AN EXAMINATION OF THE BENEFITS AND IMPLEMENTATION PROBLEMS OF THE TRANSPORTATION/UTILITY CORRIDOR CONCEPT

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ABSTRACT

The value and feasibility of implementing the Corridor concept has been debated for over twenty years. A corridor provides land for the coordinated placement of future linear facilities such as highways, railways, pipelines, powerlines and municipal services. Few corridors have been established, although there has been obvious interest in the concept. A number of studies into the feasibility of establishing corridors have been completed in the United States, Alberta and British Columbia.

This thesis examines the benefits, disadvantages and implementation problems associated with the corridor concept. Through a literature review, the factors influencing linear facility right-of-way location and width are examined. Also, from the literature, the benefits and disadvantages associated with corridor implementation and the key factors which have inhibited corridor implementation are identified.

The Alberta corridor program is studied and the corridor origins, design, institutional framework and implementation mechanism identified. The case study indicated that a set of unusual circumstances allowed for the establishment of the Alberta corridors.

This thesis concludes that corridors do provide net benefits for the community in the long term but that they are difficult to implement. The major planning implication of corridors is that they bring right-of-way planning into the sphere of land use planning and reduce the emphasis on economics and engineering.
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CHAPTER ONE  INTRODUCTION

1.1 Purpose

The Corridor concept has been discussed and debated primarily by transportation engineers and planners for over twenty years.

It is argued that Corridors can provide a wide range of benefits to the community and to the user, and that these benefits outweigh the disadvantages imposed by implementing a Corridor.

Even with this discussion and debate, few Corridors have been established. It is the purpose of this thesis is to test the following hypotheses:

1. That Corridors provide economic, environmental and social net benefits for the community in the long term.

2. That, in spite of the benefits to the community, Corridors have not been established universally because:
   a) the need to own the land requires a large capital investment;
   b) determining the appropriate Corridor width and location is difficult due to the variety of facilities having incompatible location requirements; and
   c) the lack of an institutional framework to coordinate the variety of regulatory agencies and interests involved with the linear facilities.

The specific objectives to be met include the following:

   a) consider the origins of the Corridor concept from the practice of utility accommodation and the Joint Development concept;

b) identify the right-of-way requirements, locational constraints and institutional organization associated with the various types of linear facilities;

c) explain the Corridor concept and identify from the literature the benefits and the disadvantages to corridor implementation;

d) examine the implementation of the Corridor concept in Alberta to identify where and why this corridor has been successful and to identify implementation problems.

1.2 Definitions

Easement - The right held by one person to make use of the land of another for a limited purpose (U.S.D.I., 1975, C-1).

Right-of-Way - The legal right through permit, lease, easement, license or purchase for use, occupancy, or access across land or water areas for a specified purpose or purposes (U.S.D.I., 1975, C-3).

Linear Facility - A facility requiring a narrow continuous right-of-way such as a highway, railway, pipeline or powerline.

Shared Use of Right-of-Way - The use of a right-of-way by more than one company's facilities.

Joint Use or Joint Use of Rights-of-Way - Operating facilities of the same or different systems placed parallel to each other in as close proximity as practical (U.S.D.I., 1975, C-2).

Joint Development or Multiple Use of Rights-of-Way - Is the use or occupancy of a transportation facility right-of-way or lands associated with the right-of-way by other land uses such as residential, industrial, recreational, commercial land use or utilities.
Planning Corridor or Route Selection Corridor - A broad area joining the origin and destination that has been preliminarily evaluated for environmental, economic and social constraints, in which the linear facility route alternatives will be identified.

Joint Use Corridor, Multiple Purpose Corridor, Utility Corridor or Transportation/Utility Corridor - A strip of land intentionally set aside through legislative or other means for the purpose of accommodating future linear facilities. The Corridor width is partitioned to locate similar facilities together.

Reliability - The combination of effects on a facility's capability to efficiently and effectively maintain continued service relevant to the probability and consequences of service disruptions (U.S.D.I., 1975, C-3).

1.3 Context

The majority of the literature on Joint Development and the Corridor concept relate to the United States transportation and utility planning and implementation process during the late 1960's and the early 1970's. This literature often relates to implementation processes that lack public participation and environmental impact assessments. The majority of the problems that gave rise to consideration of Joint Development and Corridors identified in this literature are still valid and are appropriate for the Canadian situation.

1.4 Importance of Research

There has been a continuing debate in the literature about the value of establishing Corridors. Many agencies and groups, such as the United States
Bureau of Land Management and the Forest Service (Montana), the American Society of Civil Engineers, the Western Utility Group (a group of electric and gas energy, communication and water service companies from 11 western states), the British Columbia Ministry of Energy, Mines and Petroleum Resources have recently studied the Corridor concept to determine the benefits of, the need for and the disadvantages and costs associated with the Corridor implementation. This thesis will establish that Corridors provide net benefits for the community in the long term. Further, it will clarify the issues that have limited the application of the Corridor concept.

There will continue to be the need for rights-of-way for pipelines, powerlines and other utility services in the future, until there is a major structural change in energy production and in the petroleum and petrochemical industry. The need for additional transportation facilities is limited. Railway lines are being abandoned not expanded, and few new highways will likely be constructed. The Corridor concept offers a means to reduce the adverse impacts associated with these facilities.

1.5 Methodology

The hypothesis will be tested and proved through:

a) a literature review to identify the benefits and disadvantages of Corridors;

b) a literature review to identify the right-of-way requirements and locational constraints associated with highways, pipelines and powerlines;
c) a case study of the Edmonton Transportation/Utility Corridor established in Alberta to identify the implementation problems. Information will be obtained through a review of existing documents, interviews with administrators and from the working experience of the author with the program.

1.6 Scope

In Alberta there are two designated Corridors, however, the thesis will describe and discuss only the Edmonton Corridor, as the Calgary Corridor is a parallel case.

Much of the literature reviewed relates to the United States process and to the conditions in the late 1960's and early 1970's but the problems and issues which gave rise to the Corridors concept continue to plague the various linear facilities in the United States and in Canada.

The benefits and disadvantages of Corridors outlined in the literature will be used to support the hypothesis that Corridors provide net benefits to the community in the long term. A detailed cost benefit analysis will not be undertaken. The costs and benefits associated with a Corridor are site specific (i.e., the number and types of facilities, the topography, the soils, the settlement and land ownership pattern) all affect the values assigned the benefits and disadvantages.

1.7 Organization

In Chapter Two, the concepts from which the Corridor concept developed will be examined. The practice of utility accommodation and the concept of Joint Development will be examined to identify the origins, benefits,
implementation mechanism and the problems. The various companies and agencies that provide transportation and utility services will be identified and their roles and constraints for implementation cooperation discussed.

In Chapter Three, the factors that influence the location and width of the rights-of-way for pipelines, powerlines, highways, railways and communication facilities will be examined. The location parameters, facility impacts and interfacility compatibility problems that affect the right-of-way requirements will be discussed. The difficulty in projecting future right-of-way requirements will be examined.

In Chapter Four, the Corridor concept will be defined and the purposes that Corridors achieve will be presented. The benefits and disadvantages that are anticipated by corridor implementation will be outlined. It will be argued that in the long term, the benefits of Corridors outweigh the disadvantages.

In Chapter Five, the implementation of the Corridor concept in Alberta will be discussed. The implementation mechanism and the original intent of the Corridors will be identified. The design of the Corridor will be explained and illustrated. In addition, the various agencies involved in the implementation of the Corridor and their roles will be identified. The program will be considered and the reasons for the success and the problems that have arisen will be identified.

In Chapter Six, the conditions necessary for the establishment of a Corridor will be outlined. Issues which require further research will be identified. Finally, the implications of the Corridor concept to planning will be discussed.
CHAPTER TWO  THE ORIGINS OF THE CORRIDOR CONCEPT

This chapter provides background material on the concepts from which the Corridor concept evolved. A review of the literature indicates that the Corridor concept has evolved from two major concepts: utility accommodation within urban road rights-of-way and Joint Development or multiple use of rights-of-way.

Utility accommodation within road rights-of-way refers to locating pipelines, powerlines and municipal services, such as natural gas lines, sewer lines and water lines within a road right-of-way. Joint development or multiple use of rights-of-way refers to the construction of a recreational, industrial, commercial or residential land use within or adjacent to a highway, freeway or rapid transit right-of-way. Many of the objectives, benefits, disadvantages and implementation problems associated with these earlier concepts still apply to the Corridor concept and their identification will facilitate a better understanding of the discussion of the Corridor concept in the next chapter.

2.1 Utility Accommodation

In the past, utilities had not been well integrated into urban development due to the way the services developed and the number of agencies involved and their mandates. Many cities or portions of cities were built before the development of urban utility services and had no provision for accommodating their right-of-way requirements (American Public Works Association (A.P.W.A.), 1974, 9). Today many different utility services are provided in most urban areas, including water, sanitary sewer, storm sewer,
gas, electric power, telephone, telegraph, cable T.V., street lighting, traffic signal cable, police signal cable, fire signal cable, combined sewers, chilled water and steam (Hoffman, 1974, 8). As servicing developed, water, sewer and drainage services were provided by a public agency (a municipality or special district or authority) (A.P.W.A., 1974, 1; Hoffman, 1974, 8). The other utilities such as telephone, telegraph and electricity were typically provided by investor owned companies that developed from inventions and entrepreneurial efforts (Hoffman, 1974, 8; A.P.W.A., 1974, 9).

These utilities, due to their physical nature, are in effect natural monopolies (Nelson, 1967, 33). It would be too costly to have competing services that require individual pipelines or powerlines so one company is usually granted an exclusive service area. Government has established regulatory agencies to control operating procedures, service requirements, rates and profits for these utilities (Nelson, 1967, 34). The numerous agencies involved in the provision of services has created difficulties in coordinating the development of the services:

Each of these regulatory agencies, and each utility service agency (investor-owned or public), has its own clientele to serve, its own interests to protect, and its own limited perspective on the problems of utility accommodation. One wants to maximize the return on investment, one wants to minimize rates, one wants to protect workmen, one wants to reduce traffic congestion, one wants to prevent damage to the pavement, one wants to beautify the community, and so on. Measures designed to optimize one of these objectives often conflicts with others. Each resolution of a problem ultimately has an effect...on a variety of groups: the utility company and its customers, the municipality and the taxpayer, the motorist, the abutting property owner or resident... (Hoffman, 1974, 9).

Utility services require narrow continuous rights-of-way and, unlike most other land uses, do not require exclusive use of their land requirements. The easement is a limited interest in land and runs with the land. It grants the power to construct and operate a facility but does not
remove the land from the original ownership. Often the owner can resume non-intensive land uses.

In many municipalities during the 1960's, utilities were not incorporated into the municipal land use planning process. The municipality provided the planning for cities, while the individual utilities provided their own planning (A.P.W.A., 1974, 9). This lack of coordination resulted in numerous problems for the utilities. In many cases, the road rights-of-way were too narrow to accommodate utilities or roadway realignments forced utility relocations or changes in planned population densities resulted in the need to expand the capacity of utility services. These problems lead to the establishment of standards and procedures for accommodating utilities within road rights-of-way.

McGrath has indicated that utilities are a natural use of the underground as they serve the same abutting lands and buildings that the roads and streets serve, which reduces the need for additional rights-of-way (1965, 128). Most urban centres in North America with public services have allowed the placement of water, sanitary and storm sewers, natural gas lines, electric distribution lines and communication circuits within the road rights-of-way. Many jurisdictions have adopted utility accommodation policies which specify the location, the minimum technical standards and the procedures for the placement of a utility facility within a road right-of-way. A review of utility accommodation policies within the United States was undertaken and reported in the 1976 National Cooperative Highway Research Program Report 34 titled, Policies for the Accommodation of Utilities on Highway Rights-of-Way. The study indicated that while most jurisdictions had an accommodation policy, there was little uniformity of standards, even
though the facilities were similar. Brown (1973) and Clinger (1982) discuss current accommodation policies for Florida and Texas. Florida was considering the use of utility zones. A utility zone was a strip of land on either side of the road within the right-of-way that was designed to accommodate specific utility facilities (Brown, 1973, 15). Texas has adopted a Utility Accommodation Policy governing the location and methods for installing and maintaining utility lines on the State highway system.

Many jurisdictions had policies for utilities crossing their roads but were opposed to parallel roadway facilities. This was due to the fact that many jurisdictions adopted the American Association of State Highway and Transportation Officials (A.A.S.H.T.O.) report, A Guide for Accommodating Utilities on Highway Rights-of-Way, as a model for their policies (N.C.H.R.P., 1976, i). The A.A.S.H.T.O. had adopted a policy which did not permit the longitudinal placement of utilities on freeway rights-of-way, except in extreme cases and under strictly controlled conditions (N.C.H.R.P., 1976, 3).

Other reasons for the opposition to paralleling utilities include safety considerations (e.g., vehicles hitting above ground structures), the need for tree trimming, the costs to cut and repair pavement, visual impacts of utilities, traffic flow reduction, reduced roadway expansion opportunities and the increased potential for future utility relocation (Lemly, 1962, 1-32; Nelson, 1962, 33-51; Blensly, 1962, 52-59).

Utility relocation has been a major concern to both transportation agencies and utilities. The transportation agencies do not want their flexibility to expand a roadway inhibited by utility rights-of-way within or adjacent to the right-of-way and the project delayed and costs increased
by utility relocations (Williams, 1977, 57; Highway Research Board, 1966, 60). The utilities are concerned, as relocation often requires the search for and acquisition of new right-of-way and the replacement of a facility. The agency that must pay for the relocation varies with jurisdiction and situation. However, unless a reimbursement statute is adopted, the utility usually bears the costs (N.C.H.R.P., 1980, 2).

There were a number of benefits for the accommodation of utilities in road rights-of-way, including lower right-of-way costs and ease of access to consumers and ease for maintenance (Lemly, 1962, 1-32; Nelson, 1962, 33-51; Blensly, 1962, 52-59).

Utility accommodation demonstrated that transportation and different utilities can be placed in close proximity and result in few technical incompatibilities. It also demonstrates that the multiple use of rights-of-way provide economic benefits for the community.

### 2.2 Urban Road Development

Beginning in the early 1940's, the impact of the automobile was being felt in major cities in North America. The number of automobiles had greatly increased and they were the common mode of travel. This lead to problems of congestion as the traffic load increased on roads not designed for these volumes. The engineering solution to roadway congestion in the city centre was to propose the construction of major freeways or expressways or a beltway, ring road or bypass.

The beltway or bypass was designed to divert traffic around the centre that did not need access to the city. Additional functions were to provide high speed access for inter-regional traffic (city to region) and for intra-
regional traffic (one neighbourhood to another), as well as to provide for scenic drives.

The expressway or freeway was designed to alleviate traffic congestion in the city by providing a limited access multi-lane facility either to the city centre or across the city. Freeways did reduce congestion for a short time but the improvement in accessibility often lead to an increase in use due to the redistribution of the existing traffic and to the generation of additional traffic from adjacent land uses. There are a number of land uses with high accessibility requirements such as industrial districts, regional shopping centres, special commercial areas, university and college campuses, medical districts, major recreation attractions, and high-density housing which benefit from proximity to a freeway (Stuart, 1968, 3).

Freeways, while designed to relieve traffic problems, created another set of concerns. Often the freeways were required to relieve congestion in developed areas. Using expropriation powers, major road rights-of-way were pushed through well established but generally lower income residential areas. This was termed slum removal or urban renewal. As Stuart states, these facilities created a number of impacts:

Urban freeways have frequently been criticized for their disruption of established neighbourhoods, for the removal of valuable land from municipal tax rolls, and for the creation of substantial relocation problems for displaced businesses and households (1968, 3).

Due to the limited access requirement, the freeway became an effective barrier to cross movement. In addition, freeway programs had significant fiscal impacts due to major land acquisition and capital costs. The freeway also lead to a decrease in air quality.
It is interesting to note that the opposition to freeways tended to focus on the automobile and not all vehicular traffic. There was widespread support for public transit initiatives as a means to relieve traffic congestion. However, as Sidamon-Eristoff notes, highways and transit:

...are intended to satisfy different but complementary needs and desires, and that subways cannot handle both masses of people and goods... (1970, 470).

It is also of note that the freeway criticism centred on their impacts and not on the facility itself.

The most unique perspective of urban freeways is that their rights-of-way are underutilized. McGrath notes that a road right-of-way is seen:

...as nothing but a paved skin surface that is hardly occupied at all, except by an occasional person or vehicle which passes by (1965, 125).

Sidamon-Eristoff has also noted this phenomena and states:

...highway engineers, planner and architects quite naturally view the space over, under or next to the highway right-of-way as wasted unless it is used for some other beneficial purpose (1971, 469).

A major problem transportation engineers must cope with is the fact that freeway planning is long range. As Leisch notes, a 20 year planning period is appropriate for freeways and that 5 to 10 years are required to plan, design and construct the facility (1969, 83). Further Leisch states:

Fully effective legislation for the protection of future rights-of-way is non-existent. Another difficulty is that funds normally are not available for the purchase of land that may not be required for construction until 10, 15 or 20 years later (1969, 84).

The problems with freeway development are primarily a result of a lack of mechanism for long range right-of-way preservation, and the social, fiscal and environmental impacts imposed on adjacent lands.
In order to resolve these problems and to take advantage of the high accessibility land uses, transportation engineers and planners turned to the concept of joint development. Rivkin noted that:

Much of the interest expressed in joint development has come from persons who view it as a way to balance, for public benefit, the land-use impacts of highways and rapid rail and to mitigate the adverse environmental, economic or social impacts of transportation facilities on communities (1977, 32).

The growing opposition to freeway development in the late 1960's reflected the public's opposition to the existing planning process which focused on efficiency and economics but ignored social and environmental impacts and costs. This opposition was extended to most major linear facility developments, including pipelines. All of these facilities can impose severe environmental, social and economic impacts on the lands they cross. The Joint Development concept and the utility Corridor concept were developed to mitigate many of these impacts.

2.3 Joint Development Defined

Joint Development has a spatial and temporal aspect, as it implies compatible or related facilities built at the same time. Van Zandt defines Joint Development as:

...the joint use or occupancy of a specific limited land area for more than one purpose, such as the use of highway right-of-way by non-highway type facilities, structures, structural elements or activities (1972, 3-1).

Rivkin limits the term to:

...projects related in space and time to the construction of a highway or a rapid rail line (1977, 32).
Opiela broadens the terms to be a:

...process by which major public facilities are constructed in concert with other projects through the coordinated efforts of public or private agencies, or both. This definition implies projects are related in time and space to public projects and implemented using an integrated approach (1980, 71).

The land under, over, beside the facility or adjacent to the facility right-of-way was seen as appropriate for Joint Development. One of the forms of Joint Development that received a great deal of attention was air rights, which involves the use of the space over a facility. This type of Joint Development has been used since medieval and Renaissance times with the construction of shops over bridges, such as the Ponte Vecchio in Florence (United States Department of Transportation (U.S.D.T.), Federal Highway Administration ([F.H.A.], 1979,3).

Initially, Joint Development projects were directly related to the transportation facility, such as concessions for transit stations or roadside rest areas. However, over time the types of land uses broadened to include facilities that created a demand for the transportation facility (e.g., high rise apartments on transit lines) or that required a central location.

The opportunities that were available for Joint Development included improvements to transit facilities and airports, railroad improvements or abandonments, and terminals or mode change points (Engelen, 1976, 565). The primary opportunity for Joint Development was freeway development.

When a road is to be constructed, the first acquisition priority is to acquire the right-of-way itself. However, due to access or size constraints, it is often necessary to buy entire parcels, even though only a portion of the parcel is required for the road. The remanent or the portion not
required for the right-of-way itself can be kept and incorporated into the right-of-way, or it can be separated from the right-of-way and leased or sold for other uses. This type of land offered large areas for Joint Development opportunities. As interest in Joint Development increased, it was recommended that these lands always be purchased. It was argued that the additional land could be economically purchased. Powell noted that:

In addition to the area needed for a highway corridor, highway departments could acquire sufficient area for these additional uses at very little extra cost, considering severance damages and right-of-way costs for the highway only (1972, 635).

Stuart also noted that:

The total cost of this procedure is likely to be about the same as the cost of acquiring freeway rights-of-way (plus severance damage payments) under present practices, so that multiple-purpose sites would, in effect, be nearly cost-free (1968, 5).

Van Zandt identified 10 categories of Joint Development projects, including buildings and structures, parks and recreation, parking, storage, transportation (other modes), utilities, multiple use complexes (residential or commercial), convenience stops (rest areas), pedestrian ways, and miscellaneous (1972, 22). A few of the various types of joint use the Federal Highway Administration has identified includes mini-parks, nature trails, bus parking and storage, rest areas, police inspection areas, garden plots and a highway maintenance station (U.S.D.T., 1979, 5).

The Joint Development concept had evolved from the use of the underutilized land over, under and beside the roadway within the right-of-way for complementary land uses to the promotion of the acquisition of lands outside the right-of-way for a wide variety of related and unrelated land uses.
2.4 Benefits of Joint Development

The proponents of Joint Development stated that Joint Development could facilitate freeway (or transit) development, mitigate the environmental, social and fiscal impacts of facility development and increase the use of the facility.

The growing public opposition to freeway developments in developed areas was a primary initiator of Joint Development. The linking of support for a public or private development with freeway development was seen as a means to get roadway approval (Van Zandt, 1968, 4-8; George, 1971, 224; R.T.A.C., 1979, 2).

The visual impacts and the barrier effect of the freeway development could be reduced by joint use to blend the facility into the environment (U.S.D.T., F.H.A., 1979, 3; Mino, 1965, 110; Stuart, 1968, 2).

The construction costs, as well as the lost tax revenues, could be offset by lease or by sale of the lands (Powell, 1972, 635: Urban Land Institute, 1980, 39; Van Zandt, 1968, 4-8). The stacking of land uses would reduce the total land required for these uses (Van Zandt, 1968, 4-8; Payne, 1968, 38).

The control of the lands adjacent to the transportation facility was also seen as a means to protect the facility from incompatible land uses that could reduce the efficiency of the facility (Van Zandt, 1968, 4-8). In the case of transit, the ability to direct high density land uses to the land adjacent to the facility was seen as a means to insure ridership was sufficient to justify the facility (Urban Land Institute, 1980, 39).

Even with all of these expected benefits, few Joint Development projects were established primarily due to the problems with implementation.
2.5 Problems with Joint Development

The major concerns over Joint Development are not directed to technical compatibility problems of combining different uses in a relatively confined area but are centred on implementation problems. McGrath identified poor location for Joint Development projects, physical restrictions to design, higher development costs and legal issues as problems with multiple use (1965, 126). Van Zandt identified the following problems with Joint Development:

- Difficulties in coordination of public and private development.
- Difficulties in reconciling varying lead time differences for accomplishment by multiple sponsors.
- Difficulties of pooling resources of multiple governmental agencies.
- Lack of clear jurisdictional authority can cause undue delays and lost time.
- Approval (and therefore implementation) delays due to multiple chains-of-command.
- Introduction of complications occasioned by the enlarged scope of a highway project with attendant increase in community relations problems.
- The fear by the local community of state intervention, even where assured of the right of approval.
- The possibility that the highway department's resulting role of landlord, property manager or developer may conflict with its primary function.
- Possible increased highway construction cost, consequently causing greater difficulty in obtaining public funds.
- Construction costs and economic risks can make joint development projects in airspace over highway more expensive than nearby land.
- Major changes or modification to airspace structures can be difficult to achieve.
- Airspace structures can create adverse tunnel effects on highway users.
- Highway facility change or expansion will be less flexible.
- Expansion of non-highway element may be prevented.
- Environmental problems of noise, vibration, fumes and odors can be more difficult and costly to deal with.
- Combined maintenance costs for joint development can be greater than if each element were locationally separated (1972, 4-8, 4-9).

On reviewing the benefits of Joint Development, there is an impression that all of the land adjacent to a transportation facility is suitable for
development. However, a freeway is a limited access facility, which means that access from adjacent land is prohibited. Access to the freeway is by the grade separated interchanges for the intersecting crossroads. The lands within one-half mile of each interchange are the most suitable for Joint Development (Stuart, 1968, 3). Traffic will leave the freeway to go to establishments that appear to be near an interchange. Stuart notes that Joint Development is:

...appropriate and feasible where surrounding land values are high or that exhibit special site advantages in relation to surrounding developments (1968, 2).

The majority of the lands adjacent to the freeway, except for the interchange nodes and special sites, are not suitable for high accessibility land uses. Land adjacent to transit lines have high accessibility nodes at transit stations (Urban Land Institute, 1980, 39).

In addition, the purchase of land adjacent to the right-of-way that is not subject to severance will increase the total land acquisition costs for agencies often having restricted budgets.

A related problem is the assembly of parcels of sufficient size and configuration suitable for development. Portions of parcels that lie outside the right-of-way and are considered to be subject to severance are often narrow strips or other awkward shapes. Also, many parcels have to be acquired, as the access to them will be eliminated by the right-of-way. In both of these situations, it will be necessary to buy even more land to make these parcels developable by providing sufficient size or to provide access.

The authority to acquire the land for a transportation facility is generally granted to the appropriate transportation department. The mandate granted often limits the acquisition to land needed for the right-of-way
only. Severance damages are paid to the owners of parcels that continue to hold the land, even though the land is often rendered undevelopable. Even if an agency could acquire additional lands outside the right-of-way, the courts have not supported the acquisition of the additional land solely for the purpose of selling to recapture costs (Rivkin, 1977, 33).

The responsibility for the design and construction of a transportation facility rests with the appropriate municipal or provincial (state) transportation department. The various Joint Development projects are generally not transportation related (except for rest areas, transit stations, etc) and are the responsibility of other agencies, such as housing or parks departments, or in many cases involve private companies. Joint Development can result in the involvement of various types and levels of public agencies and the private sector. Problems arise, as no one agency has overall responsibility for the various components of the entire project. Agency liaison is required to coordinate planning, construction, maintenance and to pool resources (Stuart, 1968, 5).

Joint Development is promoted as a means of facilitating the approval of a transportation facility, however, the linking of other land users increases the number of agencies that must review the project and results in long review periods. This delay has lead many potential projects to locate outside but adjacent to a proposed Joint Development area (Rivkin, 1977, 33). In fact, Simon-Eristoff states that:

...no major highway project, urban or rural, was ever sold to the community through which it passed by touting the possibilities of joint development (1971, 469).

The transportation facility can generate significant environmental impacts on the adjacent lands which limit the attractiveness of these sites.
The automobile creates air pollution and all transportation modes result in noise pollution, vibration problems and visual impacts. These must be mitigated by the design of the Joint Development project and result in higher costs. Depending upon the specific development, the adjacent use can have a negative visual impact for the travelling public by creating visual tunnels and distracting poles or structures. A related problem is safety, both with respect to the accident potential from travelling vehicles on the Joint Development activities, as well as to vehicles from the adjacent use, such as falling objects or above ground structures.

2.6 Implementing Joint Development

Joint Development involves at least two different land uses, one of which is a transportation facility, and requires the coordination of the agencies responsible for planning, operation and maintenance of the facilities. Engelen attributes the lack of success in Joint Development to poorly developed institutions to coordinate development (1976, 35). Engelen also identifies organization criteria to achieve Joint Development, including the flexible use of funds, a broad mandate, the use of existing institutions or the corporation concept at the Corridor level and the project level respectively (1976, 14). Several organizational alternatives have been suggested including: the expansion of transportation agency powers and responsibilities; a multifunctional public corporation; a private corporation; a land banking and land assembly and management commission; a special multipurpose development district or use of contracts to establish public-private relationships (Engelen, 1976, 14).
A transportation agency would be appropriate where the other land uses involved uses related to transportation, however, if the other uses are unrelated, the agency may not promote their interests (Engelen, 1976, 36). Rivkin has noted that transportation agencies often played a reactive or cooperative role due to legislative, financial, political and institutional constraints (1977, 37).

A multi-functional agency would be appropriate given sufficient funds and mandate but these agencies are often:

...restricted in the amounts and types of non-public developments they can include in their projects and in the ways in which they can cooperate with private investors and developers (Engelen, 1976, 37).

Private corporations have been used for major redevelopment projects, however, they would have difficulty assembling land for Joint Development (Engelen, 1976, 37). Land banking provides the mechanism to assemble and dispose of land and achieve coordination through control of development rights (Engelen, 1976, 38). Development districts, by offering special financing or basic infrastructure, promote the development in an area (Engelen, 1976, 38). Contracts could be used to require coordination and compliance with a Joint Development plan (Engelen, 1976, 38).

Opiela identified five types of institutional mechanisms for Joint Development, including expediting agencies, land use controls, development rights, municipal powers and development agencies (1980, 76). Expediting agencies would facilitate Joint Development by reducing the time and cost in the approval process (Opiela, 1980, 76). Land use controls such as zoning, density bonus allowances (Opiela, 1980, 78) and transferable development rights (Opiela, 1980, 79) can be used to promote development. By exercising
the municipal powers of expropriation, urban renewal, land banking and through the provision of infrastructure Joint Development can be promoted (Opiela, 1980, 80). Public or quasi-public development agencies can be established and granted:

...a range of powers and functions to allow flexibility in acquiring land, selecting and financing projects, and levying special taxes...[or be] limited to advocating projects and providing planning services (Opiela, 1980, 81).

Opiela (1980, 71-88) also identified four types of fiscal mechanisms, including taxing powers (tax abatement, tax rate differential and tax increment financing), infrastructure investments (capital facility investments, improvement area development), risk assumption (development loans and mortgages, public investment) and grants (land acquisition/write-downs, matching).

Rivkin has found that successful Joint Development projects have a formal interagency mechanism to coordinate or direct the process (1977, 35). Local government must also be involved to provide political support (elected officials have broad discretionary powers and are directly responsible to the public), and because they have broader mandates, various fiscal resources and can control land use (Rivkin, 1977, 36).

2.7 Summary

Utilities, due to their organizational structure and their land requirements, have not been well integrated into the urban land use planning process. The provision of basic health related services such as water lines and storm and sanitary sewers have traditionally been the responsibility of local government. The other services have evolved from private inventions
and have often been provided by investor owned companies. These facilities are natural monopolies and are regulated by government to insure rates and profits are controlled. All of these private and public companies and agencies have various objectives and mandates that make coordination of planning efforts difficult. In addition, the land requirements for these facilities (i.e., long narrow continuous easements, are unlike other land uses spatial requirements. To compensate, many jurisdictions adopted utility accommodation policies which formalized the placement of utilities within road rights-of-way.

Joint Development involves combining a transportation facility with ancillary land uses such as rest areas or unrelated land uses, including residential, industrial or recreational developments. Joint Development was promoted as a means to obtain support for transportation developments and as a means to mitigate the adverse effects of the transportation facility on the community. Joint Development had few technical problems but did experience problems in land assembly and with agency coordination. An institutional structure that will work in all Joint Development situations has not yet been found.

The utility accommodation experience demonstrates that different facilities can be placed in close proximity and result in few technical incompatibilities.

The Joint Development concept helped to promote the view that the lands for transportation facilities could accommodate other land uses and that linking other land uses would be a means to mitigate the adverse impacts from transportation facilities.
The Corridor concept was derived from these ideas. Where urban road rights-of-way accommodated small scale distribution utilities, the major freeways and highways were seen as an opportunity to locate large transmission scale facilities.

The Corridor concept advocates the coordination of transportation and/or utility facilities to reduce the adverse environmental, economic and social impacts of all rights-of-way on the community.

The next chapter provides a discussion of the Corridor concept and outlines the benefits, costs and implementation problems associated with the concept.
CHAPTER THREE  FACILITY RIGHT-OF-WAY FACTORS

In order to understand the benefits associated with the Corridor concept, the linear facility right-of-way requirements, right-of-way activities and impacts, location parameters and compatibility problems must be examined.

The facilities to be examined include highways, railways, oil and gas pipelines, powerlines and communication circuits.

3.1 Right-of-Way Criteria

The transportation agencies and utility companies have identified the single right-of-way as the best location for their facilities. An individual right-of-way maximizes facility integrity and safety and usually represents the least cost route. The determination of a right-of-way involves identifying a suitable location and width.

Location

The basis for identifying a suitable right-of-way route depends upon the system requirements. The facility origin, destination and intermediate service points set the broad location requirements (U.S.D.I., 1975, VII-2). Once the general route is determined, a detailed analysis is undertaken to identify alternative routes. The selection of alternative routes involves the consideration of these factors:

- engineering requirements (standards, codes)
- topography (grade)
- bodies of water
- geology (depth to bedrock, geologic hazards)
- soil condition (erodability, bearing capacity)
- land use and ownership
- environmental
- existing and proposed facilities
- reliability
- economics (U.S.D.I., 1975, VII-3).

Each type of facility examines these factors but have different weightings (e.g., railways have severe grade restrictions which makes topography a significant routing factor, whereas powerlines can span valleys and be built on nearly 90° slopes which makes topography of less concern). The major factors for each facility are noted on Table 1.

**Width**

The U.S.D.I. indicated that:

The width of a right-of-way for any system is dependent on several factors, including construction, operation, maintenance and technical requirements; projected system expansion needs; access; and legal control (1975, VII-9).

Each type of facility has different width requirements as noted below.

**Pipelines**

The width of right-of-way for pipeline construction is a function of pipe diameter and soil conditions (U.S.D.I., 1975, VII-12). When a pipeline is constructed, the right-of-way is initially cleared and levelled, topsoil is stockpiled and the ditch dug, the pipe is assembled and lowered into placed and buried, the topsoil replaced and the right-of-way revegetated.
TABLE 1

Facility Location Factors

<table>
<thead>
<tr>
<th></th>
<th>Powerline*</th>
<th>Pipeline*</th>
<th>Highway</th>
<th>Railway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Requirements</td>
<td>Major</td>
<td>Major</td>
<td>Major</td>
<td>Major</td>
</tr>
<tr>
<td>Topography</td>
<td>Minor</td>
<td>Minor</td>
<td>Major</td>
<td>Major</td>
</tr>
<tr>
<td>Bodies of Water</td>
<td>Minor</td>
<td>Minor</td>
<td>Major</td>
<td>Major</td>
</tr>
<tr>
<td>Geology</td>
<td>Minor</td>
<td>Major</td>
<td>Major</td>
<td>Major</td>
</tr>
<tr>
<td>Soil Condition</td>
<td>Minor</td>
<td>Major</td>
<td>Major</td>
<td>Major</td>
</tr>
<tr>
<td>Land Use and Ownership</td>
<td>Major</td>
<td>Major</td>
<td>Major</td>
<td>Major</td>
</tr>
<tr>
<td>Environmental</td>
<td>Major</td>
<td>Major</td>
<td>Major</td>
<td>Major</td>
</tr>
<tr>
<td>Existing/Proposed Systems</td>
<td>Major</td>
<td>Major</td>
<td>Minor</td>
<td>Minor</td>
</tr>
<tr>
<td>Reliability</td>
<td>Major</td>
<td>Minor</td>
<td>Minor</td>
<td>Minor</td>
</tr>
<tr>
<td>Economics</td>
<td>Major</td>
<td>Major</td>
<td>Major</td>
<td>Major</td>
</tr>
</tbody>
</table>

* Communication facilities would be similar to pipelines if buried cable or to powerlines if above ground line.


Table 2 indicates typical pipeline right-of-way widths. Approximately half the right-of-way space is needed for operation and maintenance (Howlett, 1984, 151).
TABLE 2

Typical Pipeline Easement Requirements

<table>
<thead>
<tr>
<th>Pipeline Size (Diameter)</th>
<th>Temporary Construction Width (Level Terrain)</th>
<th>Permanent Width (Operations &amp; Maint.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-14 inch</td>
<td>50 feet</td>
<td>30 feet</td>
</tr>
<tr>
<td>16-24 inch</td>
<td>70 feet</td>
<td>40-50 feet</td>
</tr>
<tr>
<td>26-36 inch</td>
<td>80 feet</td>
<td>50-60 feet</td>
</tr>
<tr>
<td>40-42 inch</td>
<td>90 feet</td>
<td>75 feet</td>
</tr>
<tr>
<td>&gt; 42 inch</td>
<td>100 feet</td>
<td>75 feet</td>
</tr>
</tbody>
</table>

Source: Ralph H. Sandmeyer, "Utility Corridors for Pipeline Construction", in Pipelines in Adverse Environments II. (New York: American Society of Civil Engineers, 1983); 420-430.

The preference for a pipeline alignment is a straight line or the shortest route (Howlett, 1984, 151). There are a few physical constraints to routing a pipeline such as steep and unstable slopes, rocky or poorly drained soils (Howlett, 1984, 151; Stewart, Weir, Stewart, Watson & Heinrichs, 1973, 36). Maintenance access for pipelines is provided by the right-of-way.

Powerlines

The right-of-way for powerlines is a function of the voltage, the number of circuits, regulated clearance distances and maintenance access (Steinmaus, 1984, 141). Powerlines follow a similar construction sequence to pipelines. The right-of-way is cleared and levelled, tower footings poured, towers erected and conductors strung and the right-of-way revegetated. Table 3 shows examples of powerline right-of-way requirements. Powerline planners also prefer shortest routes to reduce costs. There are few physical limitations to powerline routing. Maintenance access is provided by the right-of-way.
TABLE 3

Typical Powerline Rights-of-Way

<table>
<thead>
<tr>
<th>Line Voltage</th>
<th>Typical ROW Widths (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>115/138 (AC)</td>
<td>90-150</td>
</tr>
<tr>
<td>230 (AC)</td>
<td>100-150</td>
</tr>
<tr>
<td>345 (AC)</td>
<td>150-170</td>
</tr>
<tr>
<td>500 (AC)</td>
<td>135-200</td>
</tr>
<tr>
<td>765 (AC)</td>
<td>260-280</td>
</tr>
<tr>
<td>+400 (DC)</td>
<td>104-150</td>
</tr>
</tbody>
</table>


Highways

The right-of-way requirements for highways vary depending upon the design speed, maximum grade, sight distance, number of lanes, cut and fill requirements, frontage roads, width of shoulders and median and border areas (U.S.D.I., 1975, VII-14). Standards for specific types of highways have been set. Table 4 indicates the variation in the right-of-way widths for a 4 lane highway. A road alignment is designed to access the locations that generate traffic volumes for the facility and, therefore, is limited in its routing alternatives. Maintenance access is provided by the facility itself.

Railways

The right-of-way width for railways depends on the area required for cut and fill, communication, signal and power facilities, service roads, drainage and the roadbed (U.S.D.I., 1975, VII-17). Typically, a 100 foot right-of-way would be adequate on level terrain (U.S.D.I., 1975, VII-17). The railway alignment has major grade and curve limitations. The maximum grade is 1 to
TABLE 4

Typical Highway Right-of-Way Width (Feet)

<table>
<thead>
<tr>
<th>Type of Highway</th>
<th>Lane</th>
<th>Shoulder</th>
<th>Median</th>
<th>Border Area</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Lane - Restricted</td>
<td>12</td>
<td>8-10</td>
<td>4-15</td>
<td>12-15</td>
<td>90-110</td>
</tr>
<tr>
<td>4 Lane - Intermediate</td>
<td>12</td>
<td>10</td>
<td>20</td>
<td>25-40</td>
<td>140-180</td>
</tr>
<tr>
<td>4 Lane - Desirable</td>
<td>12</td>
<td>10-12</td>
<td>60</td>
<td>50-80</td>
<td>210-310</td>
</tr>
</tbody>
</table>


1.5% on level terrain and 2.2% in mountainous terrain (The Aerospace Corporation, 1975, 21). This generally results in meandering in rough topography. Maintenance access is provided by the facility and service roads.

Communication Systems

These systems can be located above ground on poles or buried. The construction activities for these systems will be similar to powerlines for above ground systems, and to pipelines for buried cables. Construction right-of-way can vary from 25 - 100 feet, with only 16 - 50 feet required for operation (The Aerospace Corporation, 1975, 27).

Reliability

Reliability is the continued availability of service (The Aerospace Corporation, 1975, 29). The consequences of system disruption vary from mere inconvenience to total system failures. The facilities related to transportation of people or materials general result in inconveniences. Vehicular traffic can be rerouted, rail service delayed and pipeline products obtained
from storage facilities. Power and communication facilities, if disrupted, can result in the loss of the system for large areas. Reliability for all of these facilities is based on:

- soundness of the system design, safety factors for variations in the load, ability to handle abnormal occurrences, the applied preventative maintenance and the adherence to sound operational or control procedures (The Aerospace Corporation, 1975, 30).

The reliability requirements of these systems often influence the location and width of rights-of-way.

3.2 Facility Impacts

Powerlines, pipelines, highways, railway and communication facilities result in varying impacts during and after construction. Powerlines and above ground communication facilities rights-of-way can result in soil erosion, loss of forest resources and wildlife habitat, increased costs of farming (Hanus, 1979) and visual impacts. The facility can cause electrical effects that interfere with adjacent communication facilities and cause shock hazard on adjacent metallic facilities.

Pipeline and buried communication facilities rights-of-way can result in soil erosion and the permanent loss of forest resources but have only short term impacts on wildlife habitat and agricultural productivity. The major impact of pipelines relates to the environmental consequences of spills (Alberta Energy and Natural Resources, 1981, 17).

The construction of a highway results in the total replacement of the environment with a paved surface. Traffic on the facility poses a significant hazard to wildlife and the noise and exhaust pollution can degrade the quality of the environment.
As with highways, the construction of a railway results in a permanent impact on the environment. Trains take a toll on wildlife as well.

3.3 Facility Compatibility

All of the facilities have varying degrees of compatibility. All of the facilities can be placed in close proximity but problems increase as the separation distance decreases and length of parallel increases (U.S.D.I., 1975, IX-4).

Powerlines pose the greatest problems for adjacent pipelines, railways and communication facilities. Powerlines can induce voltages on adjacent metallic objects through conductance (i.e., accidental ground contact or ground faults), capacitance (i.e., electrostatic voltage - an electric field is induced) and electrostatic and electromagnetic induction (Puschel, 1973, 28-32; Alberta Energy and Natural Resources, 1981; Dabkowski, 1981, 88-102; Blasingame, 1979, 39-50; Bridges, 1981, 103-109). These effects can puncture the adjacent surfaces and result in a shock hazard to construction personnel. These effects can be mitigated by increasing and maintaining a separation distance, pipeline and equipment grounding, special construction techniques and cathodic protection (Blasingame, 1979, 39-50; Dabkowski, 1981, 88-102).

Pipelines present a problem for adjacent facilities only if ruptured. Material can create a hazard to users of the highway or rail line, depending upon the product created a toxic hazard to humans and wildlife; and cause explosions or present a fire hazard (Alberta Energy and Natural Resources, 1981, 17).

Highways and railways can pose problems for adjacent pipelines, powerlines and communication facilities by vehicle accidents or train derailments,
which damage above surface structures (Robertson, 1975, 4-10). Table 5 shows the interaction between the various facilities.

3.4 Conclusion

There are marked differences in the right-of-way location criteria and width requirements between the various facilities. The route selection process for these facilities requires the identification of specific projects to allow for the environmental and economic evaluation of alternatives.

The facilities have varying degrees of compatibility but incompatibilities can be overcome through facility separation or special mitigation devices.
<table>
<thead>
<tr>
<th>Affected System</th>
<th>Electrical Transmission</th>
<th>Communications</th>
<th>Pipelines</th>
<th>Railroads</th>
<th>Highways</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Railroads</strong></td>
<td>Derailment caused outage - reliability degraded.</td>
<td>Electrified RR's same problem as power. Derailment damage to repeater stations or above ground facilities.</td>
<td>Electrified RR's same problem as power. Derailment damage to valves, compressor or pumping stations, etc.</td>
<td>Reliability degraded due to possible accident. Safety degraded.</td>
<td>Safety degraded due to potential accidents. Access interference.</td>
</tr>
<tr>
<td><strong>Highways</strong></td>
<td>Reliability degraded due to accident related outages.</td>
<td>Damage to repeater station or above ground facilities due to vehicle accident.</td>
<td>Vehicle damage to above ground facilities due to accident.</td>
<td>Reliability degraded due to possible accident. Safety degraded</td>
<td>Safety degraded due to potential accidents. Access interference.</td>
</tr>
</tbody>
</table>

**TABLE 5 - FACILITY COMPATIBILITY**

CHAPTER FOUR  THE CORRIDOR CONCEPT

The transportation and utility Corridor is simply a special case of Joint Development that involves primarily linear facilities such as roads, railways, pipelines, powerlines, communication circuits and municipal services (e.g., water lines, sanitary and storm sewer, natural gas distribution lines). In this chapter, the concept will be defined, the advantages, disadvantages and implementation problems identified. The case will be made that Corridors provide net benefits to the community in the long term. Factors which inhibit Corridor development will also be identified.

4.1 Definitions

The term "Corridor" has three basic uses in the transportation and utility literature.

One use of the term is as a synonym for the term right-of-way. In this situation, every single facility right-of-way or paralleling rights-of-way is called a Corridor. This is a misuse of the term and is misleading.

A second use of the term relates to the linear facility route selection process. One stage in the process involves the review of route alternatives at the regional level. This is undertaken using Corridors or:

...wide, elongated land areas that are selected based on broad resource capabilities, uses and potential impacts (E.N.R., 1980, 7).

A broad band between the facilities origin and destination that has the potential to provide for a right-of-way is established. This band is then subject to a detail route selection evaluation and the alternative route alignments identified. Figure 1 illustrates a route selection Corridor. The
FIGURE 1 - ROUTE SELECTION CORRIDOR

Source: Alberta Energy and Natural Resources, The Route Selection Process (Edmonton: Alberta Energy and Natural Resources, 1980): 2, Figure 1.
term "planning corridor" is related to this use of the term but instead of being tied to a specific route selection process, it relates to the establishment of areas suitable for future rights-of-way within U.S. public lands (United States Department of the Interior (U.S.D.I.), 1975, IV-1).

The third use of the term relates to the utility Corridor. In this case, a Corridor refers to a strip of land that has been set aside through legislative or other means for the purpose of accommodating future linear facilities. The land within the Corridor is allocated to specific types of linear facilities in a manner that reduces incompatibility. The U.S.D.I. refers to Corridors which have these functions as joint-use Corridors and defines them to be:

...a narrow strip of land with restricted boundaries to which facilities of the same or different systems are placed adjacent to each other in as close proximity as practical and feasible (1975, IV-2).

Elder specifies that a utility Corridor is:

...a right of way (sic) designed for the shared use of more than one type of utility, such as, electric power, telecommunication, pipelines for gas and oil, rails and even highways (1981, 2).

A Corridor is an expansion of utility accommodation in urban arterials. When a road right-of-way plan is registered, it eliminates the legal parcel plans that existed prior to the road plan. Normally, a utility is granted an easement or purchases the land for its right-of-way but when the facility is within a road right-of-way a permit is issued. Although physically one right-of-way lies within another, legally only one right-of-way exists. This is the same situation with a large utility right-of-way, such as a powerline right-of-way when the utility permits another facility on its land. This type of situation is often referred to as shared right-of-way or multiple use.
of rights-of-way. This is a limited application of the Corridor concept, as this shared use was not initially anticipated or designed for, and the rights granted to the other users are restricted.

Within a transportation and utility Corridor, land for future needs is projected and the land is allocated to specific facility types. When needed, an easement is granted to the user for a right-of-way. The width of the facility rights-of-way are reduced to only the width required for facility operation. Figure 2 illustrates the land allocation for a Corridor with powerlines, a highway and pipelines.

FIGURE 2 - CORRIDOR LAND ALLOCATION

There are variations to the land allocation depending upon the types of facilities to be accommodated. Corridors can be single or multiple purpose. A transportation and utility Corridor by definition would have a transportation component and at least one utility component. A single purpose Corridor would set land aside for the future rights-of-way of only one type of facility (e.g., a powerline Corridor).

A variation of the transportation and utility Corridor is the penetrator or window Corridor. These are short strips that pass through a constraint area such as a metropolitan area or an environmentally sensitive area. These Corridors provide access through problem areas (Hayward, 1980, 2; Stewart, Weir & Co., 1983, 4).

4.2 Corridor Purpose

A Corridor is established to efficiently and in a well planned manner preserve future right-of-way access. This in turn allows for the mitigation of the social, environmental and fiscal impacts associated with right-of-way development.

Few utility companies have preserved right-of-way for future facility requirements. This is due to the fact that the companies are not responsible for the approval of right-of-way alignments, have limited expropriation powers, must acquire the land by purchase and have limited funding for long term projects.

Although utility companies that propose a facility identify a number of alternative routes, the actual determination of the permitted route is by the appropriate regulatory agency (e.g., in Alberta the Energy Resources Conservation Board (E.R.C.B.) is the agency that issues permits for utility
rights-of-way). The regulatory agency does not necessarily approve the companies preferred route and can request route alternatives. There is, therefore, no certainty in the prediction of right-of-way alignments for short term projects, and this uncertainty is vastly increased for projects that are proposed in the future. Should the company acquire their projected right-of-way, there is no guarantee that it will be required as supply and demand factors can change. Furthermore, when the alignment is required, adjacent land use developments may have rendered it unusable.

When a company has received permission to construct a facility, they can invoke their expropriation powers to acquire a right-of-way from landowners that have not granted easements and enter the property to construct the facility. This power ensures that there are no holdouts to render an almost completely purchased right-of-way useless. However, if a company is simply acquiring land for the future, they can only rely upon negotiation with the landowners and thus may not be able to acquire all the land required. The lands not acquired could be developed for other purposes and this would impair the use of the right-of-way.

There has been significant progress in the reduction of the impacts imposed by rights-of-way on adjacent lands but these facilities continue to impose significant environmental, social and fiscal impacts. It can be argued that a right-of-way imposes limited impacts but the concern is for the cumulative impacts imposed by many rights-of-way. The regulatory agencies monitor and enforce good construction and operation practices on every facility but there are many of these facilities which affect the landscape. The number of facilities cannot be arbitrarily limited i.e., the existing facilities cannot provide additional service. In order to mitigate the
cumulative impacts, there must be control over the location of new facilities. Figure 3 shows an area of south Edmonton that has been severely impacted by pipelines. The subdivision design for these areas had to incorporate the pipeline rights-of-way and avoid placing structures on these areas.

4.3 Benefits of Corridors

A review of the literature indicates that there are a number of environmental, social, fiscal and operational benefits that can be derived from the establishment of Corridors. These benefits accrue to the potential user and/or the community.

Reduced Land Requirements

Corridors, while preserving future right-of-way access also reduce the total land requirements for these facilities. More facilities can be built on less space in a Corridor than if single rights-of-way are used. Corridors can reduce the total right-of-way requirements by providing working space for all the users; by providing a construction operation and maintenance vehicle access by providing the physical separation from adjacent land use activity, and by providing for future expansion. These are the major factors which require the right-of-way width be larger than necessary for facility operation (U.S.D.I., 1975, VII-9).

Table 6 illustrates estimated land savings of shared rights-of-way.
FIGURE 3 - PIPELINES IN SOUTH EDMONTON


### TABLE 6

**Example of Right-of-Way Savings**

<table>
<thead>
<tr>
<th></th>
<th>Shared</th>
<th>Separate</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Single Circuit 500 kV (SCT/L)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-500 kV</td>
<td>118 m</td>
<td>128 m</td>
<td>8</td>
</tr>
<tr>
<td>3-500 kV</td>
<td>172 m</td>
<td>192 m</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>Double Circuit 500 kV (DCT/L)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 DCT/L + 1 SCT/L</td>
<td>121 m(^1)</td>
<td>116 m(^1)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1-Gas Pipeline (GPL)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-Gas Pipelines</td>
<td>30 m</td>
<td>40 m</td>
<td>33</td>
</tr>
<tr>
<td>3-Gas Pipelines</td>
<td>40 m</td>
<td>60 m</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>1-Oil Pipeline (OPL)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-Oil Pipelines</td>
<td>20 m</td>
<td>40 m</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>1 GPL + 1 OPL + GPL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 m</td>
<td>60 m</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1 SCT/L + 1 GPL (Guyed Towers)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>69 m(^2)</td>
<td>84 m</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1 SCT/L + 1 OPL (Guyed Towers)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>69 m(^2)</td>
<td>84 m</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

1. Based upon falling tower clearances.
2. Based upon 10 m separation from guy anchors in flat terrain.

**Source:** Ian Hayward, *Common Corridors*, (n.p., 1982), Table 8.1, 27.

Depending upon the length of the rights-of-way, these width reductions can result in major land savings. For example, the smallest saving indicated on Table 6 is 10 m for 2-500 kV powerlines. This reduction results in 1 hectare per kilometre not required for rights-of-way. Alberta has 97,000 miles of powerlines and 112,000 miles of oil, gas and other pipelines (Environment Council of Alberta, 1982, 1). Some of these lines could have been eligible for these reductions, which could have reduced in the impact on the land base.
This right-of-way reduction results in lower right-of-way costs for the users and benefits the community by reducing the amount of land affected by rights-of-way (e.g. less loss of habitat, sensitive environmental areas and forest, mineral and agricultural resources).

**Reduced Clearing of Land**

A consequence of the reduction of land requirements is a reduction in the amount of land that must be cleared (Steinmaus, 1984, 143). In order to construct the transportation and utility facilities, the right-of-way must be cleared of vegetation and levelled. The right-of-way for the transportation facilities is surfaced and vegetation is eliminated. The right-of-way for utility facilities is disturbed during construction but is almost entirely reclaimed and limited forms of vegetation promoted. These areas are susceptible to erosion before reclamation and in the long term, if erosion control is not provided. Usually the natural vegetation cannot return, as it would interfere with the facility (e.g., tree roots disturbing pipelines or tree branches bringing down powerlines). This can have a long term impact in a forest area but does not usually have a long term impact on agricultural lands, as the crops can continue to be grown.

A reduction in the amount of clearing reduces the construction costs for the user and benefits the community by reducing the loss of native habitat, agricultural and forestry resources and reducing the potential for soil erosion.

**Reduced Right-of-Way Proliferation**

The impact of one right-of-way on one parcel may be small but the cumulative impact if many rights-of-way on many parcels can be large. Corridors direct facilities into a defined alignment that is located to
minimize the impact on critical wildlife and fisheries habitat, environmentally sensitive areas, major forestry and mineral resources and cultural or manmade features. A Corridor limits the number of parcels that are affected by right-of-way routing (Athabasca Tar Sands Corridor Study Group, Vol. 1, Part 1, 1974, 13).

The benefits of bringing facilities together in one location accrue to the community, as fewer parcels or areas are affected by rights-of-way.

Reduced Fragmentation of Land

Corridors, by controlling the location of rights-of-way, reduce land fragmentation (Alberta Energy and Natural Resources, 1980, 26, Allman, 1983, 218, Environment Council of Alberta, 1982, 33). Transportation facilities physically remove land from alternative use and often create slivers of undevelopable land within the existing pattern of parcels. While powerlines and pipelines do not physically remove the land within the right-of-way from alternative use, they greatly restrict the types of use that can be made of the right-of-way surface and the adjacent lands. Powerlines create problems for farming by requiring special machinery handling in the vicinity of the towers and the conductor (Hanus, 1979). Both powerline and pipeline rights-of-way restrict the construction of buildings and, in some cases, regulations require a development setback from these facilities. These facilities often bisect parcels (i.e., due to the fact that the shortest distance is a straight line, often on the diagonal) and must be designed around, in order to develop the property.

A Corridor, if designed to follow the parcel pattern, can reduce the fragmentation and allow for the full utilization of adjacent lands.
The benefits of reduced land fragmentation that accrue to the community include maintenance of the land development potential of the land base, lower land development costs due to ease of design, the full use of land and fewer right-of-way relocations.

**Reduced Community Disruption**

As mentioned previously, the public opposition to road rights-of-way often stems from the fact that they bisect existing communities, resulting in the removal of structures and the relocation of businesses and residences (Lea, 1969, 38). In newly developing areas, a preplanned Corridor that provides space for future transportation and utility facilities will ensure that, in the future, neighbourhoods can be designed around these facilities. Therefore, the likelihood of future neighbourhood disruption is reduced. The Corridor can be used to separate incompatible land uses or serve as a community boundary (Athabasca Tar Sands Corridor Study Group, Vol. 1, Part 1, 1974, 13).

The community benefits by not having to deal with the social and fiscal impacts of relocation, and preserving viable neighbourhood structure. The future user benefits by having lower right-of-way costs, as there is undeveloped land set aside for this purpose.

**Reduced Land Acquisition Costs**

A reduction in total right-of-way width for a Corridor results in a reduction in the amount of land that must be acquired, which reduces the costs of land acquisition. If the Corridor is under the control of one agency and it is solely responsible for land acquisition, even greater savings can result (Athabasca Tar Sands Corridor Study Group, 1974, 15). Rather than repeatedly approaching a landowner for individual rights-of-way,
the agency can approach the owner once and acquire the entire land requirements. This is more efficient use of agency personnel, reducing the number of meetings and the negotiation effort. In addition, it reduces the total land cost as the landowner, if not bought out, would likely require higher easement payments as the rights-of-way affected more of the parcel.

Approvals Expedited

It can take many years for a major road or utility service to be constructed and put into operation. Much of the time is allotted to the approval process. A Corridor can reduce the approval time by reducing the time required to identify and evaluate a viable route by reducing the number of routing alternatives that must be reviewed, and by reducing the time spent on reviewing public interventions (Athabasca Tar Sands Corridor Study Group, Vol. 1, Part 1, 1974, 15). A Corridor is only established where there are viable routes and there is no need to consider alternatives as the component areas are defined. If the Corridor is established with public support, there is likely to be few interventions for Corridor alignments. This reduces the project costs to the user and reduces the community funds required to administer the approval process.

Route Preservation

There are a number of laws, policies and regulations that have been established to protect resources, such as critical habitat areas, wilderness areas, environmentally sensitive areas, historic resources and scenic rivers. These areas, in addition to settlements, agricultural areas, forest management areas and mineral extraction areas limit the areas suitable for rights-of-way. In metropolitan areas, urban growth and infilling of development is constraining access to the areas. Corridors will prevent the "close-out" of
suitable routes (Western Utility Group, 1986, 3, Allman, 1983, 219). The preservation of routes allows for the continued establishment of rights-of-way to meet the existing and future needs of society.

Facility Integrity Prohibited

A Corridor provides a large separation of facilities from potentially damaging activities on adjacent lands. Often actions such as sewerline construction on adjacent lands results in damage to the facilities (e.g., a pipeline is hit). This is termed third party damage. Third party damage is one of the major reasons for pipeline failures. In addition, it is easier to identify and avoid a group of well marked facilities. A Corridor, therefore, reduces the likelihood of third party damage (Allman, 1983, 219).

This reduces the risk to the community of facility failure and the costs of damage control to the user.

Reduced Surveillance Costs

Each facility has a daily, weekly or monthly surveillance program. The right-of-way is walked, driven or flown to determine if there are any problems with the facility or if there are activities or situations, such as construction or ongoing erosion on adjacent lands which threatens the facility. The grouping of facilities allows for a common inspection and surveillance of the facilities. This reduces the operating costs for all of the users.

Corridor benefits for users tend to lower the costs of constructing or operating the facility. The benefits to the community focus on preserving the land and resource base; protecting the environment and the opportunities for alternative land use development, and lowering the social impacts of the linear facilities.
4.4 Costs and Disadvantages of Corridors

The establishment of a Corridor while providing a number of benefits also presents a number of disadvantages to the user and costs to the community.

Concentrated Impacts

The combining of a number of facilities within a Corridor results in significant impacts to the environment within the Corridor boundaries (Athabasca Tar Sands Corridor Study Group, 1974, 15; Hayward, 1982, 19; Ontario M.T.C., 1978, 5). The frequent surface disturbances, the land clearing, the soil compaction, the construction activity and the reclamation activities all result in the replacement of the existing wildlife and vegetation. Rather than dispersed over many landscapes, these impacts are confined to the Corridor. If not carefully located, a Corridor would result in the loss of sensitive environmental areas, critical wildlife areas and resource reserves to the community.

Community Barriers

One of the arguments against freeways is that they create a barrier to movement. A Corridor with a width much greater than a road right-of-way can create a bigger barrier to cross movement (Alberta Energy and Natural Resources, 1980, 27). Furthermore, the width can result in greater utility crossing costs, as a longer distance must be covered that do not generate revenue from service connections.

Higher Construction Costs

Facilities in a Corridor can be subject to higher construction costs due to mitigation requirements, longer route length and special construction practices. Electric transmission lines can present a hazard to metallic
surfaces, equipment and personnel adjacent to the facility (U.S.D.I., 1975, IV-21; Blasingame, 1979, 39; Howlett, 1984, 151; Puschel, 1973, 28-32; Robertson, 1975, 4-10, 4-13; Robinson, 1974, 27). Mitigation is normally achieved by increasing the separation distance. In a Corridor mitigation, devices such as shields and ground and special construction procedures are required, which increase construction costs.

All of the linear facilities have varying location criteria, such as grade and curve constraints. In order to locate a Corridor, the facility with the most restrictive location criteria will fix the alignment as all other users can follow this route (Athabasca Tar Sands Corridor Study Group, Vol. 1, Part 1, 1975, 11; Ontario M.T.C., 1978, 6). This generally results in the other users following a much longer route than their lowest cost alternative (Hayward, 1982, 5; Alberta Energy and Natural Resources, 1980, 26).

A compromise route results in an increased route length for the facilities. The Aerospace Corporation (1975) estimated the following construction costs:

- 4 lane divided highway: $1.5 - $2.0 million/mile
- 2 track railroad: $500,000 - $700,000/mile
- 1 - 42" pipeline: $318,000/mile
- 1 - 500 kV powerline: $220,000/mile

An increase in length can significantly increase the total facility construction cost.

In addition, construction of new facilities near an existing installation requires special procedures to avoid damaging the facility. Construction activity can take place over, beside or under an existing
facility. Special procedures are required to protect the existing facilities from damage (U.S.D.I., 1975, IV-32).

**Higher Energy Requirements**

A consequence of greater length is an increase in energy use. If a roadway or railway has increased length, this will require the vehicles travelling the route to use additional energy. Powerlines lose energy over distance, thus the greater the distance the greater loss. Pipelines under pressure will require more pressure if the distance is increased (Klohn, 1981, 115; Hayward, 1982, 19).

**High Corridor Acquisition Costs**

The land for the Corridor must be acquired to increase land use control (Athabasca Tar Sands Corridor Study Group, 1974, 15). This requires large capital funding to assemble the land which are difficult to raise (Weir, 1984, 125; Lea, 1969, C-1). These lands must be retained for the life of the facilities. It is argued that there are economic benefits of buying land well in advance of need (Lea, 1969, 43). Goldberg (1980, 1978, 1978a) has determined that there are no economic savings derived from the early purchase of the land. Therefore, Corridors require large capital budget that are difficult to raise and there is no economic benefits to acquiring the land before it is needed and holding the land.

**Reduced Reliability**

Reliability of a system can be reduced by locating facilities in close proximity or by clustering similar facilities (Steinmaus, 1984, 144; U.S.D.I., 1975, IV-34). The continual construction of facilities near existing facilities can increase the likelihood of third party damage. The clustering of similar facilities may also result in a total system failure.
from one action, such as storm or an explosion. A system is designed with separation to insure that the service will be maintained.

Increased Risk

A single right-of-way provides a linear facility with a safe location. The facility is further protected by the frequent surveillance by trained personnel that are able to recognize problems with the equipment or external threats to the system. In a corridor with a common inspection or surveillance program, the inspectors must be able to recognize problems with the equipment of all the various facilities and external threats to all of the various systems. The failure of one facility is more likely to affect adjacent facilities due to the reduced separation distance. To reduce the risk, special construction material and techniques are necessary i.e., thicker pipe walls, greater depth of burial. This increased level of risk may affect the determination of the level and cost of liability insurance for the various facilities.

Increased Vulnerability

The clustering of facilities may result in a multiple failure as a result of one system accident or from natural disasters or subversive actions (Athabasca Tar Sands Study Group, 1974, 15; U.S.D.I., 1975, IV-36; Hayward, 1982, 19; Alberta Energy and Natural Resources, 1980, 27; Ontario M.T.C., 1978, 6). As with system reliability, the greater the separation, the more difficult to bring down all of the facilities.

Expansion Restrictions

The clustering of facilities in a Corridor can result in the inability to expand a particular facility (Ontario M.T.C., 1978, 7; Williams, 1980, 21). This is especially true for transportation facilities that are often
improved by lane or track additions. Should these improvements be necessary, difficult and costly relocations of existing facilities would be required.

**Difficulty in Determining Location and Width of Corridor**

As discussed in Section 3.1, a facility right-of-way route and width depends upon the system needs (i.e., origin and destination) and the specific project characteristics (i.e., voltage, tower structure, pipeline diameter). In order to locate a Corridor and to establish a Corridor width, the future users must be identified. The Corridor location depends upon the coincidence of facility origins and the destinations and the different location parameters. The Corridor width is established by the total right-of-way need of the facilities, plus the separation distance to mitigate incompatible facilities and to meet reliability objectives. It is difficult to identify a general width for a Corridor that could apply in all situations (The Aerospace Corporation, 1975, 110). Therefore, prior to establishing a Corridor in any specific locale, a systematic evaluation should be performed (i.e., based on actual configurations of systems to be emplaced, sequence of possible construction, physical nature of terrain, etc.) to determine the interactions and the impacts of various Corridor widths on costs and safety to determine if a Corridor is plausible or more or less desirable than other alternatives (The Aerospace Corporation, 1975, 112).

**Lack of Corridor Implementation Mechanism or Institutional Framework**

An extensive review of the literature on Corridors uncovered little information regarding implementation. Corridors have been established by private companies, municipal or provincial agencies and by special purpose agencies. In Houston, Texas, the Exxon (formerly the Humble Oil Company) pipeline Corridor is a private sector Corridor that leases right-of-way space
to other companies (Elder, 1981, 5). In Ontario, Ontario Hydro allows other utilities and other surface uses to locate on their rights-of-way (Collie, 1987, 1). In Alberta, the provincial Department of Environment is responsible for two transportation and utility Corridors.

The legislation, regulation policies and plans that affect right-of-way location and the agencies and interests that would be involved in Corridors have been discussed in the literature (U.S.D.I., 1975, VIII-1, VIII-16). It has been noted that the successful establishment of Corridors requires a coordinated effort involving all levels of governments, public and private utilities and the public (U.S.D.I., 1975, IV-16). There are no existing mechanisms to coordinate these agencies and interests.

Mermel has noted that the problem with Corridors is not technical issues but cooperation and coordination (1969, 59).

Only one study proposed an implementation mechanism and institutional structure. The Athabasca Tar Sands Corridor Study Group concluded that Corridors could only be achieved by government legislation and action (Vol. 1, Part 1, 1974, 35). The study group identified two implementation techniques:

(A) Restrictive zoning in the covering regulations and government inspection and approval services...

(B) A single authority owning and managing the corridor (Vol. 1, Part 1, 1974, 35).

The single quasi-governmental authority would acquire, own, lease and manage the Corridor.

Most of the Corridor disadvantages relate to the costs incurred by the user of a Corridor. These factors are evaluated to determine if a Corridor alignment is feasible. However, the higher land acquisition costs, the
difficulty in locating a Corridor and determining the width of a Corridor, and the lack of an implementation mechanism or institution affects the establishment of Corridors.

4.5 Conclusion

Corridors provide benefits and impose costs on the users and the community. The user can, when a project is identified, calculate the benefits and costs of a single right-of-way versus a Corridor alignment and determine the route with the highest net benefit.

The determination of net benefit to the community is much more difficult and complex. The community, if establishing the Corridor, is faced with the high capital cost of land acquisition, the costs of holding and administering the land and the lost opportunity costs of scarce public funds directed to this purpose. The community receives the benefit of land and resource preservation, which preserve the options for future generations. This is an intangible benefit whose value is hard to quantify but that has value far into the future. Future revenues can be generated to replace public funds through taxation and easement lease fees. The land resource is finite and cannot be readily replaced. In the long term, the benefits to be gained from Corridors will outweigh the disadvantages.
CHAPTER FIVE  THE ALBERTA CORRIDOR PROGRAM

In this Chapter, the Alberta Corridor program will be examined to determine the factors that lead to the establishment of the Corridors, to identify the benefits and disadvantages resulting from the Corridors, and to identify the institutional framework for Corridor implementation and management.

5.1 The Program Beginnings

In the early 1970's, the province was experiencing rapid development of conventional oil and gas resources, due to the high world oil prices established by the Organization of Petroleum Exporting Countries (O.P.E.C.). As well, the province was promoting the development of heavy oil sands in northern Alberta. Rapid industrial growth was expected, based on the availability of cheap energy. This was expected to diversify the Alberta economy from the traditional resource and agriculture sectors.

This petroleum resource and industrial development was projected to require a large number of pipelines and powerlines.

The metropolitan areas were experiencing rapid growth and the costs of land throughout the province were increasing quickly.

The province was receiving large resource revenues during this period. Richards noted that:

Aggregate oil revenues (comprising royalties, land sales, and rentals) increased from $516 million in 1973 to $2.7 billion in 1977, creating annual budget surpluses that have threatened to embarrass even the most acquisitive Alberta cabinet ministers (1979, 241).
There was growing concern over environmental issues in Alberta during this period. In 1971, an Alberta Department for the Environment was established. The Act provided for the establishment of a department to oversee environmental matters and outlined the department's responsibilities.

A few months after the passage of this legislation, the 25 year old Social Credit government was defeated and the Conservatives were elected.

The Conservative government had a policy of balanced growth that discouraged additional development in the metropolitan areas but promoted the development in other regions. A major industrial area was located on the eastern edge of Edmonton and contained petroleum processing and terminal facilities. In the early 1970's, attention focused on developing the oil sands in northeast Alberta near Fort McMurray. The province commissioned a study to determine if a multiple purpose Corridor for linear facilities associated with oil sands development was required and if a Corridor was feasible. In addition, the consultants were to identify potential major and minor industrial sites to be related to the oil sands development. The Athabasca Tar Sands Corridor Study determined that a Corridor could be used by various linear facilities, including pipelines and powerlines required to service the site and to move products to market. The study identified viable Corridor routes and a number of industrial sites outside the metropolitan area. Edmonton was to continue to provide a major terminal function for the oil sands development. In October, 1974, the provincial government endorsed the Corridor study. To protect the Corridor alignment, the province has placed a Corridor reservation on the Crown lands in northeast Alberta that comprise the alignment and has purchased some of the private lands.
On the eastern edge of Edmonton near the industrial area, a new settlement was developing. Sherwood Park was a small hamlet that had been created to act as a bedroom community for the City of Edmonton. The hamlet was experiencing rapid growth, as was Edmonton. The province was concerned that access to the industrial area could become blocked by future development of the hamlet. In addition, the province was concerned that the hamlet remain separated from potential pollution impacts from the industries.

To accomplish these purposes, the province, through the Department of the Environment Act, established a half mile wide Restricted Development Area (R.D.A.) approximately 4 1/2 miles long, the Sherwood Park West R.D.A., along the eastern edge of the City (see Figure 4). Mr. Yurko, the Environment Minister that declared the R.D.A., when questioned in the legislature as to why a half mile width was chosen, stated:

One of the main considerations was cost. The other was, of course, considerations in regard to the effectiveness of a half-mile width in terms of separating industry from residential areas, as well as the fact that a half-mile is quite sufficient for the noise amelioration. A half-mile is quite useful for recreational purposes, as a utility corridor and for several other reasons. (Alberta Hansard, October 31, 1974, 3391).

The R.D.A. was to: provide for pipeline access to the industrial area; limit the expansion of the industries; and to provide a green space to help mitigate pollution.

The R.D.A. was eventually extended to completely circle the city to preserve the alignment of the Ring Road.

Since the early 1950's, the province had proposed a Ring Road around the City of Edmonton. The proposed alignment had shifted over time and can be traced through a number of studies.
FIGURE 4 - EDMONTON & SHERWOOD PARK WEST
RESTRICTED DEVELOPMENT AREAS
In 1956, the Edmonton District Planning Commission (E.D.P.C.), a regional level planning agency, presented an alignment to the Department of Transport for consideration. Little action was taken and only one and a half miles of the right-of-way was acquired.

By 1961, when the Metropolitan Edmonton Transportation Study (M.E.T.S.) was begun, the city had grown and, in places, development was fairly close to the 1956 Ring Road alignment. The M.E.T.S. examined the transportation requirements for the metropolitan area to the year 1980 and a revised Ring alignment was proposed two to three miles beyond the previous alignment. This roadway was to link future internal roads in the city with major rural roads in the region. Once again, no action was taken to protect the alignment.

In 1973, Alberta Highways and Transportation and the staff and members of the Edmonton Regional Planning Commission (E.R.P.C.), formerly of the E.D.P.C., participated in the Edmonton Area Study: An Outline Plan for Roads and Highways. This study identified a preferred route for the Ring Road and major connecting radial roads. The Ring alignment had to be revised due to the encroachment of development on the alignment. This study also examined the multi-purpose corridor concept by recommending that, in addition to the 350 foot road right-of-way, land be acquired for parks and green space uses (1973, 20) and utilities (1973, 22).

Also in 1973, another Ring Road study was completed. The study, A Multidisciplinary Evaluation of the Edmonton Parkway Ring, examined the Ring Road concept and identified potential environmental and socio-economic impacts. The study examined the general corridor location within which the Ring Road could be located. A half mile wide band was examined and was to
provide for the road right-of-way, other utilities, environmental buffer zones and parks and recreation, other utilities, environmental buffer zones and parks and recreation uses (1973, 6). Figure 5 indicates the Ring Road alignments from these studies.

At this stage, a viable Ring Road alignment had been identified and the merits of multi-purpose Corridor linked with the roadway. The province took the opportunity to expand the recently declared R.D.A. around the city to preserve the Ring alignment. This was done in stages, as the alignment was confirmed. Thus, an approximately half mile wide band circled the City of Edmonton, which was to provide for a transportation and utility Corridor.

5.2 Corridor Implementation

As discussed above, the province used the R.D.A. Regulation as the mechanism to establish Transportation and Utility Corridors, although other mechanisms such as the Special Planning Areas allowed for under the Planning Act were available.

Alberta Environment's Role

Unlike the Joint Development experience in the United States, the provincial Department of Transportation was not granted the responsibility to establish and manage the Corridor. Mr. Yurko, who at that time was the Minister of Environment, stated that the Department of Environment was chosen to administer the Corridors, as it was the only Department that could take a macro view of the Corridor (pers. com. 1987). The Department was responsible for the environment and this crossed all department boundaries and thus the Department could relate to the needs of all of the interests in the Corridor.
FIGURE 5

EDMONTON HISTORICAL RING ROAD ALIGNMENT

Legend
- Restricted Development Area
- 1958-Edmonton District Planning Commission
- 1963-Metropolitan Edmonton Transportation Study
- 1973-Edmonton Area Study An Outline Plan For Roads And Highways
- 1979-Conceptual Plan
Restricted Development Area Regulations

The original Department of the Environment Act provided for the establishment of Restricted Development Areas (R.D.A.s). R.D.A.s gave the Minister of the Environment land use control over the designated area. According to Mr. Henderson (pers. com. 1987), the first Minister of the Department, this power was granted to the Department to provide a mechanism to resolve interdepartmental conflicts over environmental issues.

From 1973 to 1978, the province established 13 R.D.A.s. Table 7 indicates the R.D.A.s created and their purposes. As can be seen, R.D.A.s function to preserve land for recreation purposes, to provide for transportation and utility Corridors and to preserve an historic site.

TABLE 7
List of R.D.A.s

<table>
<thead>
<tr>
<th>R.D.A.</th>
<th>Year Established</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish Creek</td>
<td>1973</td>
<td>To protect crown investment in the provincial park.</td>
</tr>
<tr>
<td>Sherwood Park West</td>
<td>1974</td>
<td>To provide for a transportation-utility Corridor.</td>
</tr>
<tr>
<td>Pinehurst Lake</td>
<td>1974</td>
<td>To protect high recreational capability shoreland.</td>
</tr>
<tr>
<td>Fort McMurray Settlement</td>
<td>1974</td>
<td>To provide for flood protection.</td>
</tr>
<tr>
<td>Edmonton-Fort Saskatchewan</td>
<td>1974</td>
<td>To protect the river valley for environmental and recreational purposes.</td>
</tr>
<tr>
<td>Edmonton-Devon</td>
<td>1974</td>
<td>To protect the river valley for environmental and recreational purposes.</td>
</tr>
</tbody>
</table>


TABLE 7

List of R.D.A.s
(Continued)

<table>
<thead>
<tr>
<th>Location</th>
<th>Year</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edmonton</td>
<td>1974</td>
<td>To provide for a transportation/utility Corridor.</td>
</tr>
<tr>
<td></td>
<td>1975</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1977</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1980</td>
<td></td>
</tr>
<tr>
<td>Blue Ridge</td>
<td>1974</td>
<td>To provide an environmental buffer between an industrial site and the hamlet.</td>
</tr>
<tr>
<td></td>
<td>1976</td>
<td></td>
</tr>
<tr>
<td>Strathcona</td>
<td>1976</td>
<td>To protect the crown investment in the provincial park.</td>
</tr>
<tr>
<td></td>
<td>1980</td>
<td></td>
</tr>
<tr>
<td>Calgary</td>
<td>1976</td>
<td>To provide for a transportation/utility Corridor.</td>
</tr>
<tr>
<td></td>
<td>1985</td>
<td>To protect environmentally sensitive areas and good quality agricultural lands and to control development in the area.</td>
</tr>
<tr>
<td>Turtle Mountain</td>
<td>1976</td>
<td>To protect the Frank Slide historic site.</td>
</tr>
<tr>
<td>Lethbridge</td>
<td>1977</td>
<td>To protect the river valley for environmental and recreational purposes.</td>
</tr>
<tr>
<td>Capital City Recreation Park</td>
<td>1978</td>
<td>To protect the crown investment in the river valley parks.</td>
</tr>
</tbody>
</table>

The Regulation allows the Minister of the Environment to identify and designate an area as an R.D.A. All of the lands described as being in the R.D.A. come under the control of the Minister. Although the ownership of the land is not affected by the designation (i.e., the landowner retains title), the province places a notice on the title that identifies the land as being in an R.D.A. The bundle of rights associated with land ownership is
affected. Although most land uses in existence when the R.D.A. was declared that are not surface disturbing can continue, the owner must obtain the permission of the Minister for any change or intensification of land use. The Regulation applies to all lands, whether held by private owners or any level of government.

The Regulation takes precedence over all other legislation, which could result in actions contributing to a surface disturbance. Prior to issuing any permit or other approval, these agencies must obtain the consent of the Minister of the Environment. The Regulation requires that the proposed activity be granted consent and the agency which is responsible for the approval or permit be granted consent to issue their approval. The granting of consent for the activity simply reflects the view that the proposed activity will not interfere with the purpose of the R.D.A. and does not imply that other approvals will be granted. In order to provide additional protection, the Regulation prohibits the granting of interests in Crown lands.

The Regulation states that the Minister can only approve uses for the area that are compatible with the intent of the R.D.A. and that conditions of approval can apply. In 1977, the Regulation faced a court challenge on the grounds that a transportation and utility Corridor was not a valid use of the R.D.A. The Crown lost the case and a portion of the Edmonton R.D.A. was removed. The province amended the Regulation to provide for Corridors and reapplied the designation. The current Regulation has been accepted by the courts.
The Regulations grant the Minister the authority to acquire land in the R.D.A. by purchase or expropriation. The Minister can order removal of structures, equipment and animals from the area and can provide compensation.

The R.D.A. Regulation provides the Minister of the Environment with a high level of land use control, as only activities subject to federal jurisdiction (i.e., interprovincial pipelines and railways) and the buying and selling of property do not fall under the Regulation. The Regulation provides a provincial level of zoning, which enables the province to maintain a low intensity use of lands in the designated areas.

5.3 Edmonton Transportation/Utility Corridor (T.U.C.)

Design and Planning

The T.U.C. was established using the R.D.A. Regulation pursuant to the Department of the Environment Act. The Sherwood Park West and the Edmonton R.D.A.s established an approximately half mile wide ring around the City of Edmonton (see Figure 7). A half mile was chosen as an appropriate width to provide for a Corridor, to provide adequate land use separation and to provide pollution control. The width is not exactly a half mile, due to the method used to describe the lands designated as R.D.A. To quickly describe the boundaries of the R.D.A., complete parcel boundaries (i.e., parcels created by a registered Plan of Subdivision or by Transfer of Title) or legal descriptions (i.e., sections, quarter sections, legal subdivisions, quarter legal subdivisions or metes and bounds) were used, even though only portions of parcels were required. In Alberta, most of the land was laid out using the Township pattern. A township is a 6 mile square containing 36 sections of 1 square mile. Each section has 4 quarter sections a half mile square,
containing 160 acres. As well, each section contains 16 legal subdivisions of 40 acres. Each quarter section contains 4 legal subdivisions. Finally, each of the legal subdivisions can be further subdivided into 10 acre parcels or quarter legal subdivisions. The section, quarter section, legal subdivision and quarter subdivision are acceptable and common means to describe land holdings. Most homesteads were a quarter section each. The rural road pattern in the more developed areas is a grid with two miles separating parallel road allowances running north-south. The use of this system resulted in defining the boundary to the nearest quarter subdivision. Figure 6 indicates the legal parcel descriptions associated with this system.

![TOWNSHIP SURVEY Diagram]

**FIGURE 6 - TOWNSHIP SURVEY**

Source: Alberta Energy and Natural Resources. Reference Manual For Alberta Land Agents. 1982. Figure 4-1, Page 4-1.
The Department of the Environment developed a series of plans for the Corridor, with the assistance of a technical committee comprised of representatives of industry, municipal service agencies and provincial agencies. The committees provided an indication of industry's right-of-way requirements in the Corridor and developed a series of ideal cross-sections for the arrangement of facilities. Figure 7 illustrates the cross-sections. The first cross-section was appropriate where the highway facility was centred within the Corridor and was to be constructed after some of the other utilities. The second cross-section was appropriate where the highway facility was centred in the Corridor and would be constructed prior to the construction of other utilities. The third cross-section was appropriate where the highway facility was to be located near to the R.D.A. boundary.

Space was allocated for the primary uses, including a highway right-of-way, oil and gas pipelines, electric transmission lines, distribution services (i.e., municipal services such as powerlines, natural gaslines, sewer and water lines), flex space (space for expansion), service roads and buffer areas. Within the pipeline, powerline and distribution services component areas, the utilities would locate their own rights-of-way. The arrangement of the components within the Corridor reflected the facility design requirements and the compatibility problems between the facilities.

The ideal cross-sections were applied to the R.D.A. lands and modifications made to reflect variations in projected right-of-way requirements and variations in the R.D.A. width. In 1985, the plans were reviewed and an extensive reassessment of the land requirements undertaken. Revised plans were prepared, which improved the component arrangement and
FIGURE 7 - IDEAL CROSS-SECTIONS

Source: Alberta Energy and Natural Resources, Report to the Electric Transmission Committee on the Planning Approach, (Edmonton, Alberta Energy and Natural Resources, 1980), Figure 1, 13.
reduced most of the component widths to reflect current industry projections of right-of-way need.

These conceptual Corridor plans do not have statutory authority but are used by Alberta Environment as a guide for the placement of utilities in the Corridor and to evaluate land use development requests and as a basis for land acquisition negotiations.

The Edmonton and the Sherwood Park West R.D.A. contain approximately 19,000 acres, of which only 11,000 acres are required for the T.U.C. The remaining 8,000 acres are not required for the T.U.C. and comprise unassigned land within the T.U.C. and residual land outside the T.U.C. but within the R.D.A. boundary. Figure 8 is a schematic of a one mile segment of the Edmonton Corridor that indicates that the unassigned lands are strips and pockets created by the design requirements of the utilities, while the residual land reflects the difference between Corridor needs and the definition of the R.D.A. boundary.

Alberta Environment has identified a range of surface land uses for the Corridor which are compatible with the primary Corridor uses. These secondary land uses are intended to maximize land use in the Corridors and to integrate the Corridor into the adjacent land use pattern. Land uses such as agriculture, parks and recreation, and parking and storage are appropriate.
Figure 8 - Corridor Land Classes

Corridor Status

The Edmonton T.U.C. has a number of utility rights-of-way but many simply cross the Corridor and predate the T.U.C. plans. Few facilities have been located in the T.U.C. in accordance with the plans. Since 1985, the City of Edmonton has been completing the detailed design for the Ring Road on the west and south sections of the Corridor. It is anticipated that construction of an interim version (i.e., the Ring Road is planned to be an eight lane limited access freeway with grade separated interchanges, while the interim plan is only a four lane facility with at grade intersections) will begin within the next few years and continue to the late 1990's.
The province had, by 1986, acquired approximately 60% of the land in the Edmonton and Sherwood Park West R.D.A.s. An examination of the annual reports for the Department of the Environment land purchases indicates that between 1976 and 1983 (i.e., the years acquisition costs are available) the Department spent approximately $200 million for land in the Edmonton and Sherwood Park West R.D.A.s.

All of the Crown land in the R.D.A.s has been leased for secondary land uses. The major use is agriculture but uses such as tree farms, rental garden plots, driving ranges, shooting ranges, gravel pits and industrial storage areas have been approved.

5.4 Institutional Framework

There are a number of acts, regulations, statutory plans and bylaws and industry standards that affect primary and secondary land use implementation, including:

- Energy Resources Conservation Act
- Hydro and Electric Energy Act
- The Land Surface Conservation and Reclamation Act
- Municipal Government Act
- Pipeline Act
- The Planning Act
- Public Lands Act
- Water Resources Act
- Subdivision Regulation
- Land Conservation Regulation
- Regional Plans
General Municipal Act
Land Use Bylaw
Canadian Standards Associations Standards

This legislation is administered by a number of government departments and municipal agencies.

The Alberta Corridor program is administered through a voluntary cooperative interdepartmental structure. The province has assigned the lead role to the Department of the Environment, as the department's responsibilities cross many departmental jurisdictions.

The government departments and the agencies involved with the Corridor program that are to be discussed include the Department of the Environment, the Department of Public Works, Supply and Services, the Department of Transportation and Utilities, the Energy Resources Conservation Board and the municipalities.

Department of the Environment

Alberta Environment is the lead agency for Corridors through the powers granted by the R.D.A. Regulation. The Land Use Branch of the Environmental Assessment Division was established to administer the R.D.A. The Branch provides program direction to all other agencies. This Branch has had prepared a plan for the Corridors and requires that all activities conform to these plans. These plans are an orthophoto base of the Corridor with the space allocations for the major uses indicated generally by parallel strips adjacent to the road right-of-way.

The Branch reviews all utility permit applications in the R.D.A.s for conformance with the Corridor plan, and assesses all interim and secondary land use development proposals to determine the implication on the Corridor
and prepares recommendations for or against granting Ministerial consent, which are submitted to the Director of the Environmental Assessment Division for a decision.

The Linear Projects Section is the main referral agency for all pipeline and powerline applications submitted to the Energy Resources Conservation Board (E.R.C.B.). Staff refer proposals to other government agencies for their review and coordinate the response of the agencies to the E.R.C.B. Section staff provide assistance to the Land Use Branch regarding technical considerations on applications for the Ministerial Approval, to be issued by the Minister of the Environment as required by the Pipeline Act and the Hydro and Electric Energy Act.

Department of Public Works, Supply and Services

The sections of the Department involved in the program include the Land Management and Planning Branch. These groups are responsible for the management of the Crown lands in the R.D.A.s.

The Land Management and Planning Branch is the lead agency for the R.D.A. management. For the right-of-way applications approved by the Department of the Environment, this branch prepares the easement documents for the Crown lands. As well, all interim and secondary land use (i.e., surface use) proposals are reviewed with regard to the impact on the Crown lands, and if use is approved by the Department of the Environment, a lease is granted.

The Land Acquisition Branch is the agency that is responsible for the acquisition of land required for all other government programs (except for Transportation projects). Prior to 1983, all provincial agency purchases were undertaken by the Land Assembly Division of Alberta Environment. The
Land Assembly Division had the purchase responsibility, as well as the Land Use Branch R.D.A. administration functions. In 1983, the Division was reorganized. The acquisition responsibility was transferred to the Department of Public Works, Supply and Services by Alberta Regulation 289/83, Public Service Administrative Transfers Act. This Branch has been given the acquisition powers in the R.D.A. Regulation, and can negotiate to acquire the lands or invoke the expropriation powers.

The Municipal Development Branch provides basic engineering services for the Department. Generally, this means the provision of site services for a Department sponsored development but for the R.D.A. program this Branch provides site maintenance services.

**Department of Transportation and Utilities**

This Department has been a lead agency for the planning of the Ring Road and the Corridors. The Urban Transportation and Planning Division is the primary participant.

The Urban Transportation Branch is responsible for the review of the detailed plans for roads in and around major centres, which will receive funding from the province. With respect to the Corridors, this Branch reviews the Ring Road plans prepared by the municipalities for conformance with provincial objectives and standards.

The Planning Branch developed the initial preliminary functional plans for the Ring Roads. This Branch continues to have primary responsibility for the design of the Calgary Ring Road but since the majority of the Edmonton Ring Road lies within the city, it is no longer undertaking the design for the Edmonton Ring Road. The Branch acts as a referral agency for Alberta Environment by reviewing the Ring Road plans prepared by the municipalities.
for conformance with provincial standards and the Corridor plans. It also
reviews interim and secondary land use proposals to determine the potential
impact to the Ring Road.

Energy Resources Conservation Board (E.R.C.B.)

The E.R.C.B. was established to conserve and manage the energy resources
in the province. The E.R.C.B. has members with experience from government
resource agencies or private sector resource industries. The E.R.C.B.
prepares projections of remaining reserves and projections of energy demand,
controls the development of resources and ensures safe industry practices.
The Board, as a quasi-judicial tribunal, administers the Hydro and Electric
Energy Act and the Pipeline Act. In the review of applications for permits
to construction pipelines and powerlines, the E.R.C.B. considers the project
justification, right-of-way routing issues, economics, land use and
environmental impacts and technical and safety considerations. The E.R.C.B.
solicits the views of interested government agencies and other affected
groups or individuals. Although the E.R.C.B. is responsible for the permit
to construct, a permit cannot be issued without Ministerial Approvals by the
Minister of the Environment and the Minister of Forests, Lands and Wildlife.

Municipalities

The municipalities which are responsible for the land within an R.D.A.
designation continue to discharge their legislative responsibilities. The
only restriction is that prior to issuing approvals for activities which
would result in surface disturbances, Ministerial consent from the Department
of the Environment is required. This creates another step in the municipal
approval process. If Ministerial consent is obtained, the municipality
proceeds to review the proposal and renders a decision. The granting of
Ministerial consent does not influence the decision making process (i.e., an approval may not be granted, even though consent was obtained). If Ministerial consent has been refused, the municipality may not proceed with the approval process.

The municipality continues to be responsible for the provision of municipal services and remains the taxing authority for these lands.

The responsibility for Ring Road planning transfers to the city when the R.D.A. lies within its boundary. This transfer occurs because Section 172 of the Municipal Government Act grants ownership of the road right-of-way to the municipality.

The municipalities have cooperated with the Department of the Environment to integrate the Corridors into the proposed land use pattern by referring land use proposals within one half mile of the R.D.A. boundary to the Department for review. The municipality is not bound by Environment's comments, as the lands are outside the R.D.A.

These agencies are not required by their Acts or Regulations to cooperate in the administration of the Corridors but rather cooperate to maintain good will and to avoid encountering the overriding power of the R.D.A. Regulation granted the Department of the Environment.

5.5 Consideration of Alberta Corridor Program

The Alberta implementation legislation and the institutional arrangement has allowed the Corridor program to be in effect for over 10 years. The legislation has withstood several court challenges. The superior standing of the legislation has resulted in the construction of a number of pipelines and
legislation has also maintained the low density use of the Corridor, which has preserved the viability of the alignment.

The Corridor was located using the projected pipeline right-of-way needs in north Edmonton and the ring road alignment. A circular alignment with no origin-destination but centred on a road right-of-way solved a major problem with Corridor establishment. A coordinated effort of the utility companies, the municipal service and transportation agencies identified the projected types of facilities that could use the Corridor. The expropriation powers of the legislation have ensured that parcels required for an alignment for a pending facility can be obtained.

Although the various agencies and interests have cooperated in the design of the Corridor plans, these agencies have not adopted the plans which has resulted in changes to the design.

The province reassessed the number and type of projects and the Corridor land requirements were reduced and the plans revised. This reduction was expected to greatly reduce the land acquisition costs. The land acquisition program has required approximately $400 million for both the Edmonton and the Calgary Corridors. With the purchase program 60% complete and assuming the acquisition costs remain constant, another $250 million would be required to complete the purchases. These funds come from the Land Purchase Fund, do not affect the program budgets of the other departments and have not resulted in interdepartmental opposition. However, there is a concern that the public may not approve the expenditure of scarce public funds on this program.
A problem that has arisen from the acquisition program is the disposition of excess lands. As noted previously, although the province has attempted to buy only the portion of a parcel that is required for the Corridor, landowner requests and access or parcel size constraints have necessitated the purchase of entire parcels. These lands are not required for the Corridor but lie within the R.D.A. The province is presently considering whether or not to release these lands from the R.D.A. and sell the lands. In a few instances, in response to landowner requests, the province has redefined the R.D.A. boundary to release rather than purchase the residual lands. However, a release policy has not been established and this has created uncertainty for the Corridor landowners, adjacent landowners and the planning authorities in the stability of the R.D.A. boundaries. The majority of the residual land could be physically incorporated into the adjacent areas, as long as the land is included in the land use plans for the adjacent lands. Once a subdivision plan is registered, it would be difficult, if not impossible, to incorporate these lands. As development is approaching the inner boundary of the R.D.A., the province must decide soon whether or not to release these residual lands for development.

There has been concern raised by the land development industry that the Corridor creates a hardship on the developers of areas outside the R.D.A. boundaries, as all of the services must cross approximately half mile with no compensation. In general, the Corridor will not require services and, thus, will not contribute to the construction costs. These costs will be passed on to the consumers of the lots in these areas. The development industry has requested that the province compensate for the additional costs incurred to cross the Corridor and the province is presently considering this request.
The Corridor is a continuous band that has variation in width to reflect variations in right-of-way demand. The Corridor is designed to accommodate a consistent number of facilities along a length of certain width. However, many utilities do not require an alignment along an entire length but can pass in and out of the Corridor in a short distance. This results in an uneven use of the space for the component. Utilities prefer a straight alignment to minimize construction costs and oppose a zigzag route. This results in the loss of land for rights-of-way.

A Corridor with a roadway component in a metropolitan area experiences design difficulties imposed by interchanges. Most metropolitan limited access roadways require a large number of interchanges to direct traffic to and from the facility. While pipelines and powerlines have a consistent width, a road right-of-way has width variations due to the interchange land requirements. An interchange can require a half mile of land. Pipelines and powerlines must deflect around interchanges, which increases the length and increases construction costs. The greater the number of interchanges, the greater the costs.

The Corridor was designed to be incorporated within the city with urban development straddling the R.D.A. Once development lies adjacent to the outer boundary of the Corridor, a barrier to right-of-way access to the Corridor could be created. To overcome this problem, a number of short penetrator Corridors have been proposed to provide radial access through to the major Corridor. These Corridors must be of sufficient width and length to ensure the major Corridor is used to its full capacity. To minimize land use and community impacts, these penetrators must be established prior to
intensive development outside the R.D.A. The identification of suitable locations for these facilities is as difficult a problem as determining Corridor width.

Secondary land uses have been identified to help integrate the Corridor into the adjacent land use pattern but the adjacent land developers have not recognized the surface use of the Corridor as an opportunity. An examination of the land use plans for land adjacent to the boundary reveals that many of the subdivisions are designed with lots that back onto the Corridor and create a barrier. Furthermore, only a limited number of access points have been provided through these subdivisions to reduce the barrier effect of the Corridor. There are no examples where a subdivision open space use, such as a park reserve, has been designed to be linked with the open space of the Corridor. The Corridor, therefore, remains isolated from adjacent development.

When the R.D.A.s were established, they were often called Greenbelts. A review of the newspaper articles on the R.D.A.s reveals that the media have used this term in most articles. A powerline is being proposed along the east side of Edmonton. The company wants to use portions of an existing right-of-way within the city but the Department of the Environment has requested an alternative alignment within the Sherwood Park West R.D.A. (i.e., within the Corridor) be provided. Major opposition has arisen from the landowners adjacent to the R.D.A. They argue that a powerline is unsightly and not an appropriate use for a Greenbelt. The application is presently before the E.R.C.B.

The utility companies have not accepted the Corridors without reservations. A review of permit applications for facilities in or near the
Corridors indicates a reluctance to use a Corridor alignment. This reluctance stems from three sources, the existence of private landowners in the Corridor, the uncertainty over the alignment of the Ring Road right-of-way and the increases in construction costs. The remaining landowners in the R.D.A. are not interested in selling their land for a variety of reasons and can require the utility company to face a prolonged approval process through submission of an intervention. Until the Ring Road is constructed, the possibility exists that there will be changes in the right-of-way boundary. Since the road right-of-way forms the core of the Corridor and all facilities are arranged in the Corridor with reference to this right-of-way, any changes could necessitate difficult and costly relocations. As noted above, a Corridor alignment can require that the facility not use the shortest route. The interchanges and the circular aspect of the Corridor results in the need for bends and deflections in the alignments. Both of these result in increased costs.

The Corridor is administered by the cooperative efforts of a number of provincial and municipal agencies. While the R.D.A. regulation grants the Department of the Environment control over land use in the designated area, it does not provide for control over activities on adjacent land that could impact the Corridor. The Regulations do not provide a mechanism to require industry to use a Corridor alignment. By refusing to grant Ministerial Approval pursuant to the *Pipelines Act* or the *Hydro and Electric Energy Act* for alignments outside the Corridor, the Department of the Environment can pressure the companies to provide a Corridor alternative. There is no mechanism to ensure that the E.R.C.B. approves the Corridor alternative, as the E.R.C.B. has to consider each application on its merits and not be
predisposed to a specific alignment or use precedent. There is no mechanism to require the agencies to cooperate and to resolve disputes. The program functions to a certain extent on the understanding and reasonableness of agency staff. As development pressures increase and there are a greater number of facilities in the Corridor, this management system may not be capable of handling the conflicts and pressures.

5.6 Conclusion

The Alberta Corridor program was established due to a number of unique circumstances.

Although there were very large land acquisition costs associated with the program, the province had access to vast budget surpluses that reduced the significance of the acquisition costs. The province saw the Corridor program as a major component of their balanced growth policy.

The policy of balanced growth and the determination of major industrial sites and the cooperation of industry, made the determination of the location and width of Corridors possible.

The R.D.A. Regulation is unique legislation that provides a means to control land use and expropriate property. Its superior standing requires the compliance of the other agencies and interests in the Corridor, to the Department of the Environment's requirements. It provides a coordinating function.
CHAPTER SIX  CONCLUSIONS

In this chapter, a summary of the conclusions about the thesis hypothesis will be provided. Conclusions regarding the requirements for Corridor implementation will be put forward and those requiring further research will be noted. Finally, the implication of Corridor implementation to planning will be discussed.

6.1 Hypothesis Conclusions

The hypotheses to be addressed in these were:

1. That Corridors provide economic, environmental and social net benefits for the community in the long term.

2. That, in spite of the benefits to the community, Corridors have not been established universally because:
   a) the need to own the land requires a large capital investment;
   b) determining the appropriate Corridor width and location is difficult due to the variety of facilities having incompatible location requirements; and
   c) the lack of an institutional framework to coordinate the variety of regulatory agencies and interests involved with the linear facilities.

Chapter Three outlined the benefits and disadvantages to Corridor implementation. Most of the advantages and disadvantages for the potential users are short term, and related to the decision to locate in a single
right-of-way or in a Corridor alignment. The disadvantage of Corridors to the community focus on the major fiscal contribution. The community that implements Corridors receives net benefits in the long term through the preservation of their resources and the land use options for future generations.

In Chapter Two, the linear facilities right-of-way criteria and impacts and the compatibility between linear facilities was discussed. It was shown that the location and the width of rights-of-way is dependent upon site and project specific characteristics. In Chapter Three, it was noted that three major disadvantages inhibited Corridor implementation, including high land costs, the difficulty in locating and establishing the width of Corridors and the lack of an implementation mechanism or institutional framework to coordinate the government departments, regulatory agencies, and public and private utilities. The case study of the Alberta Corridor program indicated how, through a unique set of circumstances, these problems were overcome to allow for the establishment of two transportation/utility Corridors.

6.2 Alternatives for Corridor Implementation

The ideal situation is to have identified actual projects and associated linear facilities and the probable route, have full ownership of the route and have the ability to control the location of the facilities. This combination is difficult to achieve but this does not mean that Corridors cannot be established unless all of the conditions are met. It is possible to estimate linear facility development, identify right-of-way need and design a Corridor location and width to meet the minimum requirements of the
projected facilities. The argument being that the costs of overestimating demand are less than the costs incurred by not controlling right-of-way development.

There are three techniques to locate and establish a width for Corridors that can overcome some of the implementation difficulties. These are the use of existing rights-of-way, developing a Corridor grid and identifying areas that are restricted for rights-of-way.

Existing Rights-of-Way

An established right-of-way through an area, especially a road or railway right-of-way, has a major impact on the area. The addition of land for future rights-of-way adjacent to the existing facility will increase the impact but not as greatly as single rights-of-way. The choice of the existing right-of-way to be followed must meet the objectives of providing needed access but minimizing impacts.

Corridor Grid

A grid of Corridor would likely work best within urban areas as noted by Lea (1969) and Leisch (1969). Using the major arterial pattern as the basis of the grid, a fixed width would be set aside adjacent to the road right-of-way for future rights-of-way. The width would be established by examining the existing right-of-way commitment and projecting future requirements.

Restricted Areas

In Montana, the Bureau of Land Management and the Forest Service have a program to identify avoidance areas, inclusion areas and windows. In the Utility-Transportation Corridor Study for Montana, these are defined as follows:
Avoidance areas - Land areas that pose particular environmental impacts which would be difficult or impossible to mitigate or which pose unusual engineering constraints (1981, 57).

Exclusion areas - Land areas determined to be unavailable for corridor allocation or facility siting for reasons of unsuitability, legislative classification, or prior, unalterable allocation to uses incompatible with facility siting (1981, 57).

Window - Usually short, narrow passageways through constrained areas which are the most feasible potential locations for linear facilities, considering engineering and/or environmental factors (1981, 58).

The approach to Corridor planning is reversed. By identifying areas that are not available or suitable for rights-of-way, appropriate Corridor locations are identified by default.

These alternatives work best in areas under control of a government agency or agencies, such as municipal government or management agencies for Crown lands.

6.3 Further Research

From the existing literature, it is not clear what the range of additional costs of using a Corridor alignment are to the utilities. A comparison is required of the costs and benefits associated with a facility route within the Edmonton Corridor and those associated with a route outside or without the Corridor.

The costs of overestimating a Corridor land requirement should be identified. The lost opportunity costs and the consequences of an unused strip of land on the adjacent land use pattern should be determined.

It would be interesting to examine why municipalities, such as Sarnia, with similar linear facility pressure to Edmonton have not established a
Corridor. The means that have provided for right-of-way access and the problem should be identified.

6.4 Implications for Planning

Corridors will not resolve all linear facility right-of-way concerns. The spatial distribution of resources, terminals and population centres prohibits the location of all rights-of-way in Corridors. However, where there are patterns of heavy right-of-way use and demand, Corridors can reduce the impacts of these facilities. Corridors can be used to promote the development of a remote site in a manner similar to the provision of infrastructure in an urban area. Corridors can help balance resource development and associated right-of-way needs with the preservation of the environment. The major implication of Corridors is that it incorporates the planning of utilities in the municipal or provincial land use planning process. In Alberta, powerlines and pipelines, through provisions of, and exemption to the Planning Act, are not included in the land use planning process. These facilities are under the jurisdiction of other Acts and Regulations that provide for land use planning concerns but only in a reactive manner (i.e., responding to applications and lodging interventions). Planning for Corridors allows rights-of-way to be treated in the same manner (i.e. protect and provide opportunities as all other land uses). At present, primarily economics and engineering factors influence right-of-way planning. Corridors would ensure that these facilities were integrated with and not at odds with policies for all other uses for land.
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