 1991)

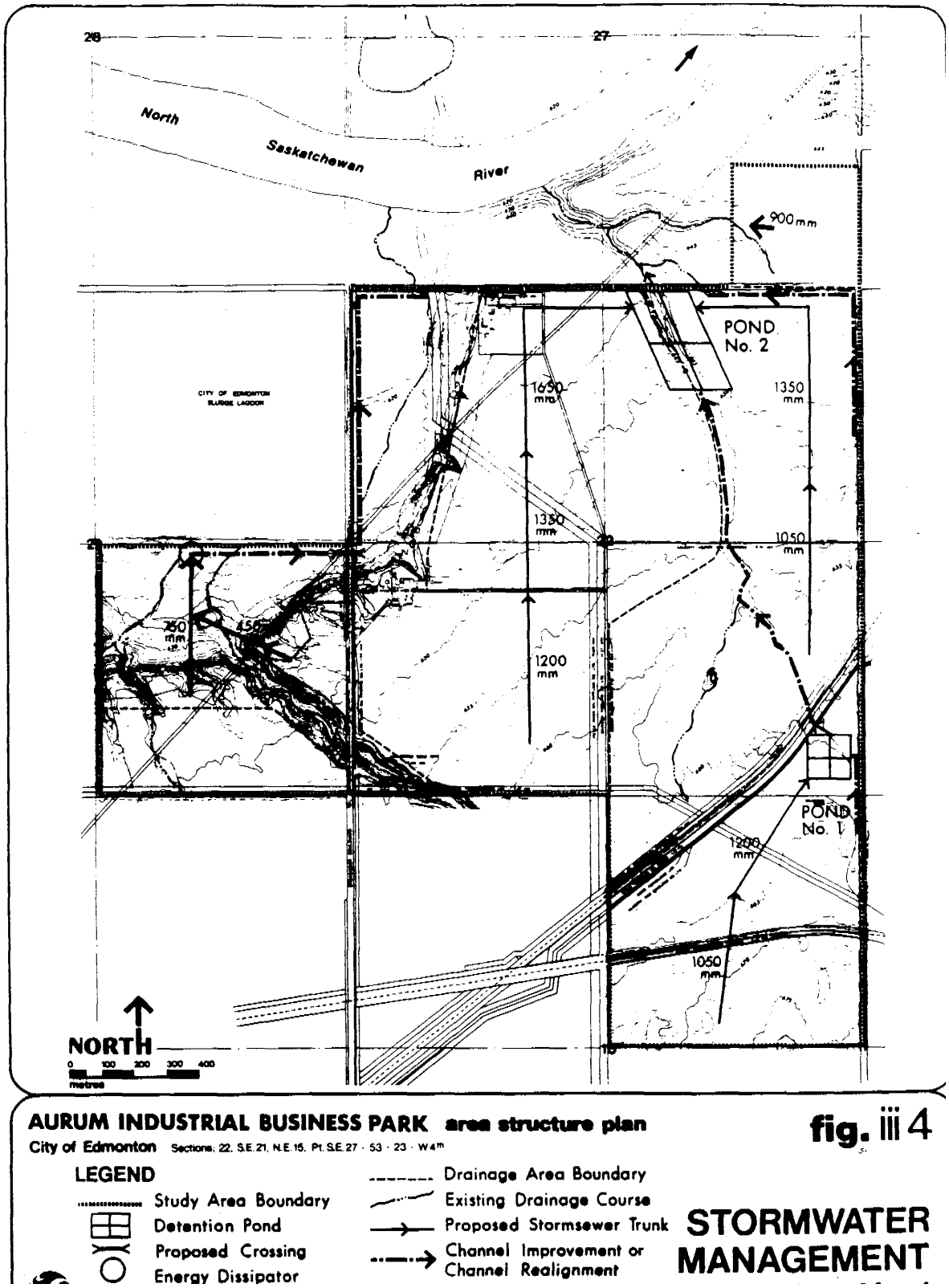
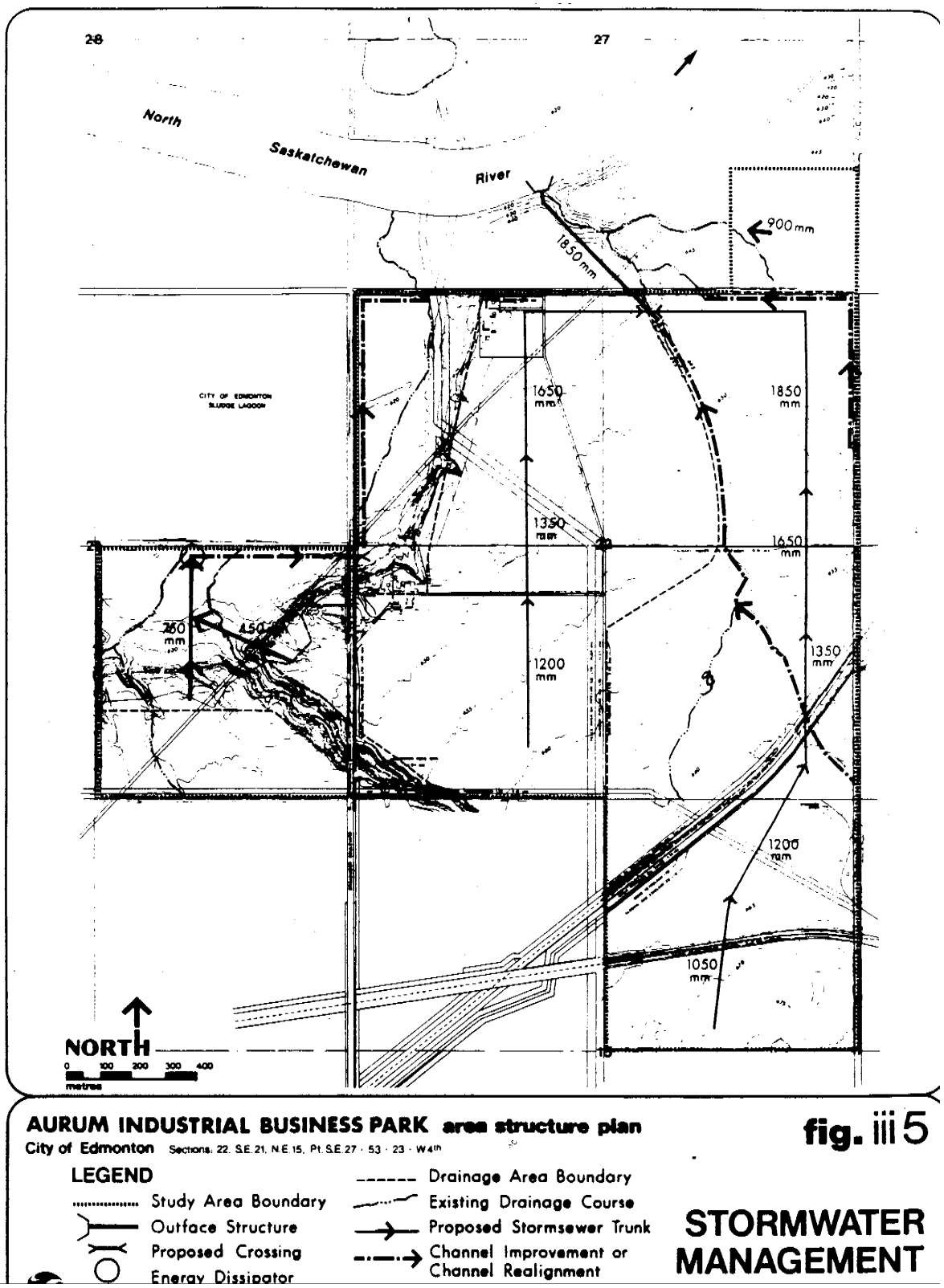


Figure iii.5 – Stormwater Management Alternative No.2
(Bylaw 9809, October 8, 1991)



from the development area will be controlled to predevelopment rates by providing detention ponds in low lying locations in the study area. Stormwater disposal will be achieved by releasing stormwater into Unnamed Creek.

This alternative provides a 2.02 ha (Pond ill) and 6.47 ha (Pond #2) stormwater detention (dry) pond at ground level in the SE 22 and NE 22 respectively (Figure 1II.4). Alternative #1 provides storage for runoff from a storm of up to a 1 in 100 year storm return period. Runoff from any storm exceeding conduit system capacity (e.g. having a return period greater than about 5 years) will be controlled by the proposed stormwater ponds rather than the minor systems in the SE 22 and NE 22. Outflow from ponds #1 and #2 will be controlled and released at pre-development rate at crossings #3 and #1 of Unnamed Creek drainage basin as shown in Tables 9 and 10. The stage -discharge -storage relationship of stormwater detention ponds #1 and #2 are shown in Tables 7 and 8. The stormwater ponds are assumed to have a side slope of 4 to 1 and a mximum depth of 3 m. The physical characteristics of the ponds are shown in Tables 9 and 10.

This alternative also provides channel improvement and realignment of Unnamed Creek in E% 22 and NE% as shown in Figurae 1II.4. The channel improvement works consist of three reaches of open channels 6 m wide to convey pre-development runoff of Unnamed Creek drainage basin up to a 1 in 100 year storm return period. The channels have a side slope of 3 to 1 a depth of 1 m and a free board of 0.3 m. The velocity in the channel is between 0.5 to 1.0 m/s.

The estimated cost including engineering and contingency of alternative 1 is $3,403,000. The cost breakdown is shown in Table 11.

4.3 ALTERNATIVE 2 - PIPING TO RIVER

This alternative provides an 1850 mm diameter storm sewer to convey the 1 in 5 year post development runoff from Section 22 and NE 15 to the North Saskatchewan River (Figure III.5). It also provides oversizing of some of the storm sewers in Eh 22 relative to alternative 1, to convey the increased flow due to the elimination of the detention ponds. This alternative provides the same channel improvement works as proposed in alternatiave 1. The estimated cost including engineering and contingency of alternative 2 is $1,219,000. The cost breakdown is shown in Table 12.

Table 7

Stage – Discharge – Storage Relationship

Pond #1

Stage (m)	Discharge (m^3/s)	Storage ($10^3 m^3$)
0.0	0.00	0.00
0.3	0.09	4.28
0.6	0.23	8.75
0.9	0.31	13.41
1.2	0.37	18.24
1.5	0.71	23.28
1.8	0.96	28.52
2.1	1.42	33.97
2.4	1.84	39.63
2.7	2.07	45.50
3.0	2.32	51.60

Note:

1. Stage is measured from bottom of detention pond.
2. Discharge is calculated for a 450 mm diameter CMP (set at bottom of the pond) and a 900 mm diameter CMP (set at 1.2 m above the bottom of the pond).
3. Side slope of detention pond is 4 to 1.

Table 8

Stage - Discharge - Storage Relationship

Stage (m)	Discharge (m^3/s)	Storage ($10^3 m^3$)
0.0	0.00	0.00
0.3	0.11	16.22
0.6	0.31	32.79
0.9	0.51	49.70
1.2	0.68	66.98
1.5	1.08	84.61
1.8	1.44	102.62
2.1	2.10	121.00
2.4	2.80	139.76
2.7	3.43	158.91
3.0	3.91	178.44

Note:

1. Stage is measured from bottom of detention pond.
2. Discharge is calculated for a 600 mm diameter CMP (set at bottom of the pond) and a 1200 mm diameter CMP (set at 1.2 m above the bottom of the pond).
3. Side slope of detention pond is 4 to 1.

Table 9

STORMWATER POND #1 PHYSICAL CHARACTERISTICS

Pond Level	Stage (m)	Surface Area (ha)	Storage ($10^3 m^3$)	Outflow	
				From Pond (m^3/s)	Pre-Development (m^3/s)
Bottom of Pond	0.00	1.38	0.00	0.00	-
1 : 5 year storm	1.28	1.63	19.28	0.42	0.34
1 : 25 year storm	2.10	1.80	33.33	1.36	1.64
1 : 100 year storm	3.00	2.02	51.60	2.15	3.26

Note: Pre-development runoff rate is based on HYMO simulation at crossing 1/3 of Unnamed Creek drainage basin.

Table 10

STORMWATER POND #2 PHYSICAL CHARACTERISTICS

Pond Level	Stage (m)	Surface Area (ha)	Storage ($10^3 m^3$)	Outflow	
				From Pond (m^3/s)	Pre-Development (m^3/s)
Bottom of Pond	0.00	5.26	0.00	0.00	-
1 : 5 year storm	1.37	5.77	75.74	0.87	0.51
1 : 25 year storm	2.16	6.07	122.86	2.15	2.41
1 : 100 year storm	3.00	6.47	178.44	3.46	4.76

Note: Pre-development runoff rate is based on HYMO simulation at crossing #1 of Unnamed Creek drainage basin.

Table 11

COST ESTIMATE OF ALTERNATIVE #1

1.	Stormwater detention pond ail	
	- excavation	$ 105,000
	- clearing and stripping	16,000
	land cost	500, 000
		$ 621,000
2.	Stormwater detention pond #2	
	- excavation	$ 420,000
	clearing and stripping	60,000
	- land cost (excluding environmental reserve)	1,400
		$1,880,000
3.	Channel improvement	
	- excavation and construction	$. 30,000
		$ 30,000
4.	Piping	
	- 750 mm diameter storm sewer	$ 150,000
	- 450 mm diameter storm sewer	60,000
	- manholes	20,000
		$ 230,000
5.	Miscellaneous	
	- energy dissipator	$ 100,000
	- road crossing	5 000
		$ 105,000
	SUB TOTAL	$2,866,000
	Engineering and Contingency (20%)	$ 537, 000
	TOTAL	**$3,403,000**

Table 12

COST ESTIMATE OF ALTERNATIVE #2

1.	Piping	
	- 1850 mm diameter storm sewer	$ 300,000
	- 750 mm diameter storm sewer	150,000
	- 450 mm diameter storm sewer	60,000
	- storm sewer oversizing in EA 22	281,500
	- manholes	30,000
		$ 821,000
2.	Channel improvement	
	- excavation and construction	$ 30,000
		$ 30,000
3.	Miscellaneous	
	- energy dissipator	$ 100,000
	- road crossing	5,000
	- outfall structure	60000
		$ 165,000
	SUB TOTAL	$1,016,000
	Engineering and Contingency (20%)	$ 203,000
	TOTAL	**$1,219,000**

SECTION 5

DISCUSSION OF STORMWATER MANAGEMENT ALTERNATIVES

A cost comparison of the two stormwater management alternatives determined the Alternative 2 involving direct discharge of stormwater through piping to the North Saskatchewan River is the most economic alternative (Table 13). Alternative 1 which provides two stormwater detention ponds to control runoff within the development is approximately 2.8 times more expensive than Alternative 2. This significant difference in cost is mainly due to the cost of land required for the stormwater ponds in Alternative 1.

The other disadvantages of Alternative 1 is a higher cost for maintenance resulting from the stormwater ponds. An estimate for maintenance was not included in the cost estimate. The proposed stormwater ponds are dry ponds and they do not have recreational potential. Also, stormwater pond #2 is located within the Northeast Edmonton Pipeline Corridor. Its location may create minor adverse effects to existing and proposed pipelines in terms of operation and maintenance.

Alternative 1 does have the advantage of controlling runoff within the development for up to the 1 in 100 year storm return period. Alternative 2 can convey only the 1 in 5 year post development peak flow through conventional piping system to the North Saskatchewan River. Storms in excess of the 1 in 5 year storm event would have a greater chance to cause flooding within the development.

Table 13

STORMYATER MANAGEMENT ALTERNATIVE COST COMPARISON

Alternative	Description	Costs
1	Direct discharge to Unnamed Creek with 2 stormwater detention Ponds	$3,403,000
2	Direct discharge to North Saskatchewan River through piping	1,219,000

Note: Costs are expressed terms of 1982 dollars and include allowance for engineering and contingency.

SECTION 6

RECOMMENDATIONS

1. Stormwater management Alternative 2 involving direct discharge through piping to the North Saskatchewan River should be adopted for the proposed development.

2. Prior to future subdivision approval by the City of Edmonton, a Master Drainage Plan should be carried out to determine the final sizing, invert elevation, slope and depth etc., and include the following information:

   - minor system within the development to convey the 1 in 5 year post-development peak runoff

   - piping to convey the 1 in 5 year post-development peak runoff from the development to the North Saskatchewan River.

   Channel improvement and realignment of Unnamed Creek

   - Proposed energy dissipator and outfall structure.

3. A detailed study should be carried out to outline the major and minor system boundaries and the direction of flow within the development during the design of the subdivision.

4. Geotechnical investigations should be carried out to determine the most suitable location and alignment for the piping to the North Saskatchewan River and for the final design of the proposed energy dissipator and outfall structure.

APPENDIX IV

EXISTING PIPELINE TRANSMISSION FACILITIES

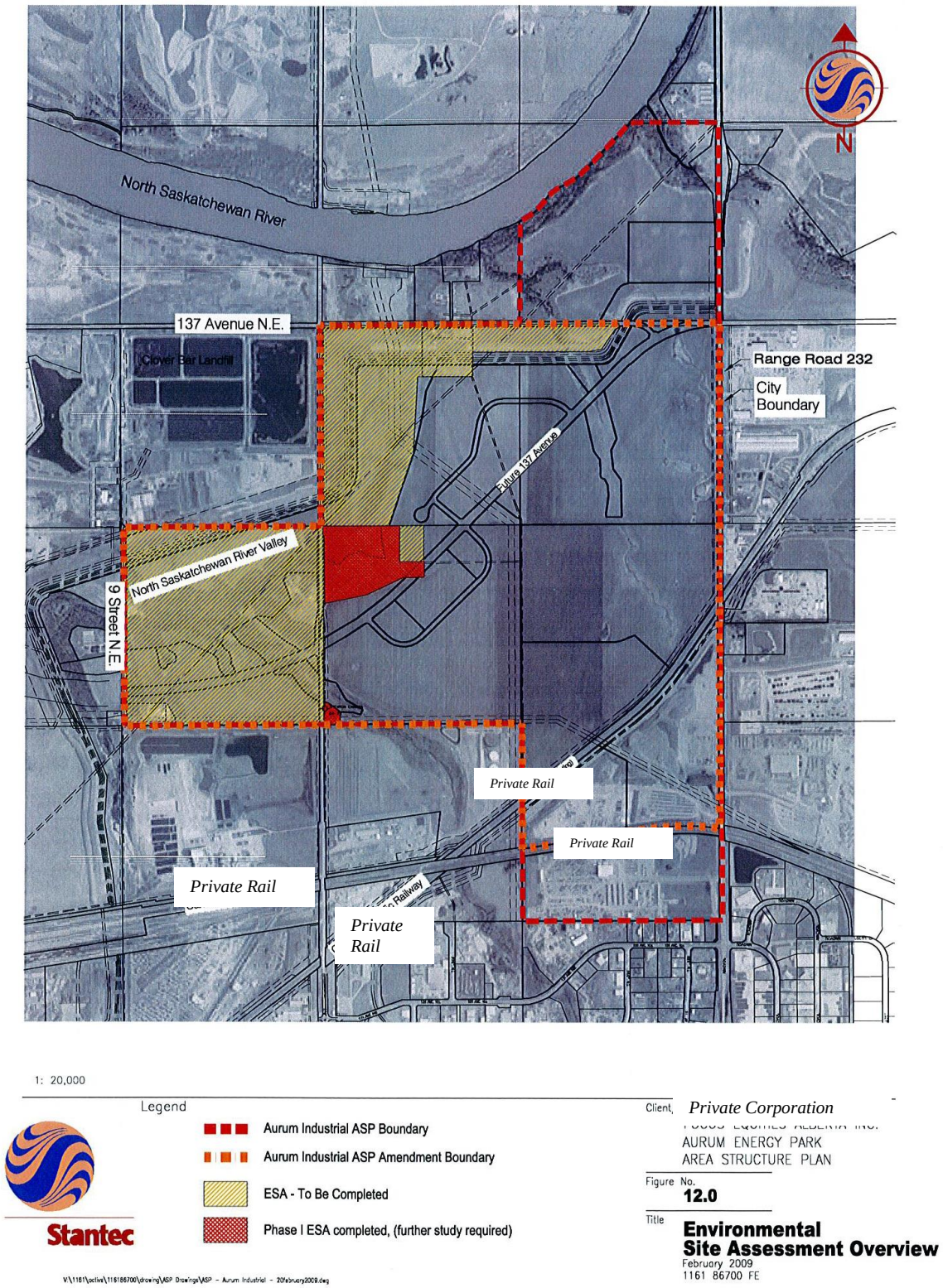
APPENDIX IV – EXISTING PIPELINE TRANSMISSION FACILITIES

Company		Substance	Max. Outside Diameter (mm)
1	Pembina Pipeline Corp.	Oil	508mm
1	Rainbow Pipeline	Oil	609mm
2	Terasen	Crude Oil	508mm
2	Terasen	LVP Products	406mm
2	Praxair	Hydrogen	114.3mm
2	Inter Pipeline	Oil	610mm
2	Shell	Products	219mm
2	Shell	Products	273mm
2	ATCO Gas	Gas	610mm
2	Imperial	Oil	168mm
2	Inter Pipeline	Products	323mm
3	Suncor	Oil	406mm
3	Nova	HVP	323mm
3	Nova	HVP	168mm
3	BP	HVP	406mm
3	BP	HVP	323mm
3	Keyspan	HVP	232mm
3	Keyspan	HVP	218mm
3	Keyspan	HVP	406mm
4	ATCO Gas	Gas	508mm
5	Pembina	DEACTIVATED	323mm

APPENDIX V

ENVIRONMENTAL SITE ASSESSMENTS

Figure 12.0 Environmental Site Assessments* (Bylaw 15108, March 23, 2009)



*Amended by Editor