THE VISUAL PERCEPTION OF THE HIGHWAY LANDSCAPE

A VISUAL ANALYSIS OF THE TRANS-CANADA HIGHWAY CORRIDOR

33

BY

TERRY F. MINARIK

A practicum submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

MASTER OF LANDSCAPE ARCHITECTURE

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a Visual Analysis of the Trans-Canada Highway Corridor

by. Terry f. Minarik

A Practicum submitted in Partial Fulfilment
of the Requirements for the Degree,
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Department of Landscape Architecture
University of Manitoba
Winnipeg, Manitoba, Canada.
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Abstract

In addressing the premise integration of people and the environment, landscape architects adhere to a basic philosophical commitment, that projects must be planned, designed and implemented in a manner that compliments both the natural and cultural landscape.

When this philosophy is applied to the highway environment there are many connectors between the environmental, physical, an functional components which are regularly encountered. The successful integration of these directly affect the quality of the highway experience. If the components are properly orchestrated, the driver would see how the landscape is organized, what it symbolizes, how people use it, and gain an appreciation of how it relates to them.

History has proven that it is possible to create a road which is scenic without preempting functional and safety concerns. To do this requires a complete understanding of the highway environment and consideration of aesthetic, functional and environmental parameters in combination. The articulation and implementation of Landscape Architecture design philosophies results in a balance between facility requirements, natural environments and user needs, a condition currently absent in the engineered environment of the Trans-Canada Highway.

The study identifies a process that attempts to define the character of the highway lanndscape within the environment in such a manner that allows the traveller to become more aware of the natural and cultural features through which they are passing. This process is intended to reduce the visual boredom and increase the visual enjoyment and contribute to the understanding of the natural and cultural forces that created the adjacent landscape. The study explores the highway

landscape in great detail through both a thematic inventory and a graphic Visual Analysis of the Trans-Canada Highway between the cities of Winnipeg and Portage la Prairie. The resultant product is a set of design guidelines that can serve as a framework for future highway design, as well as current highway rehabilitation and enhancement within the context of the highway corridor.

Within this practicum various techniques of inventory analysis and design are used in the development of the highway corridor, first efforts toward improving the highway experience. The crucial test will come in applying these ideas to an actual design situation, and in evaluating the results obtained. Here, techniques of design and analysis can be refined and our understanding of principles strengthened.

Acknowledgements

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Forward

Note: *Following is the quoted account of Edward McCourt, who travelled the Newly Completed Trans-Canada Highway Corridor in 1965 and recorded his expedition in:*

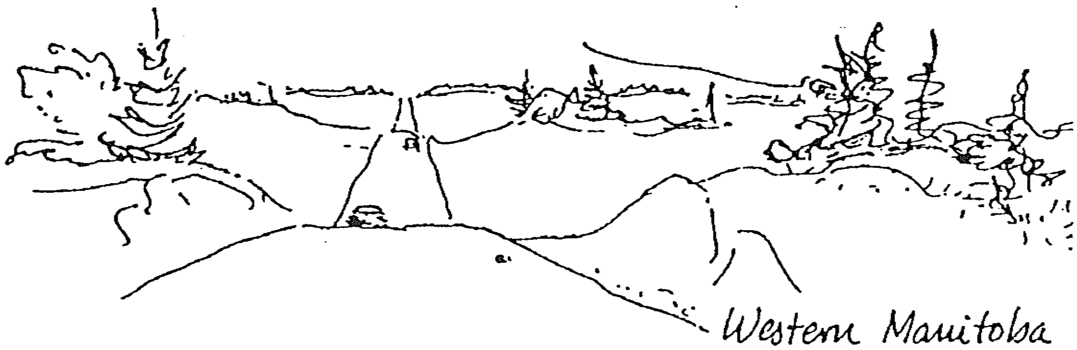
THE ROAD ACROSS CANADA

"Of all the provinces of Canada, the Trans-Canada Highway in Manitoba is the most difficult for the outsider to come to grips with. Manitoba is always spoken of as one of the three prairie provinces but the Laurentian Shield does not terminate at the border. Western Ontario and eastern Manitoba form a homogenous landmass; and the Highway continues for a hundred miles or more through rock and forest muskeg, skirting the southeast corner of the Whiteshell Forest Reserve. A recreational area of some 1,500 square miles which is now being developed as a vast provincial playground and tourist attraction. Falcon Lake lying along side the Highway just inside the eastern border is so far the showpiece of the reserve. Around it's shores are to be found all the amenities; campsites, picnic grounds, golf course, motels, restaurants, features of life in the wilderness."

"A tourist who sticks to the Trans-Canada Highway and by-passes Winnipeg on alternate route No.1A may traverse the entire width of the province and note hardly a feature worth remembering. The Whiteshell and Agassiz forest reserves mark the petering out of the Laurentian Shield; the flat plains around Winnipeg, once the bed of ancient Lake Agassiz in a time following the melting of a mighty ice-age glacier, do not compare in sweep and lonely grandeur with those of Southern Saskatchewan and Alberta; the rivers, except when in flood, are uninteresting tree-lined streams which we pass over almost before we are aware of their existence; and the few valleys and low hills visible from the highway attract our attention not because of their size or beauty but simply because they exist at all. Only the great marshlands lying far north of the highway and the mighty lakes they border are without duplication elsewhere, and they are not to every man's taste. Manitoba's only importance comes as it appertains to the past and what is to come, it is one of the most interesting of our provinces because of the men who shaped it long ago. A drive north to Lake Winnipeg along the lower reaches of the Red River re-creates as no volume of history can do the sad journeyings of the dispossessed; and a town as dull and stereotyped as Portage La Prairie acquires an interest and glamour which Brandon can never share when we remember that La Verendreye found it more than 200 years ago."

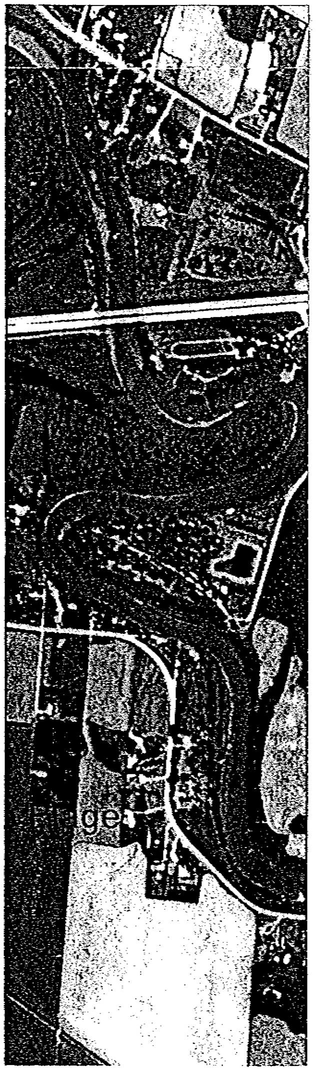
"West from Portage La Prairie there is little of historic interest to compensate for the drabness of the landscape, for here the only story to be told is that of land settlement, a story no doubt rich in human interest but lacking spectacular events of heroic personalities. Brandon is a well-treed town in the wide valley of the Assiniboine, and the centre of a model farming district. The town of Virden, thirty miles from the Saskatchewan border; marks the centre of Manitoba's first significant oil development. Donkey engines pump away in the nearby wheat fields, and even within the limits of the town itself. The result are no doubt profitable but they are also unsightly."

"Between Portage La Prairie and the Saskatchewan border the highway passes out of the old Lake Agassiz bed through the Manitoba Escarpment, a line of broken ridges and hills running from the Pasquia Hills in northern Saskatchewan southeast through the Porcupine Forest Reserve and Riding Mountain National Park to Turtle Mountain near the American border. The escarpment once formed the western shore of Lake Agassiz."



"But the highway traveller is not likely to be aware of any significant change in the landscape, only that he passed from the Great Shield into a region where the earth rolls a little and casts up a few low hills far off."

Manitoba 1965, The Road Across



PART ONE

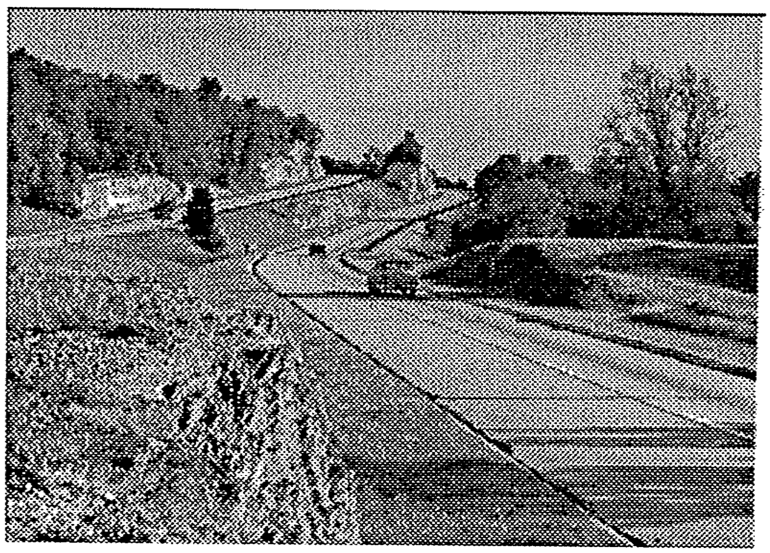
Introduction

A basic premise of landscape Architecture is that human made features can be successfully integrated with natural environments. Such integration requires careful consideration of many factors. These factors are technological, ecological, historical and cultural as well as visual and aesthetic related.

In addressing the integration of people and the environment, Landscape Architects adhere to a basic philosophical commitment that projects must be planned, designed and implemented in a manner that compliments the environment and adjacent land uses.

When applied to a highway environment there are many connectors between the environmental, physical and functional components which are regularly encountered. The successful integration of these directly affect the quality of the highway experience. The view from the road can be a dramatic play of space and motion, of light and texture, all on a new scale. These long sequences have the potential to make our vast regional landscapes comprehensive. If the components are properly orchestrated, the driver would see how the landscape is organized, what it symbolizes, how people use it, and gain an appreciation of how it relates to them.

While highways reveal the landscape to us through the movement of the viewer, they also remove pieces of it from our visual contact both creating and blocking views. Along the Trans-Canada Highway the majority of user experience comes from viewing the landscape through a vehicles windshield, and the surrounding aesthetics become a part of particular significance. The functional parameters which must be served by the road are visible and can therefore be categorized as having aesthetic impact. Also aesthetic parameters such as a distant view, can also have an impact on highway design; particularly aspects of alignment, location and right-of-way treatments. History has proven that it is possible to create a road which is scenic without preempting functional and safety concerns. To do this requires a complete understanding of the highway environment and consideration of aesthetic, functional and environmental parameters in combination. Design involves a balanced judgement about many factors, of which visual requirements are only one parameter. We as Landscape Architects are convinced however, that these requirements are among the most important that a road must satisfy.



' History has proven that it is possible to create a road which is scenic whitout preempting functional and safety concerns '

The articulation and implementation of Landscape Architecture design philosophies results in a balance between facility, requirements, natural environments and user needs, a condition absent in the engineered environment of the Trans-Canada Highway.

The aim of this study is to undertake a Visual Analysis of the Trans-Canada Highway between the City of Winnipeg and Portage La Prairie from a LLandscapeArchitecture point of view and to:

1. *Identify a means that attempts to establish the presence of the highway within the environment and to allow the traveller to become more aware of the natural and cultural features that they are passing through.*

2. *To increase visual enjoyment and contribute to the understanding of the natural and cultural forces that created this landscape.*

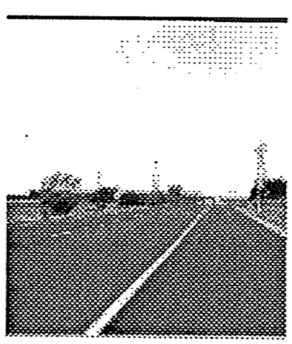
3. *Propose guidelines for future highway enhancement and development within the context of the Trans-Canada Highway Corridor.*

By analyzing the natural and cultural components found in this environment the study explores the linkage and integration between highway and landscape, defining a sense of place.

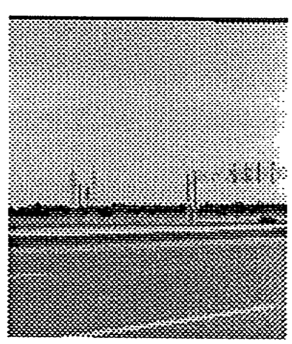
IMPORTANCE OF REGIONAL PARAMETERS

The consideration of Regional Parameters is particularly important in the aesthetic design of roadways since the driving experience as a function of scale generally enhances the appreciation of major landscape elements rather than the appreciation of specific details.

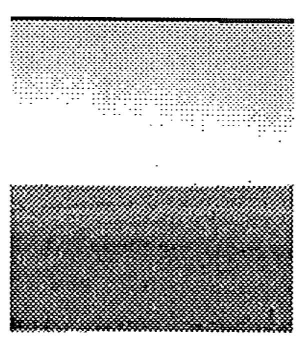
Regional mapping of visual character and landmarks (physical, ecological, cultural, historic) allows one to establish the overall aesthetic quality of the project setting. Within the Province of Manitoba, for example, the complete inventory must be initially examined to establish those areas which require very careful aesthetic consideration.



' Views of the road from the road '



' Views from adjacent areas '



' Views from the road '

When determining visual character, three aesthetic viewpoints are considered. The first, *'views of the road from the road,'* allow one to catalogue and assess the visual fit of the roads functional parameters with the landscape form. The second, *'views from the road,'* provide much of the data upon which the trip will be remembered, such as the view of a meandering river or the view of a hidden valley. The third viewpoint, *'appearance of the road from adjacent areas,'* recognizes that other facilities are significant and their success is related to how well the road fits within the overall environment.

When travelling the Trans-Canada Highway, we primarily experience the landscape from a vehicle moving at 100km/hr. Because of this, site developments should be strongly affected by the regional and local context in which they are located. In analyzing regional and local aesthetic components the relationship between the aesthetic experiences generated within the region must be comparable to the visual experience of the immediate roadside, and the preceding visual references obtained along the roadway. The resulting design synthesis provides the "windshield" tourists with a more complete appreciation of the landscape through which they are travelling.

It is often necessary to illustrate the development of a specific site and address specific site treatments to accommodate a sequence of regional and local views or to screen unsightly features from a locally important viewpoint. In designing for this conflicts sometimes arise between the site specific and regional requirements. Resolving these conflicts may demand that the site be deliberately manipulated to accommodate the larger landscape parameters, as these features most often provide the more memorable and definitive experience. However, this does not preclude the need to recognize site specific features for they also contribute to the overall visual experience.

Source: Twinning the Trans-Canada Highway

STUDY AREA

The study area is within the context of the Trans-Canada Highway between the City of Winnipeg and the City of Portage La Prairie. The identification of a regional landscape units within the Province of Manitoba will be the contextual focus for development. The regional landscape unit boundaries are determined by the concurrence of similar existing ecological, geological, cultural and physical features within this environment. The edges of the boundaries are determined by town site and the most identifiable landmarks within the Trans-Canada Highway Corridor. The study will direct its inventory, analysis and Development Strategy towards a single Landscape Unit. However, it is intended that the study process used within this Regional analysis can easily be adapted to or addressed within any other Region within the Trans-Canada Highway Corridor.

' The regional landscape unit boundaries are determined by the concurrence of similar existing ecological, geological, cultural and physical features within this environment '

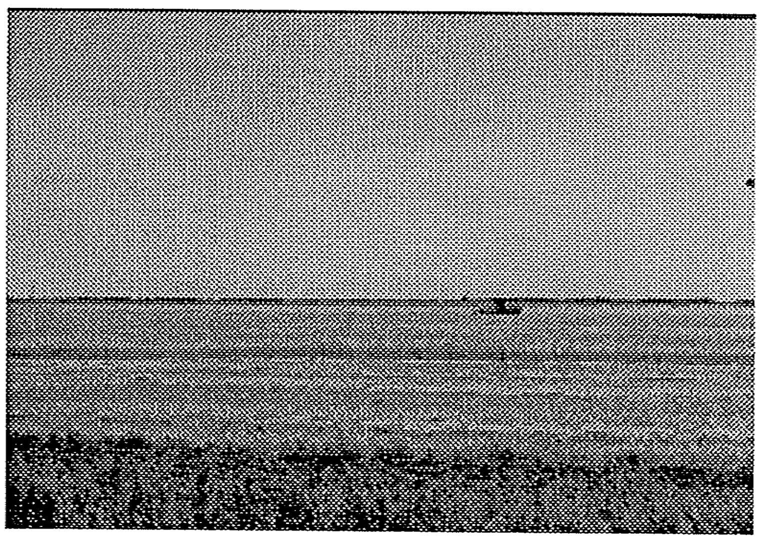
STUDY ISSUES, GOALS AND OBJECTIVES

The articulation of Landscape Architecture design philosophies results in a balance between facility requirements, natural environments and user needs. The emphasis of this study shall be on the presence of the highway within an existing environment, how it relates, and how it is perceived. The viewshed of the highway user will serve as the vehicle of expression to enhance the relationship between man and the environment and create an understanding of this highway landscape.

ISSUES

1. The Trans-Canada Highway corridor lacks any development guidelines as related to the Highway R.O.W., adjacent landscape and landscape viewsheds. The highway development process currently used is employed on a project by project basis with landscape treatment being addressed on individual basis or strictly from a safety, maintenance and engineering standpoint.

2. The perception of the Trans-Canada Highway environment by the highway user is greatly misunderstood within certain contexts; particularly within the Prairie Region.



' The open spaces of the prairie region are often not appreciated and greatly misunderstood.'

GOALS

The execution of this study is to include the following goals:

a) Establish a data base of a single landscape unit identifying the natural landscape elements, including topography and physical features, ecological characteristics recreational attributes, cultural qualities, historical features and visual values.

b) Formulate guidelines for highway landscape development relating to: improved perceptual quality and appearance, aesthetic values, the enhancement of historic features, protection against erosion, and enhancement planting, all of which affect the visual quality of the Manitoban highway landscape.

c) Investigate and identify landscape elements and other features for potential corridor enhancement and multi-use development possibilities within the right-of-way.

d) Formulate a conceptual development strategy and procedure that presents a characteristic view of the prairie along the Trans-Canada Highway within the Manitoba landscape and makes the highway traveller more aware of the natural and cultural features through which they are passing.

e) Illustrate the application of the proposed highway landscape guidelines and a strategy for a prototypical site concept development and enhancement project addressing the intent of this practicum.

OBJECTIVES

1. To inventory the existing area characteristics related to topographical, ecological, historical and cultural, technological and recreation features of the regional landscape units along the Manitoba Trans-Canada Highway Corridor from Portage La Prairie to Winnipeg.

2. To undertake a qualitative biophysical and visual analysis of the highway landscape by employing a modified Litton Technique to identify the inherent qualities of the Region and provide an overview which addresses opportunities and constraints as related to the Trans-Canada Highway environment.

3. To identify guidelines for highway landscape development by utilizing development principles of the AASHO(American Association of State Highway Officials) Adopted

"Guide for Highway Landscape and Environmental Design" as a resource base, and by applying analytical results of site specific resources and Litton visual analysis to the Trans-Canada Highway Corridor context within Manitoba.

4. To examine the process of site development and enhancement of the Trans-Canada Highway by using the natural and cultural heritage of the highway landscape as a vehicle to express a characteristic view of the prairie in the highway environment and increasing the visual enjoyment of a region.

METHODOLOGY

This practicum has been organized into seven distinct parts. Part one deals with the introduction to the problem statement and the study issues. The second is directed specifically at the Trans-Canada Highway in context. The third part creates graphic inventory to be used in the analysis of the Trans-Canada Highway. The fourth is a development of highway landscape design guidelines. Part five isolates specific site treatments within the Trans-Canada corridor; with part six demonstrating the application of the study process on the development of a safety rest stop area. The practicum is concluded with a look at design process and ideas for future study.

PART ONE introduces the reader to the basic premise of landscape architecture, and when applied to the highway environment, what it reveals to us. Part one describes the intent of the practicum, it's regional parameters and study area. The issues, goals and objectives are stated and the study methodology is outlined both graphically and in written form.

PART TWO discusses perception and the visual landscape. The focus here, is on a functional approach to landscape aesthetics. Peoples' reactions are viewed in terms of what sense they are able to make out of a scene and what interest they are able to find in it. The four elements of coherence, complexity, legibility, and mystery provide a means of assessing landscape quality that are empirically based while at the same time intuitively meaningful.

PART THREE outlines the Trans-Canada in context from the national to provincial to regional levels. On a national level the Trans-Canada Highway is introduced. The study looks at the highway historically from the idea stage to early construction, what is was intended to serve as and what is today. From a national level the study moves to a provincial context. The provincial context looks at the Province of Manitoba, what it is composed of and what a highway driver experiences when passing through it. It studies cultural and natural aspects of it's landscape character, looking at it's history and modern development. The regional context is a graphic inventory of the Trans-Canada Highway from Portage la Prairie to Winnipeg. The inventory looks at natural landscape elements, recreational potential, topographic and physical characteristics, ecological factors, technological quality, historical features and visual values. The information from this inventory produces images to be used later as tools for design symbolizing direct meaning to development in the highway landscape.

PART FOUR is a graphic application of the modified Litton Technique to be used for the recognition of the visual and scenic resources along the Trans-Canada Highway Corridor. Although descriptive, the graphic application will be accompanied by additional analysis within the practicum. The technique is presented in part four under the following general areas; the Litton Technique- an Analysis, a Summation, and as Applied to the Evaluation of the Trans-Canada Highway, followed by an Overview Analysis.

PART FIVE develops specific design guidelines to be used to enhance, mitigate, or rehabilitate the highway to conform with the characteristic landscape. General design guidelines precede the highway landscape design guidelines identifying basic principles of architectural design. These principles are extended into the highway landscape to improve perceptual qualities and appearance, enhance aesthetic values, preserve historic features, develop appropriate plantings, and reduce roadside maintenance in the landscape design.

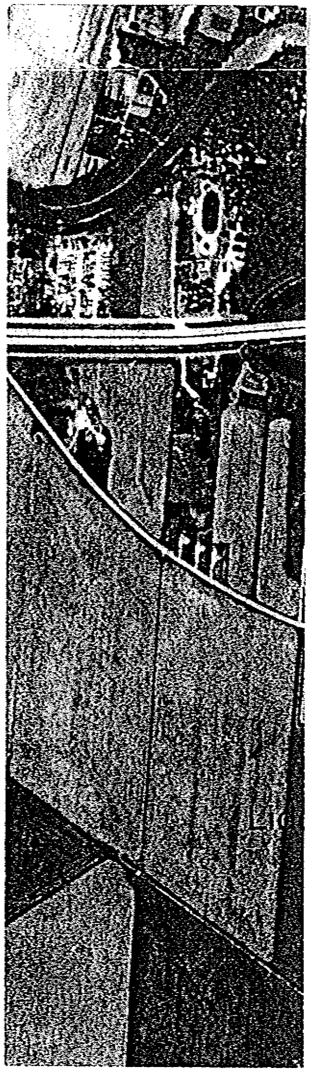
PART SIX identifies the site treatment within the highway landscape. Certain areas along the highway require detailed study and special treatment because of their importance in the highway system, their value in the landscape, and their unique character or use. This section identifies and evaluates these special sites, enabling the necessary design of these areas to be developed concurrently with the other phases of the highway design. The sites may include interchanges, safety rest areas, information centres, historic sites, weigh stations, and maintenance areas.

PART SEVEN is the design and development process associated with the site treatment areas in the highway corridor. The process stresses preservation and utilization of many of the site features identified. The design process involves a thorough analysis of the proposed site, a diagrammatic analysis of the functions of proposed site treatment components and alignment studies relating the highway to the site. The last step of the design process is a concept plan of the proposed site showing the relationship of the site's physical features to the site treatment program requirements.

PART EIGHT concludes the practicum stating the process undertaken is only the beginning to the subject of highway design and it's gains can be consolidated and extended to further study. The bibliography and appendices provide the reader with relevant background information to the development of this practicum.

PART TWO

Perception



The concept of perception is complex. When related to the landscape, it involves the reception and processing of information gleaned from the landscape. The landscape is the source of both the stimulation and the information. It is important to recognize, however, that perception is conditioned by a range of factors in addition to landscape stimulus and the receptor organs. It is enhanced by an individual's previous experiences; by his values; beliefs and attitudes; by his social and economic well-being; and by his expectations for the future.

The focus here is on a functional approach to landscape aesthetics. People's reactions are viewed in terms of what sense they are able to make out of the scene and what interest they are able to find in it. This analysis applies first to the two-dimensional space of the '*picture plane*', where the assessment is in terms of coherence and complexity.(S.Kaplan1979)

In addition to this '*surface*' analysis, there is a rapid and unconscious assessment of what one would experience if one were to proceed '*deeper*' into the scene. In this way inferences about the nature of the three-dimensional environment lead to conclusions concerning how legible it is likely to be and how much additional information is likely to be provided. These four elements - coherence, complexity, legibility, and mystery - provide means of assessing landscape quality that are empirically based while at the same time intuitively meaningful.(S.Kaplan1975)

Certainly there are environments that one can comprehend and at the same time be stimulating. Likewise, there are environments that offer neither possibility.

In reaching to the visual environment, people seem to relate to the information they pick up in two different ways. They read both to the visual array, the two-dimensional pattern, as if the environment in front of them were a flat picture, as well as to the three-dimensional pattern of space that unfolds before them. The idea of the visual array is easiest to think of in terms of a photograph of any given landscape. The pattern of light and dark on the photograph, the organization of this '*picture plane*', constitutes the basis of this blend of analysis.

As the surface of a photograph can have much or little to look at, scenes can vary in involvement at this level of analysis. Comparably, the pattern of information on the surface of a photograph can be easier or harder to organize, constituting the '*making sense*' aspect of visual array. Let us examine each of these components in somewhat greater detail.

Complexity is the '*involvement*' component at this surface level of analysis. Perhaps more appropriately refereed to as '*diversity*' or "richness", this component was at one time thought to be the sole or at least the primary determinant of aesthetic reactions in general. It reflects how much is '*going on*' in a particular scene and how much there is to look at. If there is very little going on as, for example, a scene consisting of an undifferentiated open field with horizon in the background then preference is likely to be low.(S.Kaplan1975)

Coherence is the '*making sense*' component at this surface level of analysis. It includes those factors which make the picture plane easier to organize, to comprehend, to structure. Coherence is strengthened by anything which makes it easier to organize the pattern of light and dark into a manageable number of major objects and/or areas. These include repeated elements and smooth textures that identify a '*region*' or area of the picture plane. readily identifiable components and in giving a sense of coherence. It is also important that a change in texture or brightness in the visual array is associated with something important going on in the scene. In other words, something that draws one's attention within the scene should turn out to be an important object or a boundary between regions or some other significant property. If what draw's one's attention and what is worth looking at turn out to be different, then the scene lacks coherence.(S.Kaplan1975)

People can only hold a certain amount of information in what is called their ' *working memory* ' at one time. Research on this fact suggests that this limit in capacity is best understood in terms of certain number of major units of information of ' *chunks* '. Thus, rather than being able to hold onto a few distinct larger groupings of information. The current evidence suggests that most people are able to hold approximately five such chunks or units in their working memory at once.(Mander, 1967)

The analysis at the level of the visual array, of the picture plane itself, is important to the viewer but at the same time limited. Landscapes are three-dimensional configurations. It is hardly surprising that people automatically interpret photographs of the environment in term of a third dimension as well.

As we might expect, humans are highly effective at perceiving depth. Perhaps the most central issue in analyzing a scene involves three-dimensional space and its implications. As Appleton (1975) points out, there are implications both in terms of informational opportunities and in terms of informational dangers. The informational opportunities he calls ' *prospect* '. This idea of being able to gather new information has a relationship to the involvement side of the framework. In particular the opportunity to gather new information in the context of an inferred space in what we have come to call ' *mystery* '.

Mystery. One of the most striking aspects of people's reaction to the landscape that suggests a three-dimensional interpretation is their preference for scenes where it appears as if one could see more if one were to ' *walk into* ' the scene a ways. Mystery makes not the presence of new information, but its promise. Mystery embodies the attraction of the bend in the road, the view partially obscured by foliage, the temptation to follow the path just a little farther. Scene high in mystery are characterized by continuity; there is a connection between what is seen and what is anticipated.(Hubbard and Kimball 1917) While there is indeed the suggestion of new information, the character of that new information is implied by the information that is available. Not only is the degree of novelty limited in this way; there is also a sense of control. A sense that the role of exposure to novelty is at the discretion of the viewers. A scene high in mystery is one in which one could learn more if one were to proceed further into the scene. Thus one's rate and direction of travel would serve to limit the rate at which new information must be dealt with. For people readily bored with the familiar and yet uncomfortable with the strange, such an arrangement must be close to ideal.

Mystery implies uncertainty, but here uncertainty in thoroughly constrained and bounded. It is of a limited degree and its rate of introduction us under control. It is by no means beyond comprehension; rather it is possible to anticipate to a reasonable degree. Mystery arouses curiosity. What it evokes is not a blank state of mind but a mind focused on a variety of possibilities, of ideas of what might be coming next. It may be the very opportunity to anticipate several possibilities that make mystery so fascinating and mind filling.

Legibility. The other aspect of landscape stressed by Appleton concerns safety in the context of space. While he terms the component ' *refuge* ' emphasizing being able to see without being seen, from an informational perspective safety involves more than this. This broad perception of safety closely parallels the ' *making sense* ' side of our framework; we have chosen the term ' *legibility* ' to refer to the possibility of making sense within a three-dimensional space.(Appleton 1975)

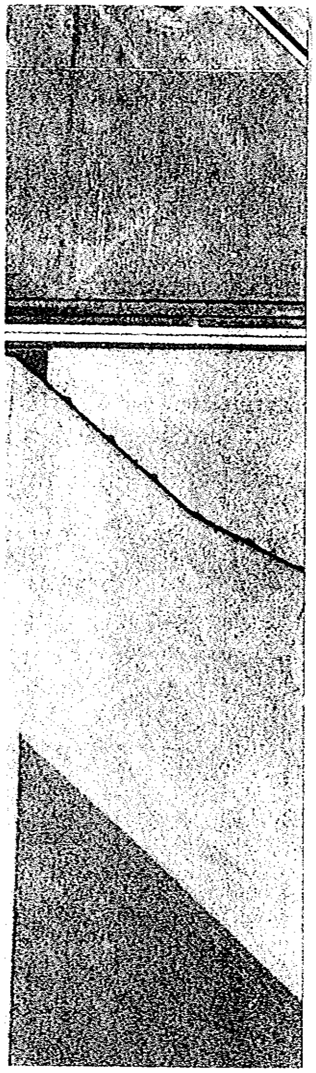
Like mystery, legibility entails a promise, a prediction, but in this case not of the opportunity to learn but to function. It is concerned with interpreting the space, with finding one's way and with finding one's way back. Hence it deals with the structuring of space, with its differentiation, with it readability. It is like coherence but instead of dealing with the organization of the ' *picture plane* ' it deals with the organization of the ground plane, of the space that extends out from the foreground to the horizon.

A highly legible scene is one that is easy to oversee and to form a cognitive map of. Hence legibility is greater when there is considerable apparent depth and a well defined space. Textures aid in this and so do descriptive elements well distributed throughout the space that can serve as landmarks. Another aspect of legibility involves the ease with which one can perceive the space as divided up into subareas or regions. There is a strong parallel here to what makes a scene coherent, but coherence differs in referring to the organization of the visual array rather than to the three-dimensional space. Coherence concerns the conditions for perceiving while legibility concerns the conditions for moving within the space.

The interpretation of a scene in three dimensions is, like the analysis of the visual array or '*picture plane*', an automatic and generally unconscious process. People tend not to know that they are doing this. It characteristically happens very rapidly and effortlessly. This process is a processing affordances, of what the environment has to offer. These issues can be looked at in two different manners. One from the perspective of the kinds of information required for making sense and the other as the kinds of information that enhance involvement. On the making sense side, structure is required in a scene to comprehend what is where in the visual array and to interpret the larger spatial configuration. At the same time, there may be few different things in the scene or many. The more complex scene increases the possibilities for what one could look at, and hence, in a sense, increases the uncertainty, likewise it may be implied that a scene is available but beyond one's present view.

There have been many effects in trying to identify the crucial aspects of the human reaction to landscape. It is thought that the more unusual the scenery, the more valuable it is. this is an economic argument, relying mostly on scarcity of the resource. However, while partially true, people's reaction to nature is often of a noneconomic need, an intrusive reaction. People value even common instances of nature, and at the same time rare, and non-natural elements are not valued at all.

There is a sense in which uniqueness is valued. That is when a place has a distinctiveness, a '*sense of place*' that makes it possible to know where one is whenever one visits that place. The purpose of understanding perception when dealing with the visual landscape is to describe a different way of thinking about people, a new way of conceptualizing environment. When people view a landscape they are making a judgement, however intuitive and unconscious this process may be. This judgement concerns the sorts of experiences they would have within the landscape, the ease of locomoting, of moving, of exploring in the environment they are viewing.



PART THREE

The Trans-Canada in Context

THE NEW YORK TIMES - August 5, 1962

"The opening last week of the final link in the chain of roads comprising the 4,860 - mile Trans-Canada Highway signalled the beginning of a new era for motorists travelling across this sprawling country. With the completion of the rugged ninety-two-mile Rogers Pass Highway, it is possible at last to drive with relative ease from St. John's, Nfld., all the way to Victoria, B.C.

The opening of the route, built at immense cost and effort, is an historic occasion for Canada. The event will be formally observed on Sept. 3, when Prime Minister John Diefenbaker will unveil a special memorial at Rogers Pass, in the Canadian Rockies, commemorating the linking of Canada's Atlantic and Pacific shore."

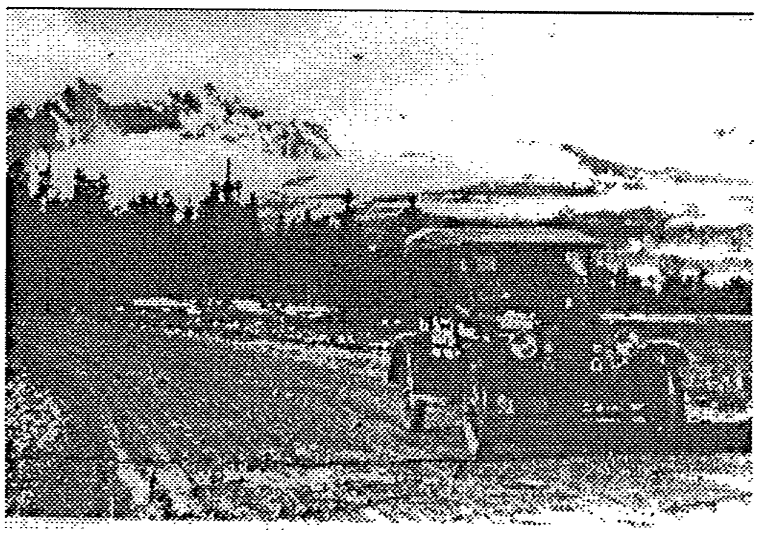
NATIONAL CONTEXT

Not too many years before America began its quest to put a man on the moon, it was impossible for Canadians to cross the country on reliable roads. While the superpowers raced to the stars, Canada achieved a more down-to-earth but equally daunting goal, the completion of a completely paved, nearly eight thousand kilometre highway stretching from coast to coast and across all ten provinces.

The Trans-Canada Highway project was jointly undertaken by the Federal and Provincial governments and called for combining existing roads (sometimes improving them) with newly constructed routes, when necessary. Insofar as it was possible, the highway was to provide the most direct route across Canada, parallel to and within 320 kilometres of the U.S. border.

After all, prior to the 1960's, most cross-Canada motor transportation was via the safer U.S. super highways near by. If the Trans-Canada was to compete for the trucking business, it would have to be easily accessible and not far from the existing U.S. transport routes.

The Trans-Canada Highway Act became law in 1949. Thirteen years later, Prime Minister John Diefenbaker proudly declared the Trans-Canada Highway (TCH) open to all traffic. Over the next twenty-five years, a good number of Canadians packed the family car and drove from coast to coast. Today highway travellers still drive the TCH and marvel at the colour of Canada , the green pastures of British Columbia, blue prairie skies, the ice-cold silver gleam of a northern Ontario winter morning. The highway is the means to show the country exactly as the country is - it brings us face to face with every season and every landscape that is Canada.



'The Trans-Canada Highway signalled the beginning of a new era for motorists linking the nation from coast to coast.'

Although the romance of *"goin' down the road"* from coast-to-coast died with the sixties, virtually all of us have driven at least some part of the Trans-Canada, watching the landscape change from muskeg to mountain to endless prairies, experiencing through bloodshot and tired eyes, the diversity of Canada.(Rataushk 1988). For Canada is different when seen from the road. It's longer, grander, and deadlier. It's comforting, dangerous and hospitable. It pleases all of the people some of the time and maybe even some of the people all of the time. We get out of it what we put into it, as the kilometres tick by.

The Trans-Canada follows many historical paths. It rides over the famous east-west trails of Canada's explores and pioneers. It passes maritime settlements of the Acadians and Loyalists, and it flows arm-in-arm with Quebec's and northern Ontario's voyageur lakes and streams. In the west, the highway connects to what were Hudson Bay Company and the N.W.M.P. forts - now travelling past modern Hudson's Bay Company stores and R.C.M.P. depots - and it nudges up to time-honoured railway tracks through the Rockies and Selkirks, before joining with British Columbia's famed Caribou Wagon Trail to the sea.

Those of us who travel this giant road embark on an epic journey across six time zones, through prairie, forests, and mountain, and at the widest parts of the North American continent. Anyone who has driven long stretches along the highway is familiar with the common emotions: the thrill of a natural wonder; the anger of being caught behind an endless stream of camper trailers; and the evening relief of stumbling out of the car after 1200 hard-driving kilometres. Some say you don't embark on a Trans-Canada trip, you enlist. Drivers are constantly in danger of smashing into a wayward moose, skidding off a bridge that iced before the rest of the roadway, or being hit by falling rocks. Travelling across the second largest country on earth isn't easy, but the rewards are great.

The Trans-Canada, along most of its path, is not a divided superhighway like many of America's freeways. But it doesn't try to be. The Trans-Canada is, rather Canada's Main Street and, in an unassuming way, pulls itself around more than a fifth of the circumference of the planet, at this latitude. The great highway of Canada is twice as long as the Great Wall of China. Beyond the urban congestion of motels, fast food restaurants and self-serve gas bars, the Trans-Canada leads its wanderers along cliffs that can take the breath away, through landscapes that sigh with gentle beauty and beneath the crushing power of mountainside laden with unstable snow.

PROVINCIAL CONTEXT

Manitoba marks the beginning of Canada's real west. Even though the Province saw waves of immigrant settlers long before the rest of Rupert's Land and the Northwest Territories (as western Canada was called then), Manitoba remained a mosaic of distinctive cultures long after younger provinces became more homogenized.(B.Milne 1986)

The route followed by the Trans-Canada Highway through the first two hundred kilometres of Manitoba was once covered by ice some twelve thousand years ago. Two thousand years later the last of the great ice sheets melted, forming four giant lakes: Regina, Indian Head, Souris and Agassiz. Together these prehistoric bodies of water covered the whole of southern Manitoba and Saskatchewan. Where those lakes once drenched the land, are now fertile plains. Where the glaciers once traversed the higher ground, there remains a rough parkland, treed by forests of aspen. In those locations where the retreating waters erode the soil, sandy deltas were sculpted by the wind and mounded into unfertile dunes of sand. The plains have turned out to be some of the most agriculturally productive lands to be found in Canada. Portions of the parklands, as well as the dunes, have stayed almost intact, define all the efforts of farmers and respecting the forces which shaped this landscape.

When the Trans-Canada Highway enters Manitoba, the landscape continues to be much as it has been through Northwestern Ontario, a landscape that appears much the same as it did when the glaciers receded tens of thousands of years ago. The same rocks and evergreens line the route, and if there was not a sign located at the provincial boundary, you would not realize that you had entered a prairie province.

For about ninety kilometres the route continues to be flanked by evergreens, many growing in gently rolling sand dunes. It is only after the Trans-Canada passes through Agassiz and Sandilands provincial forests that the rolling terrain opens up, dotted with communities and almost entirely covered by multi-coloured fields of wheat, canola and other crops.

On a clear, sunny day, and there are many a sunny day to be enjoyed on the prairies, the brightly coloured grain elevators, the surrounding community buildings and the neatly ploughed farm fields, backdropped by deeply blue skies that are often embellished by clouds of various shapes and sizes. You can see why this landscape has captured the attention of painters and photographers ever since European pioneers first attempted to tame the land. Before that, the original terrain with its wild grasses, wildflowers and lazily moving bundles of tumbleweed were often depicted by native artists on tepees and shields - pictures that almost invariably included that monarch of the plains, the North American bison.(B.Milne)

The numbers of bison that roamed over some two million square kilometres of North America before the coming of the Europeans have been estimated at between thirty and forty million. The bison (or buffalo, as it is often incorrectly called) and Manitoba are synonymous even today, though only a few small herds of wild bison remain within the province. This animal, more than any other, provided the first settlers with meat for survival and kept themselves warm with its hides while they built their first soddies (shanties made from prairie sods supported by a lattice of poles) and plowed their first few hectares of land. At the same time, bison became an important economic factor - their meat and hides were transported south by Red River carts (those colourful, wooden-wheeled contraptions that shrieked loudly as they were pulled by oxen or horses) and later transferred to paddle-wheelers for their journey to eastern and southern markets in the U.S. and Canada.

Although Winnipeg can be entered directly east of the city, the Trans-Canada Highway bypasses Manitoba's capital by means of a throughway that virtually rings the built-up area. Exactly 9.6 kilometres beyond the western end of the bypass, the highway crosses the Principal Meridian, a geographical line that was laid out between 1869 and 1871 as the first of five north-to-south baselines aimed at facilitating the land survey of western Canada.(B.Milne). The Metis leader, Louis Reil, who opposed many of the plans that the Canadian government had for the Manitoba region, ordered his men to interrupt the survey work almost as soon as it began. This first Northwest Rebellion, as it was called, was solved politically by the establishment of the province of Manitoba in 1870. Historically, Louis Reil was in fact the founder of Manitoba, for without the Metis rebellion of 1869 the future of this province might well have been quite different.

In any event, the Trans-Canada today crosses the exact point where the first rebellion began, bringing peace to the region for some years. By 1885, however, discontented with the dealings of unscrupulous land speculators, by the plight of Indians starving on the reserve, and by a number of land-ownership problems, the Metis once again asked Riel to plead their cause in Ottawa. He did so, but when the government refused to listen, the Metis declared war, which led to Riel's capture and subsequent execution in 1885. Today it is generally recognized that Riel was a great leader and patriot, and that he and his Metis were driven to the barricades by injustice and the indifference of the Canadian government of the day.

Slightly more than sixteen kilometres from the Principal Meridian, the TCH enters the northern boundary of a tall-grass prairie region that was formerly dominated by such wild grasses as big bluestem and little bluestem as well as by a multitude of wildflowers. This was once a characteristic bison and antelope range, though the only place where these natural grasses can be seen today is in Winnipeg's Living Prairie Museum, where specimens are carefully nurtured.

At Portage la Prairie, where the Trans-Canada joins the Yellow Quill trail, a marker points south to a cairn commemorating Fort la Reine. At this site, in October 1738, Pierre Gaultier de la Verendrye, the French explorer of Canada's west, built the fourth and most important of his wilderness outposts. La Verendrye was the first white explorer to reach the confluence of the Red and Assiniboine rivers, where Winnipeg now stands. Starting from Montreal in 1731, he followed what was to become the voyageur's route up the Ottawa and Mattawa rivers, across Lake Nipissing and along the French River into Lake Huron. Moving along the north shores of Lake Huron and Lake Superior, he then traced a route to the western plains, by way of Rainy River, Lake of the Woods and the Winnipeg River. Along the way, La Verendrye established a series of forts and trading posts. He was the first European to navigate the Winnipeg River, the first to see Lake Winnipeg, the first on the Red, Assiniboine and Saskatchewan rivers, and probably the first to cross the great plans to the Missouri River.

Manitoba's past is evident in its place names. MacGregor hints of the province's first settlers - Irish and Scots who came here under the sponsorship of Douglas, the Earl of Selkirk, St. Eustache recalls the French voyageurs who paddled Manitoba's waterways in search of fur and fortune. Other town names salute Manitoba's largest surge of immigrants, from eastern Europe, who were attracted by the Canadian government promises of freedom and free land.

West of Portage la Prairie, about a half hour's driving time from Sidney, are the Carberry Sand Hills. A side trip to Spruce Woods Provincial Park within the hills south of the Trans-Canada is well worth taking, for nowhere else along the Manitoba section of the highway is there to be found such wild beauty. The land rolls gracefully on its mattress of sand, dotted by quiet ponds and dressed in tall white spruce, which artist and naturalist Ernest Thompson Seton once described as *"a crop of priceless treasures"*. (B.Milne 1986). This fertile oasis is the home of elk and moose, white-tailed deer, coyotes, timber wolves and fox. It is the most scenic and biologically diverse part of southern Manitoba, but motorists will see only a hint of its wonder if they stay on the highway.

In western Manitoba, the Assiniboine River winds back and forth across the Trans-Canada's path. Near one of these crossings lies the City of Brandon, also known as the *"Wheat City"* since the 1880's when it was reputed to lead the world in delivery of grain from farmer's wagons. Views of Brandon from the Trans-Canada are practically impossible, as the City lies beyond a rise to the south of the road.

Oil and saltwater pumps, seen from the roadside near Virden, are reminders of the salt water origin of western Canada. One hundred thirty-six million years ago, the Trans-Canada roadbed was under half a kilometre of water. Today, prehistoric remnants of oil and salt water are the raw materials of Manitoba's small but active petroleum industry.

Along and beyond the Manitoba border, stands of aspen trees which grow in thick concentration around green meadows; they patiently wait for farmers to give up the fight, allowing the trees to reclaim land that was once theirs alone. Aspens stand guard over the Trans-Canada Highway, sun gilding their green leaves and striking through car windshields.

REGIONAL CONTEXT - A GRAPHIC INVENTORY

Introduction

When dealing within the highway landscape corridor many elements of design are important. Inventory and evaluation of natural landscape elements, recreation potential, topographical and physical characteristics, ecological factors, technological qualities, historical features, cultural features and visual values are key in understanding the regional character of the area within.

The information produced in Inventory Analysis creates images of the regional character. These images can be used as tools for design symbolizing direct meaning to site treatment elements in the highway landscape.The Regional Context is best represented through a Graphic Inventory. The creation of themed *' image pannels '* or *' idea boards '*not only help to represent the character of a region, but serve as visually stimulating and highly informative tools to the Landscape Architect.

The highly coloured inventory pannels are illustrated with vibrant colour photographs, maps, and renderings as well as text. The themed pannels use a variety of graphic media that together issue a strong image to the Landscape Architect which may be incorporated in the landscape design

"As we dissect meaning of place, the value of built form most likely reveals itself within the cultural and natural context, which suggests that the built form becomes meaningful only when culture and nature are being examined as an integral system."

Lawrence Halprin RSVP Cycles

Following is the written text of the themed Graphic Inventory pannels.

Silent Thunder

It is now beyond living memory since the pounding of bison hooves on the prairie reverberated like the sound of distant thunder. It is difficult to imagine what it was like when some 75 million plains bison roamed the prairies of North America. Today, only echoes of those ghostly legions may be felt when viewing a captive herd or wandering some forgotten corner of their former range. Here and there across the prairie you may also stumble upon scattered tipi rings, reminders of those who once pursued bison for the essentials of life. When Manitobans contemplate the sight of vast herds of animals, we think immediately of Africa - a continent few of us have seen first hand. Had we the ability to see our own backyards through the eyes of Paul Kene or Alexander Henry, though, we would have seen wildlife spectaculars that rivalled those of the Serengeti Plain. Instead of wildebeest and giraffe sweeping across the horizon, imagine bison and pronghorn, elk and mule deer. But it was the plains bison that overwhelmed the early explorers more than anything else.

' The ground was covered at every point of the compass,
as far as the eye could reach, and every animal was in motion.'

Black Horizon

Alexander Henry the Younger provided one of the most vivid accounts of bison (commonly referred to as "buffalo") in the Red River Valley. On January 14, 1801, while at his Park River Post, he recorded in his journal:

"At daybreak I was awakened by the bellowing of buffaloes. I got up and was astonished when I climbed into the S.W. bastion. On my right the plains were black, and appeared as if in motion, south to north. Opposite the fort the ice was covered; and on my left, to the utmost extent of the reach below us, the river was covered with buffalo moving northward. I had seen almost incredible numbers of buffalo in the fall, but nothing in comparison to what I now beheld. The ground was covered at every point of the compass, as far as the eye could reach, and every animal was in motion."

A Way of Life

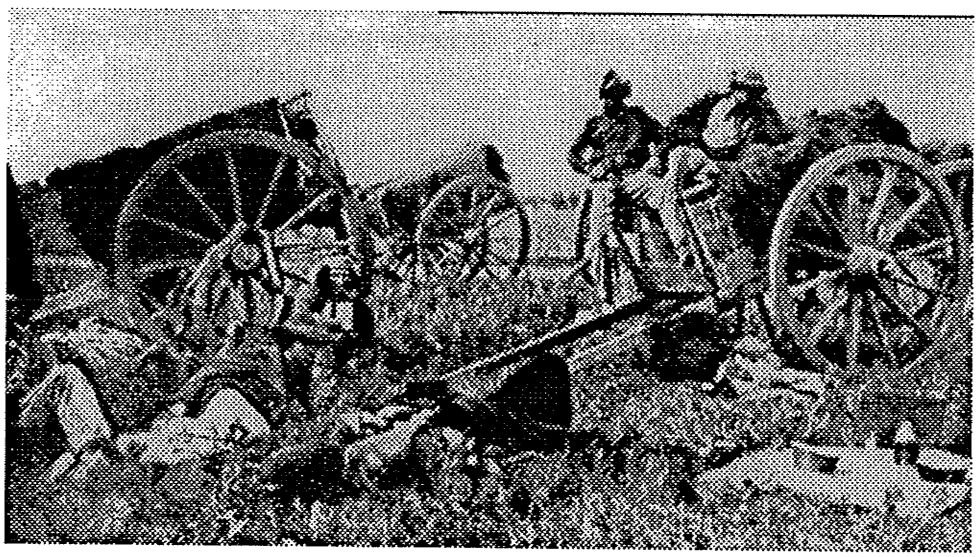
Long before the European traders and explorers arrived, bison provided a way of life for the Plains Indians, but the bison hunts of the plains Indians were soon outmoded by riflemen mounted on horseback. The Métis of the Red River became legendary for their great bison hunting prowess and brigades. Pemmican, the primary food for those in the fur trade, helped fuel a growing juggernaut of European trade and settlement that would soon nearly extinguish most wildlife on the prairies, including the once great bison herds themselves.

The destruction of the plains bison was the end of a way of life for the Plains Indians and the Métis of Assiniboine River Valley. The ability for the Plains Indians to be self-sufficient in food, clothing and shelter was lost; and the Métis no longer had a reason to mount their semi-annual hunting expeditions onto the plains.

White Horse Plains

Western Canada's first settlers were Scottish and Irish immigrants who arrived at Fort Garry (Winnipeg) in 1812 under the sponsorship of Douglas, Earl of Selkirk. Lord Selkirk's 1817 treaty with the Indians gave him the land as far back from the riverbanks as daylight could be seen under the belly of a pony standing on the level prairie, a distance of about 3 km. River lots, laid out along the Assiniboine and Red Rivers, were grouped into parishes that bear names of Scottish and French Saints.

Métis were the offspring of Scottish or French fur traders and Saulteaux or Cree Indians. Many of them worked for the Hudson's Bay and North West companies; their forte was conducting the great annual bison hunts that provided them, the fur traders, and the early settlers with winter food. After the 1821 merger of the two fur trading companies and the closing of duplicate trading posts, the Métis were left unemployed and encouraged to settle on the White Horse Plains in the Red River Valley. Here known as Les Bois Brules (literally, *"burnt wood"*) because of their dark skin, they became a virtual nation of restless, carefree, hospitable, and devout people.*(Ecotours 1980)*



' their forte was conducting the great annual bison hunts that provided them, the fur traders, and the early settlers with winter food.'

When Manitoba became a province in 1870, it was largely French speaking, and its first legislature was dominated by the Métis. This was soon to change, however, with the arrival of many other ethnic groups. Today the White Horse Plains are a multicultural conglomerate, with over forty nationalities represented.

The People of a Colony

The first Hutterites to settle in Canada were a group of 22 from South Dakota who built three colonies near Elie in 1918. Hutterites are a people joined by faith and communal vision who live in farm communities in which property is held jointly by all members, who bunk in dormitories and work together under elected leaders. Each colony is limited to about 100 members, with a community plan resembling the main street of a rural town. There are now sixty such colonies in Manitoba.

Legend

During the early 17th Century, when only Indians roamed the Western Plains, the local Crees were being pushed further north and closer to starvation by the Sioux and Assiniboines. But with the arrival of the white man, the Crees acquired guns and pushed the invaders back. The Assiniboines, who now became their neighbours to the south, were forced to make peace with the Crees. Some years later a band of the Assiniboines made a camp on the banks of the Assiniboine River. The Assiniboine Chief had a beautiful daughter whose hand was sought by two Indian Chiefs, one Cree and the other a Sioux. The father could not resist the gift of a beautiful white horse of rare Mexican breed offered to him by the Cree, and chose the Cree Chief as his future son-in law. Word was sent to the Sioux, and they attacked the Assiniboine camp. In an attempt to escape, the couple rode off on the white horse. After a brisk chase the arrows of the Sioux caught up to the fleeing couple near present-day St. Francois Xavier. The White steed escaped, and for years was seen roaming the plains. As years went by, a belief grew of a ghost white horse that continued to haunt the plains.

A Sea of Grass

Imagine yourself on a hot prairie day in the 1700's. The waves of shoulder high grasses that surround you flow over the southern horizon almost to Texas - a sea of grass one and a half times the size of the province of Manitoba.

Around you, the tall prairie hums with life. A scattered herd of bison grazes its way toward the horizon, shadowed by a few elusive grey forms - plains wolves. Heavy - bodied bumblebees and colourful butterflies seek refuge and nectar in the wildflowers that dot the landscape. The nearby clatter of red - winged blackbirds tells of the rich wetland communities that lend colour and texture to the prairie mosaic. So do the myriads of ducks and geese that crowd the skies come fall.

The very richness of the tall - grass prairie spelled its doom. The sod that protected and rejuvenated the black soils beneath it fell to the plough. Fields of cereal and forage crops soon dominated the prairie landscape as droves of European settlers claimed the new land. Loss of habitat and indiscriminate hunting has pushed the elk and waterfowl into marginal regions. Only a handful of bison escaped overhunting, some species, like the plains wolf, were eliminated completely.

The tall - grass prairie community has adapted to a special combination of moisture, soils, light and other natural phenomena such as wind and fire. There is only one area where these special conditions are met - it extends from Oklahoma through the midwestern states into southern Manitoba.

Fire

Before settlers cleared fields and ploughed firebreaks, a single prairie wildfire could rage from horizon to horizon, burning everything in its path. But for the tall-grass prairie, fire was far from a destructive force. It was, and continues to be, an important part of prairie ecology.

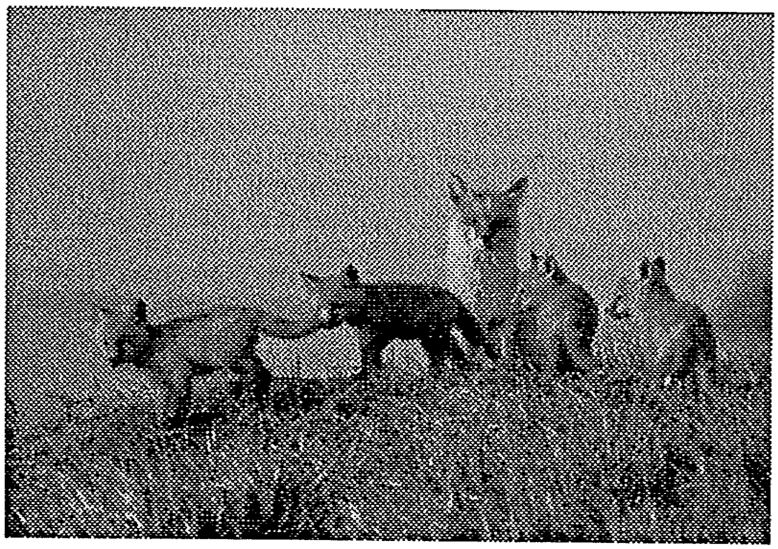
Fire breaks down dead vegetation, returning nutrients to the soil and giving the sun an opportunity to warm the ground earlier in spring. It also retards the growth of trees and shrubs which might otherwise encroach on the prairie. Prairie plants, with much of their energy stored in underground root systems, are better adapted to fire than these competitors, which store more energy in above-ground parts and may be prevented from producing seed if fire occurs early in the growing season.

Wind

The strong winds that fanned prairie wildfires also pollinated prairie plants and later dispersed their seeds. The deep roots that anchored them so firmly and saved them from fire formed a heavy sod that many Red River settlers used to build their homes.

Plants

Prairie plant species have special adaptations to overcome extremes in temperature and moisture. Hairy or rolled leaves reduce moisture loss; deep spreading root systems take advantage of available moisture and store great quantities of food. These adaptations are especially important in surviving the periods of drought that are characteristic of the prairies.



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Because there are few trees, some prairie creatures make their homes in dens or underground burrows. Bumble bees, foxes, badgers, burrowing owls and some reptiles and amphibians spend part of their time under the prairie. Voles, mice and shrews make grass nests in the ground. Tawny coloration, plant-eating and burrowing habits, and an ability to survive drought are characteristics which help prairie animals to thrive in a flat, treeless environment.

Sanctuary of River

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The flow of water is the cycle of fertility renewing itself. It happens only because the sun has been shining, the mists rising, and the rains falling in the distant hills. A deep human instinct of involvement in the onward flow of life, of the cyclical movements of nature, has given us this archetype of flowing water, the sound of it telling us that the world is alive.

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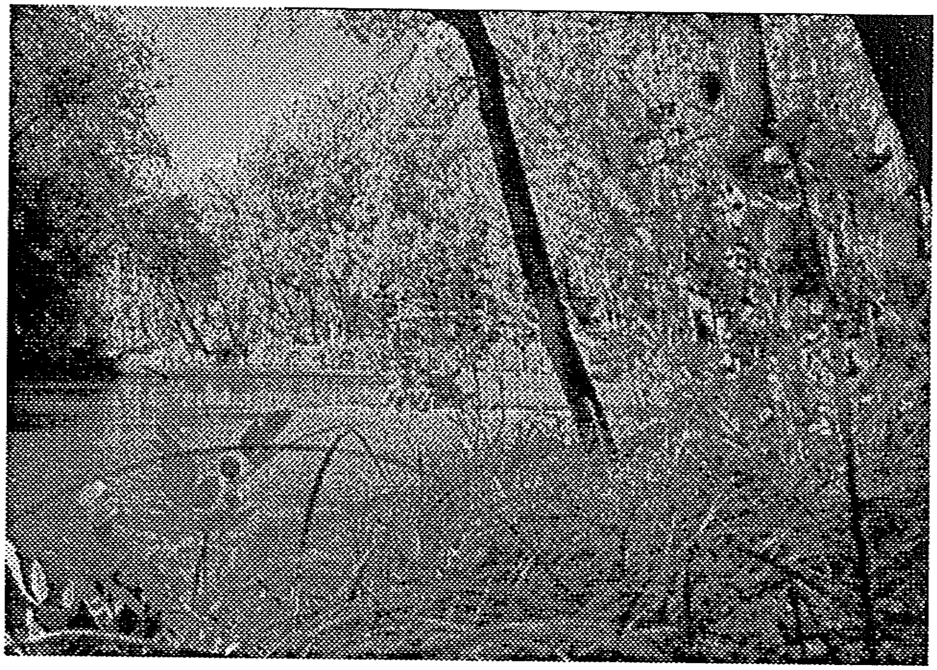

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Life on the Edge

The boundary area between two ecosystems is called an ecotone. Life is varied and abundant wherever these areas occur, a fact well known to bird watchers and hunters. The river shore is an ecotone between the river and the prairie ecosystem in which it exists. This narrow ribbon of land is visited by nearly all of the creatures of the adjoining land ecosystem, and some make it their special province.

A River of Ice

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The Red and Assiniboine rivers are also the villains of the prairie. Slow running with low banks and wide, flat valleys; they are subject to massive flooding. If snowfall has been moderate and the thaw is early and gradual, the river can handle the runoff. But if the snow is deep and it thaws late, the water and ice can suddenly spill over the low banks onto the valley, often carrying away buildings and livestock, and filling basements with the fine silt that the river always carries.

Images of the Prairie

Today only a fraction of former prairie life remains. The most productive prairies, the tall grass and mixed grass regions have given way to mechanized agriculture. The once native vegetation has been ploughed under and destroyed. In its place grow straight rows of corn, symmetrical swaths of wheat, barley and rye-cereal crops to feed the peoples of the world. Roads, highways, train tracks, canals, ditches, fences, power lines, and cultivated windbreaks have divided the landscape into a characteristic patchwork quilt of altered environments.

With the buffalo hunts behind them the Métis and Early Selkirk Settlers turned to agriculture. So that every settler could have access to the Assiniboine river, lots 3200 meters long by only 240 meters wide were laid out between Fort Garry and Portage la Prairie. Shortly thereafter the first settlers in the Assiniboine Valley began to raise grain, corn and vegetables.

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In 1870 the Principle Meridian was established as the first of five north south base lines for land surveyors in Western Canada. Land surveyors sent by Ottawa began to lay out 6-mile-square townships containing thirty six 1-square mile (2.6 km²) sections across western Canada with no concern for either topographic features such as rivers or existing land allocations. When the railroads linked the prairie to outside markets and opened it to widespread settlement, the pioneering in the use of farm machinery led to agricultural efficiency. Mechanization allowed farmers to overcome obstacles in the landscape and led to reclamation of wetlands, crop specialization and adaption.

The prairie landscape today continues to change with new characteristics emerging as icons of a new age. Land holdings are bringing the one section family farm into commercially operated farm corporations. With this amalgamation traditional fence and hedge row boundaries are being removed and new crops have brought new colour to the prairies, and no longer follow the section and range boundaries. New transportation, and technologies are seeing the removal of the elevator, the telephone poles and the rail lines and seeing the emerging of a new, more ambiguous vision of the prairie cultural landscape.

Shelterbelts

Shelter belts further define and protect the disturbed prairie soil fields from destruction, lined in neat rows of Manitoba maple, willow, caragana, and green ash that slow the prairie winds.

Fencelines

Fence lines border the patterned landscape separating one crop from another and defining the edges of a settlers domain.

Grain Elevators

In the distance are the farmyard and grain elevator as a beacon homecoming to the weary traveller.

Powerlines

Communication is seen but not heard, as power lines and transformers line the open landscape and create silhouettes in the setting sun. These are the traditional images of the prairie landscape.

Memories and Old Bones

"Onward the train moved, cutting the plains in two...as it travelled westward it pushed through a country of memories and old bones - furrowed trails fashioned decades before by thousands of bison moving in single file towards the water, vast fields of grey and withered herbage, dead lakes rimmed with telltale crusts of alkali."

Pierre Burton "The Last Spike"

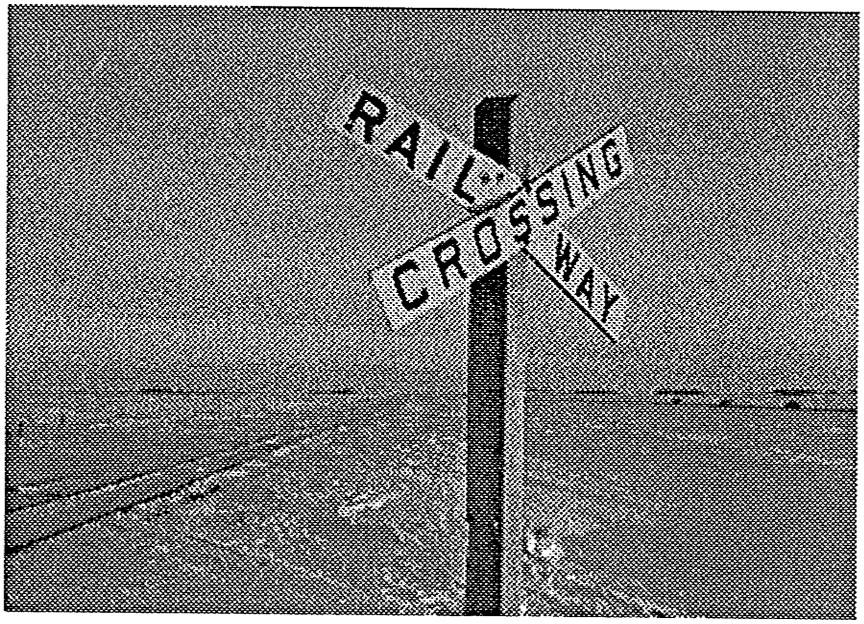
The development of the prairies has set aside these images of the past and with the coming of the railway and the first settlers created a new symbolism within the prairie landscape. Gone are the lone prairie crocus and undisturbed open plains, in its place are the rigid constraints of a manmade environment.

Climate of Extremes

Nowhere else in Canada does weather distress people so much or stimulate so much conversation, as it does on the plains. Every waking moment of the day the grain farmer squints into the sky for signs of rain, hail, frost, blizzards or dust storms. When he's not watching the weather he is talking about it. It dominates his life and makes him the fatalist he is. The climate of the plains is capricious and cruel. Winters are long and extremely cold; summers are short and often unbearably hot. The winds blow unceasingly; in the winter howling blizzards block the highways, bury animals and can cause a man to become lost and perish within distances as short as from his house to his barn.

The plains are extremely dry at times, the average rainfall fluctuates from year to year with periodic droughts that may last as long as ten years. Associated with the drought and often following its devastating effect are dust storms, grasshoppers and the Russian thistle. Sloughs can dry up completely and waterfowl perish by the thousands. Howling winds can fill the air with choking dust for day on end, and precious top soil is swept into sand-like drifts.

In summer the opposite often happens. Winds from the south bring extremes of hot weather to the plains often accompanied by sudden destructive storms. On a hot July or August day, dark, white-capped thunder heads build up on the horizon. Like messengers of doom they roll and broil, while the land below stands watching, helplessly. The terrible calm before the storm is followed by a howling rush of wind that flattens the fields, and too often is accompanied by the roaring beat of hailstones. Often as big as golf balls, they bounce off the hard clay, smash windows and within minutes can beat and flood a crop into a soggy pulp.



'The winds blow unceasingly; in the winter howling blizzards block highways.'

The Letter Home

"I don't believe it is normal even here to have a snowstorm in May but it does happen. Last year they say they got a good layer of snow in mid June and had it not been for that they would not have had a crop for that was the last moisture they got until harvest time...".

"We had a snowstorm, a heat wave, highwinds, rain, a terrible sand storm, hail, thunder and lightening and a sudden cyclone that made the trap door on the cellar hole flap up and down. We seldom have two days alike so if that is the world's healthiest climate, as they say it is, then it certainly is not the most pleasant."

The letter home, July 12, 1911

Razors Edge

Each year snow renews our sense of wonder. The first flakes are always magical, their slow whitening of the landscape drawing us irresistibly out of doors. Animals wonder at snow, but above all, their instincts prepare them to deal with it as a physical force that can freeze or warm, feed or starve, trap or free. We have to deal with snow for only as long as it takes us to shovel our walks and plow our roads, but animals cope with it constantly.

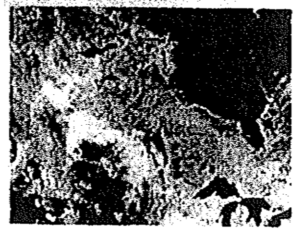
Many animals must travel on a razors edge between survival and death; snow, buy its character or depth, can easily throw them to one side or the other. Every form of life is affected differently by the forms of winter. Even the slightest snow changes the daily movements of an animal; covers seed and insects from view; and adds an element of challenge and excitement to man's rigid environment.

Slightly deeper snow forms an insulating layer over the land blanketing diverse agricultural patterns and protecting the soil from the drying chilling wind. The character of snow is as important as its depth. Snow can be fluffy, wind packed, wet, thinly crusted, glazed, or dry and drifting. These qualities can hurt or help each plant and animals in a different way, and the adaptations and instincts of different species determine whether or not they can use the qualities of snow to their own advantage.

A Graphic Inventory ofThe Highway Landscape

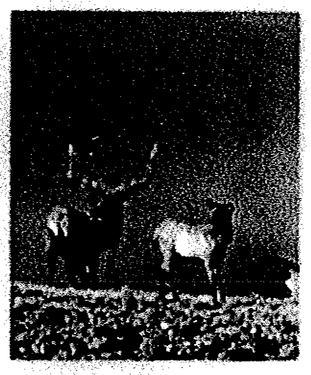
Following are Graphic Inventory presentation pannels used in the analysis of the Highway Landscape The information produced in the Graphic Inventory pannels creates images of the study areas regional characteristics. These graphic images can be used within the design process to give direct meaning to the site location, site aesthetics and architectural design.

Silent Thunder



It is now beyond living memory since the pounding of bison hooves on the prairie reverberated like the sound of distant thunder. It is difficult to imagine what it was like when some 75 million plains bison roamed the prairies of North America. Today, only echoes of those ghostly legions may be felt when viewing a captive herd or wandering some forgotten corner of their former range. Here and there across the prairie you may also stumble upon scattered tipi rings, reminders of those who once pursued bison for the essentials of life.

When Manitobans contemplate the sight of vast herds of animals, we think immediately of Africa - a continent few of us have seen first hand. Had we the ability to see our own backyards through the eyes of Paul Kene or Alexander Henry, though, we would have seen wildlife spectaculars that rivalled those of the Serengeti Plain. Instead of wildebeest and giraffe sweeping across the horizon, imagine bison and pronghorn, elk and mule deer. But it was the plains bison that overwhelmed the early explorers more than anything else.



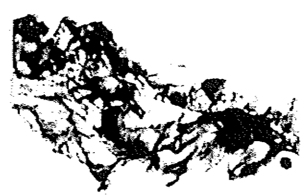
bison

(bī'sən, bī'z'n) n. a member of Bison, fam. Bovidae, a genus of large, shaggy, bovine mammals, often called buffalo, having a large hump on the withers and back. Two species are extant

A Way of Life

Long before the European traders and explorers arrived, bison provided a way of life for the Plains Indians, but the bison hunts of the plains Indians were soon outmoded by riflemen mounted on horseback. The Métis of the Red River became legendary for their great bison hunting prowess and brigades. Pemmican, the primary food for those in the fur trade, helped fuel a growing juggernaut of European trade and settlement that would soon nearly extinguish most wildlife on the prairies, including the once great bison herds themselves.

The destruction of the plains bison was the end of a way of life for the Plains Indians and the Métis of Assiniboine River Valley. The ability for the Plains Indians to be self-sufficient in food, clothing and shelter was lost; and the Métis no longer had a reason to mount their semi-annual hunting expeditions onto the plains.



Black Horizon

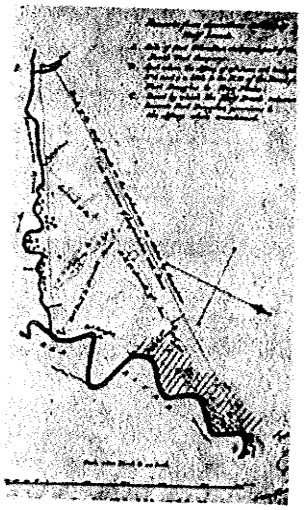
Alexander Henry the Younger provided one of the most vivid accounts of bison (commonly referred to as "buffalo") in the Red River Valley. On January 14, 1801, while at his Park River Post, he recorded in his journal:

"At daybreak I was awakened by the bellowing of buffaloes. I got up and was astonished when I climbed into the S.W. bastion. On my right the plains were black, and appeared as if in motion, south to north. Opposite the fort the ice was covered, and on my left, to the utmost extent of the reach below us, the river was covered with buffalo moving northward. I had seen almost incredible numbers of buffalo in the fall, but nothing in comparison to what I now beheld.

The ground was covered at every point of the compass, as far as the eye could reach, and every animal was in motion."

White Horse Plains

Western Canada's first settlers were Scottish and Irish immigrants who arrived at Fort Garry (Winnipeg) in 1812 under the sponsorship of Douglas, Earl of Selkirk. Lord Selkirk's 1817 treaty with the Indians gave him the land as far back from the riverbanks as daylight could be seen under the belly of a pony standing on the level prairie - a distance of about 3 km. River lots, laid out along the Assiniboine and Red Rivers, were grouped into parishes that bear names of Scottish and French Saints.



Metis were the offspring of Scottish or French fur traders and Saulteaux or Cree Indians. Many of them worked for the Hudson's Bay and North West companies; their forte was conducting the great annual bison hunts that provided them, the fur traders, and the early settlers with winter food. After the 1821 merger of the two furtrading companies and the closing of duplicate trading posts, the Metis were left unemployed and encouraged to settle on the White Horse Plains in the Red River Valley.

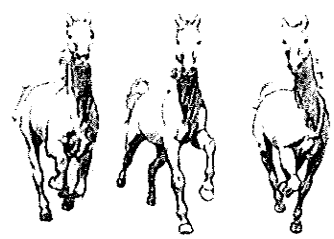
Here known as Les Bois Brules (literally, "burnt wood") because of their dark skin, they became a virtual nation of restless, carefree, hospitable, and devout people.

When Manitoba became a province in 1870, it was largely French speaking, and its first legislature was dominated by the Metis. This was soon to change, however, with the arrival of many other ethnic groups. Today the White Horse Plains are a multicultural conglomerate, with over forty nationalities represented.

Legend

During the early 17th Century, when only Indians roamed the Western Plains, the local Crees were being pushed farther north and closer to starvation by the Sioux and Assiniboines. But with the arrival of the white man, the Crees acquired guns and pushed the invaders back. The Assiniboines, who now became their neighbours to the south, were forced to make peace with the Crees.

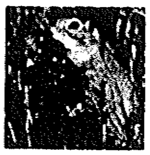
Some years later a band of the Assiniboines made a camp on the banks of the Assiniboine River. The Assiniboine Chief had a beautiful daughter whose hand was sought by two Indian Chiefs, one Cree and the other a Sioux. The father could not resist the gift of a beautiful white horse of rare Mexican breed offered to him by the Cree, and chose the Cree Chief as his future son-in-law. Word was sent to the Sioux, and they attacked the Assiniboine camp. In an attempt to escape, the couple rode off on the white horse. After a brisk chase the arrows of the Sioux caught up to the fleeing couple near present-day St. Francois Xavier. The White steed escaped, and for years was seen roaming the plains. As years went by, a belief grew of a ghost white horse that continued to haunt the plains.



The People of a Colony

The first Hutterites to settle in Canada were a group of 21 from South Dakota who built three colonies near Elie in 1918. Hutterites are a people joined by faith and communal vision who live in farm communities in which property is held jointly by all members, who bunk in dormitories and work together under elected leaders. Each colony is limited to about 100 members, with a community plan resembling the main street of a rural town. There are now sixty such colonies in Manitoba.

A Sea of Grass



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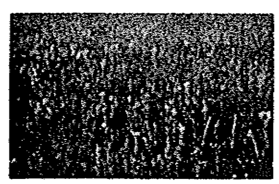

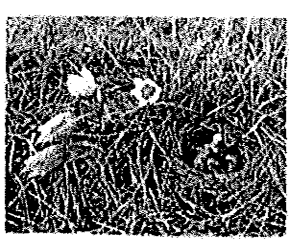

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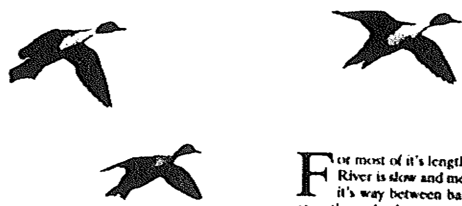

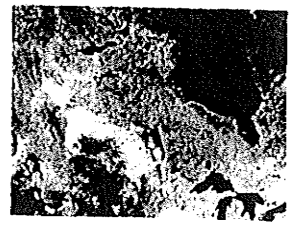

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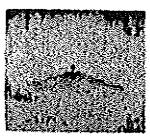

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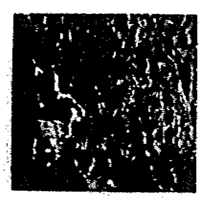

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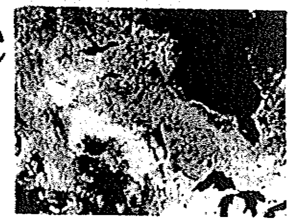
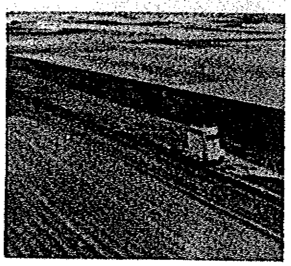
Images of the Prairie



Today only a fraction of former prairie life remains. The most productive prairies, the tall grass and mixed grass regions have given way to mechanized agriculture. The once native vegetation has been ploughed under and destroyed. In its place grow straight rows of corn, symmetrical swaths of wheat, barley and rye-cereal crops to feed the peoples of the world. Roads, highways, train tracks, canals, ditches, fences, power lines, and cultivated windbreaks have divided the landscape into a characteristic patchwork quilt of altered environments.



With the buffalo hunts behind them the Métis and Early Selkirk Settlers turned to agriculture. So that every settler could have access to the Assiniboine river, lots 3200 meters long by only 240 meters wide were laid out between Fort Garry and Portage la Prairie. Shortly thereafter the first settlers in the Assiniboine Valley began to raise grain, corn and vegetables.

In 1870 the Principle Meridian was established as the first of five north south base lines for land surveyors in Western Canada. Land surveyors sent by Ottawa began to lay out 6-mile-square townships containing thirty six 1-square mile (2.6 km²) sections across western Canada with no concern for either topographic features such as rivers or existing land allocations. When the railroads linked the prairie to outside markets and opened it to widespread settlement, the pioneering in the use of farm machinery led to agricultural efficiency. Mechanization allowed farmers to overcome obstacles in the landscape and led to reclamation of wetlands, crop specialization and adaption.

The prairie landscape today continues to change with new characteristics emerging as icons of a new age. Land holdings are bringing the one section family farm into commercially operated farm corporations. With this amalgamation traditional fence and hedge row boundaries are being removed and new crops have brought new colour to the prairies, and no longer follow the section and range boundaries. New transportation, and technologies are seeing the removal of the elevator, the telephone poles and the rail lines and seeing the emerging of a new, more ambiguous vision of the prairie cultural landscape.

IMAGES

Shelterbelts

Shelter belts further define and protect the disturbed prairie soil fields from destruction, lined in neat rows of Manitoba maple, willow, caragana, and green ash that slow the prairie winds.

Fencelines

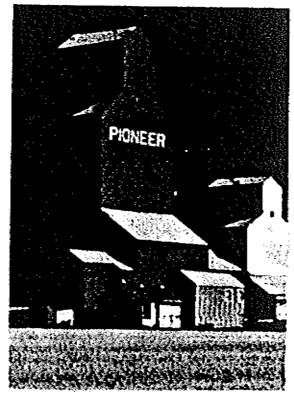
Fence lines border the patterned landscape separating one crop from another and defining the edges of a settlers domain.

Grain Elevators

In the distance are the farmyard and grain elevator as a beacon homecoming to the weary traveller.

Powerlines

Communication is seen but not heard, as power lines and transformers line the open landscape and create silhouettes in the setting sun. These are the traditional images of the prairie landscape.



Train Tracks

Open Skies

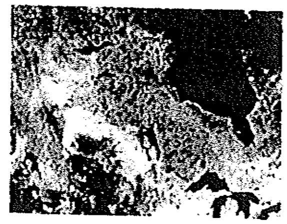
Memories and Old Bones

"Onward the train moved, cutting the plains in two. as it travelled westward it pushed through a country of memories and old bones - furrowed trails fashioned decades before by thousands of bison moving in single file towards the water, vast fields of grey and weathered heritage, dead lakes rimmed with telltale crests of alkali."

Pierre Berton "The Last Spike"

The development of the prairies has set aside these images of the past and with the coming of the railway and the first settlers created a new symbolism within the prairie landscape. Gone are the lone prairie crocus and undisturbed open plains, in its place are the rigid constraints of a manmade environment.

A Climate of Extremes



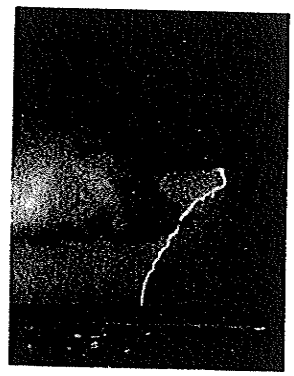
Nowhere else in Canada does weather distress people so much or stimulate so much conversation, as it does on the plains. Every waking moment of the day the grain farmer squints into the sky for signs of rain, hail, frost, blizzards or dust storms. When he's not watching the weather he is talking about it. It dominates his life and makes him the fatalist he is. The climate of the plains is capricious and cruel. Winters are long and extremely cold; summers are short and often unbearably hot. The winds blow unceasingly; in the winter howling blizzards block the highways, bury animals and can cause a man to become lost and perish within distances as short as from his house to his barn.

The plains are extremely dry at times, the average rainfall fluctuates from year to year with periodic droughts that may last as long as ten years. Associated with the drought and often following its devastating effect are dust storms, grasshoppers and the Russian thistle.

Sloughs can dry up completely and waterfowl perish by the thousands. Howling winds can fill the air with choking dust for day on end, and precious top soil is swept into sand-like drifts.

In summer the opposite often happens. Winds from the south bring extremes of hot weather to the plains often accompanied by sudden destructive storms. On a hot July or August day, dark, white-capped thunder heads build up on the horizon. Like messengers of doom they roll and broil, while the land below stands watching, helplessly. The terrible calm before the storm is followed by a howling rush of wind that flattens the fields, and too often is accompanied by the roaring beat of hailstones. Often as big as golf balls, they bounce off the hard clay, smash windows, and within minutes can beat and flood a crop worth thousands of dollars into a soggy pulp.

The Letter Home



"I don't believe it is normal even here to have a snowstorm in May but it does happen. Last year they say they got a good layer of snow in mid June and had it not been for that they would not have had a crop for that was the last moisture they got until harvest time."

"We had a snowstorm, a heat wave, highwinds, rain, a terrible sand storm, hail, thunder and lightening and a sudden cyclone that made the trap door on the cellar hole flap up and down. We seldom have two days alike so if that is the world's healthiest climate, as they say it is, then it certainly is not the most pleasant."

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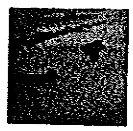
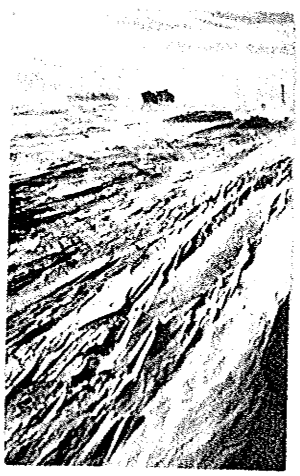
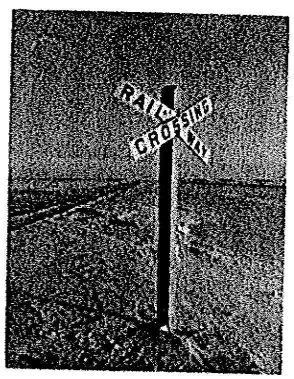
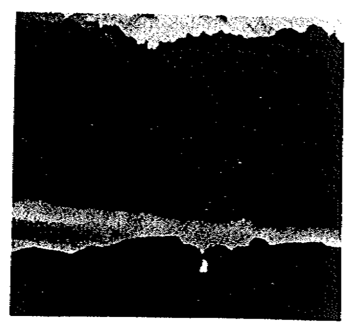








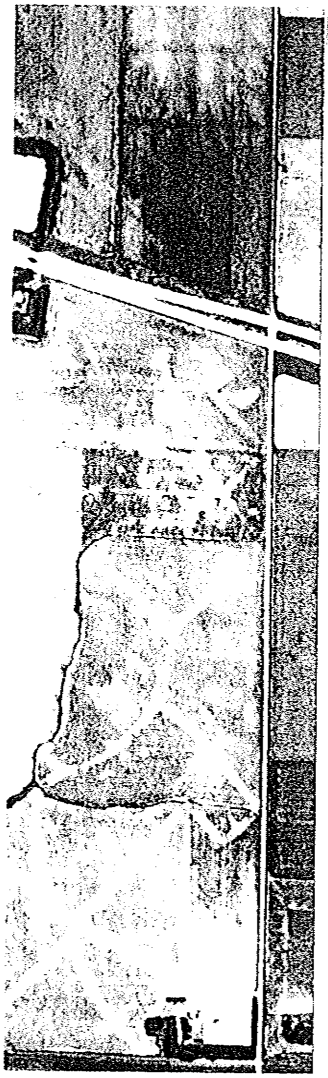
Razors Edge

Each year snow renews our sense of wonder. The first flakes are always magical, their slow whitening of the landscape drawing us irresistibly out of doors. Animals wonder at snow, but above all, their instincts prepare them to deal with it as a physical force that can freeze or warm, feed or starve, trap or free. We have to deal with snow for only as long as it takes us to shovel our walks and plow our roads, but animals cope with it constantly.

Many animals must travel on a razors edge between survival and death, snow, by its character or depth, can easily throw them to one side or the other.

Every form of life is affected differently by the forms of winter. Even the slightest snow changes the daily movements of an animal, covers seed and insects from view, and adds an element of challenge and excitement to man's rigid environment.

Slightly deeper snow forms an insulating layer over the land blanketing diverse agricultural patterns and protecting the soil from the drying chilling wind. The character of snow is as important as its depth. Snow can be fluffy, wind packed, wet, thinly crusted, glazed, or dry and drifting. These qualities can hurt or help each plant and animals in a different way, and the adaptations and instincts of different species determine whether or not they can use the qualities of snow to their own advantage.



PART FOUR

A Visual Analysis of the Trans-Canada Highway

As outlined in the Methodology of this study, the graphic application of the Litton Technique for the recognition of the visual and scenic resources along the Trans-Canada Highway will be applied to the identified geographical region from Winnipeg to Portage La Prairie.

Although descriptive, the graphic application of the Litton Technique should be accompanied by additional analysis within the presentation.

This brief visual analysis discussion is intended to accompany and compliment the Litton Analysis sheets and provide those areas of additional information needed to fully understand the visual nature and resources of the Trans-Canada Highway.

The technique is presented under the following general areas of discussion:

The Litton Technique - An Analysis

The Litton Technique - A Summation

The Litton Technique as Applied in the Evaluation of the Trans-Canada Highway

An Overview Analysis of the Trans-Canada Highway

THE LITTON TECHNIQUE: AN ANALYSIS

The visual and aesthetic design of a highway is essentially achieved by manipulating the landscape in order to achieve desirable views, view sequences, an understanding of the landscape, a sense of position and direction in that landscape, etc., and by then controlling associated land uses in the highway landscape in order to insure that the visual intent is preserved.

In manipulating the highway there are two main areas of consideration:

The landscape itself or that aspect of the scene that is fixed including landscape form, texture, organization, scale, light, etc.

The relationship of the driver to that landscape or that aspect of the experience that is flexible, including, observer position, scale, distance, speed, view sequences, etc.

Burton Litton Jr.'s report to the U.S. Forest Service was primarily concerned with identifying these two aspects of the fixed landscape and observer position relative to the fixed landscape. An understanding of his report, *"Forest Landscape Description and Inventories, a Basis for Land Planning and Region"* is essential to the understanding of analysis required and undertaken for any particular highway and highway landscape. Applying this method of studying the scenic resource is not in itself however, an analysis. For example, the identification and description of major landscape views along an existing highway alignment do not reveal whether or not these views are desirable, offer any sense of the overall landscape structure, or occur in logical sequence.

Therefore if the Litton Technique of landscape description (and variations thereof) are to be used, they must first and foremost be recognized as primarily inventory. Any analysis in association with this inventory should include the following:

(1) An Overview Analysis to Include:

(a) The overall relationship of the highway to the major landscape structure.

(b) The general image of the highway route by visual segments and visual sub-segments, or similar technique.

(c) The general image of this highway relative to other highways in the region.

(d) The existing major view sequences or lack of view sequences.

(e) The sense of entry, approach, and climax associated with the highway, in essence of how well the highway landscape story is being told.

(f) The level to which the highway experiences foster an understanding of that landscape in the driver's mind.

(g) The sense of position and direction that the driver has while negotiation his way through the landscape.

(2) The Detailed Relationship of the Highway to the Landscape Including:

(a) The manner in which the highway does or does not reveal the detailed highway landscape.

(b) The relationship of the highway to vegetation, ponds, streams, bogs, etc.

(c) The right-of-way width and its effect on the highway landscape.

(d) The treatment of ditches, cuts, swales, etc. and their impact on the highway experience.

(e) The resultant speed required to best appreciate the scale and detail of that landscape.

(3) The Identification of the Symbols Used and Their Meaning in Terms of the Landscape Under Study.

Any particular symbol used will vary in its significance between one landscape type and another. For example, well-defined spaces in a dense forest landscape may be quite different from well-defined spaces in a sparsely treed prairie landscape. The definition of "well-defined" spaces in the landscape under study is therefore essential.

(4) The Identification of the Symbols Used and Their Meaning in Terms of the Proponent Undertaking the Study.

It is most likely that, with the possible exception of the major highway landscape features, two different individuals working independently of one another could arrive at seemingly quite different inventories. This is not to suggest that either result is wrong or incomplete. It is rather the result that each person *"comprehends"* the landscape differently. In order that those persons reviewing any presented inventory understand that inventory, it is therefore necessary that they also understand the meaning of the symbols used.

Two other observations should perhaps also be pointed out regarding the utilization of the Litton Technique or variations thereof:

(1) The utilization of the technique involves an extensive amount of time in illustration, correlation of information, etc. which can only be done by the Landscape Architect (as versus draftsman) and as a result can prove to be costly in time and effort. In addition, a rest time period between inventory and analysis is required in order that the Landscape Architect is able to effectively switch from the details of applying the technique back to the important overview analysis suggested.

(2) The technique is considerably more difficult to apply to new highways as versus existing highway landscapes, the problem is essentially one of the difficulty inherent in identifying what can *"potentially"* be seen along proposed highway alignments. The analysis and time involved in that study, if the results are to be comparable for both existing or proposed alignments, is out of necessity, much more extensive.

THE LITTON TECHNIQUE: A SUMMATION

Litton has identified and defined six variable factors that affect the resultant image of the highway landscape. As previously noted, these factors relate to either the fixed landscape per se or are concerned with the observer in the landscape. These six factors are:

The Landscape - Fixed

1. *Form:* - Form in the landscape is primarily topographic form and refers to the three-dimensional convex elements of the geomorphic base - such as hills, knolls, ridge, esker, etc. Contrast is the necessary condition to reveal a dominant form, that contrast being the potential result of isolation, size, silhouette, surface variations, etc.

2. *Spatial Definition:* - Spatial definition within the landscape or landscape spaces refers to the three-dimensional concave elements of the geomorphic base, vegetative enclosure, or a combination of both - such as basin, valley, ravine, meadow, etc. The spatial effectiveness is the result of the proportion of wall height to floor expanse, the nature of the floor and enclosing walls, the configuration of the floor as it meets a boundary of trees or earth face, and finally, differences in absolute sizes.

3. *Light:* - Landscape lighting affects the landscape colour, and sense of depth in the landscape, and in turn affects contrast, scale, image, etc..

The Observer in the Landscape - Flexible

4. *Observer Position:* - Observer position is described as (a) observer superior (above the general landscape), (b) Observer normal (horizontal with the landscape), and (c) observer inferior (below the landscape as at the bottom of a valley).

5. *Distance:* - The distance between the observer and what he sees may be described in terms of foreground, middleground, and background.

6. *Sequence:* - Sequence is the total impression of the landscape as perceived through time and space.

In relationship of the observer position factors to the landscape factors Litton has further identified seven landscape compositional types. These compositional types are:

1. *The Panoramic Landscape:* - The panoramic landscape essentially offers large unrestricted views to generally a horizontal landscape.

2. *Feature Landscape:* - The feature landscape offer generally unrestricted views to a landscape dominated by a distinctive form, i.e. a mountain or a tall vegetation stand.

3. *Enclosed Landscape:* - The enclosed landscape offers views in and through what is essentially an outdoor space to either a general landscape or a feature landscape.

4. *Focal Landscape:* - A series of essentially parallel lines or of elements seen in alignment lead the eye towards a particular landscape and thus create a focal landscape.

5. *Canopied Landscape:* - The minor details of a single view which contribute meaning to the visual experience both by themselves or in combinations with a series of views are referred to as detailed landscape compositional types.

6. *The Ephemeral Landscape:* - The ephemeral landscape is essentially that aspect of the landscape that evokes changing moods and images, i.e. wildlife, seasons, a rainy day, etc.

THE LITTON TECHNIQUE AS APPLIED

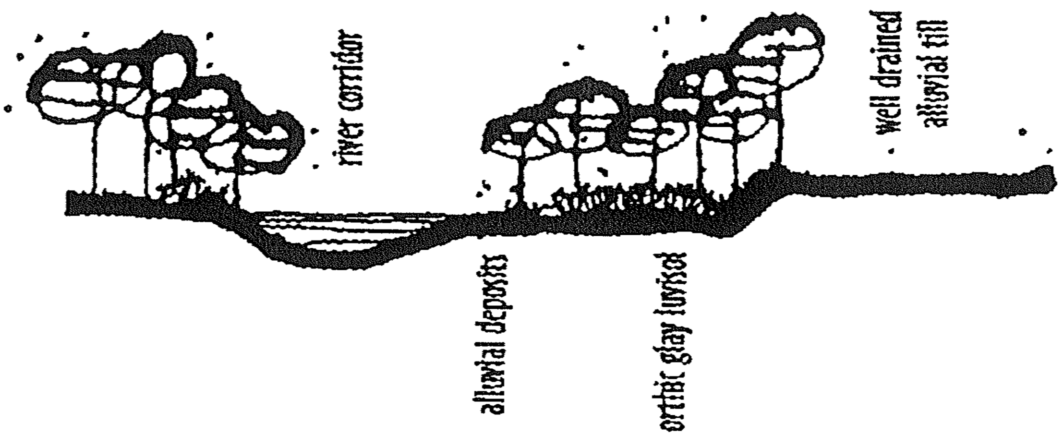
The Litton Landscape Description and Inventory Categorization has been taken one step further in the form of a graphic portrayal. This graphic method of landscape inventory is essentially as developed by The Technical Services Branch of the Department of Northern and Indian Affairs in their report *"Landscape, Character and Inventory"* dated 1982.

This graphic notation will be used within the study in association with 1:20 000 air photo mosaics for the Trans Canada Highway. The notation symbols used, and their general application to the Trans-Canada Highway landscape, are as follows:

(1) Profile
(2) Observer Position
(3) Observer Scale and Proportion
(4) Spatial Definition
(5) Sequential Notation
(6) Intensity of Interest

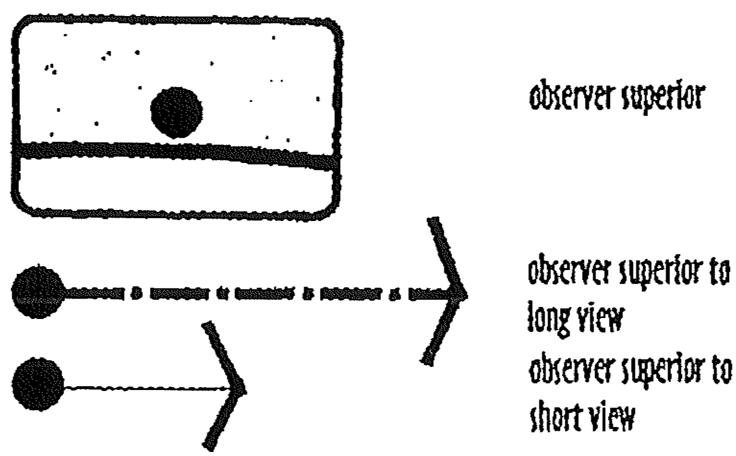
(1) Profile: The profile of the existing highway is shown at a horizontal scale of 1:20 000. In addition it describes the landscape type, through which the observer is travelling, in terms of vegetative cover and soil material. It is felt that the study area is adequately homogeneous to categorize the cover type into open land, deciduous, low shrub cover and coniferous, for visual purposes. Where specific stands of vegetation are of particular importance (i.e. Aspen for fall colour) these stands are treated as part of the detailed landscape and identified as such with sequential notation.

The soil texture and drainage as show, is intended to explain additional aspects of the detailed landscape. Thus, for example, an open space over muck soil becomes a marsh, or an open space over well-drained till is grassland.

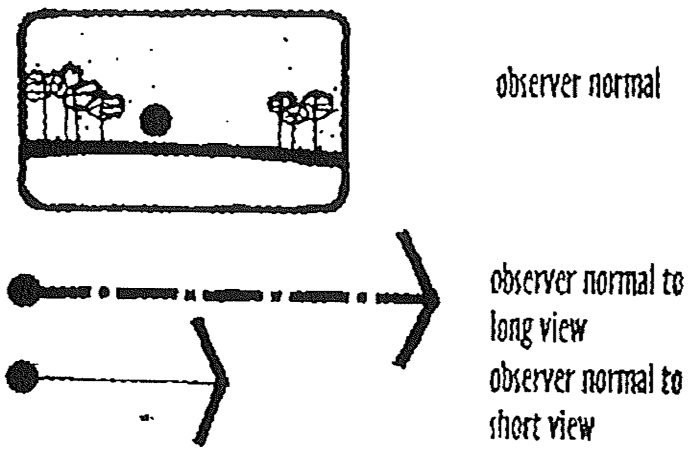


(2) ***Observer Position:*** The cross-sectional notations describing the observer superior, normal and inferior positions, are *'view from the road'* photographs illustrating the existing highway conditions.

(a) Observer Superior: There are many instance along this region of the Trans-Canada Highway where the observer is in a superior position, where he has virtually unrestricted views over the landscape.



(b) Observer Normal: The observer normal position occurs at intervals in the existing highway landscape limiting opportunity to look out over the landscape or up at a feature landscape.



(c) Observer Inferior: The observer inferior position is non-existent within the present region of the highway landscape, although a drastic change in spatial definition at times may suggest this position, the wide highway right-of-way does not translate this experience and the landscape is no more than observer normal.

(3) Observer Scale and Proportion: Three observer scales have been identified along the existing Trans-Canada Highway. These scales, (as related to the impact of foreground, middleground, and background) are (a) observer scale large, (b) observer scale medium, and (c) observer scale small (it is important to remember these scales reflect two way traffic within a four lane divided highway environment).

(a) Observer Scale Large: In such an instance the observer is in a small space where he has a strong sense of being a part of the detailed landscape -where the foreground has a high degree of visual impact.

There are no instances along this region of the Trans-Canada Highway where the observer scale is large, mostly due to high traffic volumes and wide right-of-ways associated with it.

(b) Observer Scale medium: In such an instance the observer is passing through a variety of medium scaled, well or poorly defined spaces. In certain instances the foreground may be predominant but the visual impact of the at foreground is weak, such as along the median of the general highway right-of-way or in passing through a rural community or river corridor. In other instances the scale of the space passed through may be much larger (i.e. Shelter belt of trees) and the middleground is predominant.

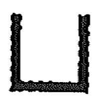
general r.o.w. with weak forground

(c) Observer Scale Small: In such an instance the observer seems small in relationship to his sense of a much larger landscape - essentially where views to a background landscape are dominant. Observer scale small represents a majority of this region of the Trans-Canada Highway.

middleground landscape predominant

(4) Spatial Definition: Three levels of spatial definition have been identified for the landscape spaces along the Trans-Canada Highway. These levels of spatial definition (relating to size of space, degree of enclosure, and type of enclosure) are (a) well-defined spaces, (b) weakly-defined spaces and (c) spaces with distant edge. It should be noted that defined here are the spaces that the motorist passes through as opposed to the spaces that the observer might view to.

(a) Well-Defined Spaces: Those spaces along the road that possess strong, articulated, and well integrated, topographic and vegetative edges, are considered well-defined. Such spaces along the Trans-Canada Highway are normally meandering rivers. The general R.O.W. at this time cannot be considered well-defined because of both width, lack of enclosure, and the manner in which the road slices through the landscape without regard for topographical or vegetative conditions.



well defined space : narrow

well defined space : wide

(b) Weakly-defined Spaces: Those spaces along the road which offer a sense of space but through lack of contrast, undefined edges, or only partial enclosure may be described as weakly-defined spaces. Such spaces along the Trans-Canada Highway include the general right-of-way, areas of severe scaring, or areas where views to well-defined spaces are weakened by poor edge treatment along the R.O.W.

weakly defined space : narrow

weakly defined space :wide

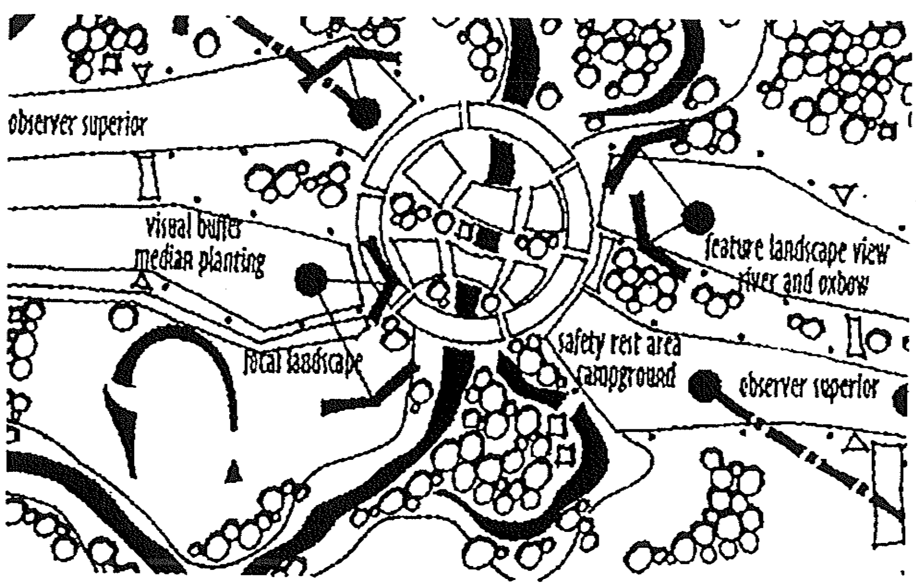
(c) Space with Distant Edge: There are many instances when the observer passes through large landscape spaces where the edges are distant. (ie. Wide open agricultural landscape) Such distant edges are noted as below.

distant edges

well defined edge : distant edge

weakly defined edge :distant edge

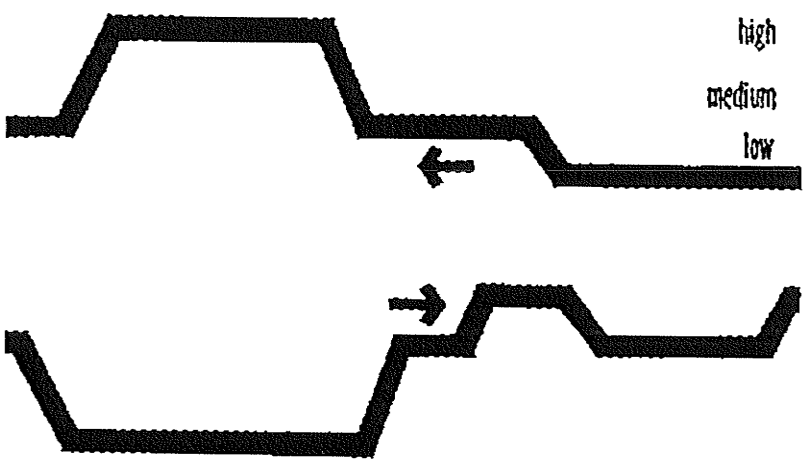
(5) ***Sequential Notation:*** Sequential notation graphically illustrates a general description of the landscape along the highway (vegetation, spaces, fields, ponds, etc.), the general relationship of the highway to the landscape (horizontal alignment, vertical alignment, and placement or form), and identifies segments of detailed visual experiences (areas within the region where the view along the highway is broken in either direction by a major intersection, water feature or townsite).



This notation does not in fact imply sequence. The relationship between one visual experience and the next is not defined.

Further, no qualitative judgement made regarding views, alignment flow, road grade relationship to landscape, etc. As a result notes have been added to the sequential notation that are of a descriptive nature (poor view, pleasant curve, sequential relationship, etc.)

(6) ***Intensity of Interest:*** The intensity of interest essentially defines the degree of response that the landscape and associated development might evoke in the observer. Three general levels of interest intensity have been identified for the Trans-Canada Highway landscape - low, medium, and high. Low intensity of interest relates to the general right-of-way, moderate intensity of interest is considered to be those ares of well-defined secondary landscape views (to larger agricultural areas in particular). High intensity of interest has been identified as those areas of focussed and well-defined major landscape views (i.e. Assiniboine River Corridor) or views to areas of major activity interest (i.e. St. Francis-Xavier rest stop or Prairie Homestead).



It should be noted that intensity of interest is not a description of visual quality or appropriateness. For example, while the road through a rural townsite may offer a high degree of interest it is not visually pleasing at times, and while the rest stop also offers a high degree of interest, it is not well integrated into the Rural landscape. Further, it must be stressed that the same level of visual experience (i.e. agricultural fields) varies in the intensity of interest offered as the observer moves through the landscape.

AN OVERVIEW ANALYSIS

As noted in the critique on the Litton technique as used, it is considered essential to provide an overview analysis in association with the Litton Inventory. In the Trans-Canada Highway this overview analysis covers:

(1) *The Trans-Canada Highway and the region*

(2) *The Trans-Canada Highway and the regional landscape structure*

(3) *The Trans-Canada Highway and the detailed landscape*

(1) The Trans-Canada Highway and the Region:

(a) General: This portion of the Trans-Canada Highway presents primarily an open prairie highway experience in sharp contrast to the coniferous forest of the Upper Assiniboine Delta and the crowded urban streets of the region's capital Winnipeg. For most Manitobans and for the tourist, this transition from an enclosed to open landscape thus provides an unpleasant change regardless of the quality of the highway itself. As regional character goes, the grandeur of the open prairie is lost within scattered development and blocked views. The small rural town sites and the meandering rivers tree lined banks serve as borders to mark ecotone boundaries and emphasize a change in upcoming landscape. For the observer driving kilometres 0 to 67, the landscape is more or less flat, the expanse of landscape being broken only by scattered stands of vegetation and rural development.

(b) The Regional Entrance: There are two primary and take-off points to the Manitoba lake bottom region of the Trans-Canada Highway corridor. These approaches are, from the City of Winnipeg and it's by-pass in the east, and from the City of Portage la Prairie and it's by-pass in the west.

The problem with the eastern entrance is that there is no opportunity for the observer to fully enjoy the views and understand the landscape through interpretation. The lack of control over the visual landscape beyond the right-of-way has resulted in development that is out of context with the regional landscape character. The area from Winnipeg to Headingley was once part of the City commercial strip and with a narrow right-of-way has been developed to that extent. The entrance to the region's less modified landscape does not begin until you have passed the Town of Headingley and the Trans-Canada Highway corridor divides into a double lane.

The western entrance suffers from the same problems as the eastern but to a lesser degree. Uncontrolled development beyond the right-of-way (and gas stations, restaurants, signage) and the City entry seriously detracts from the open panoramic and focal landscapes.

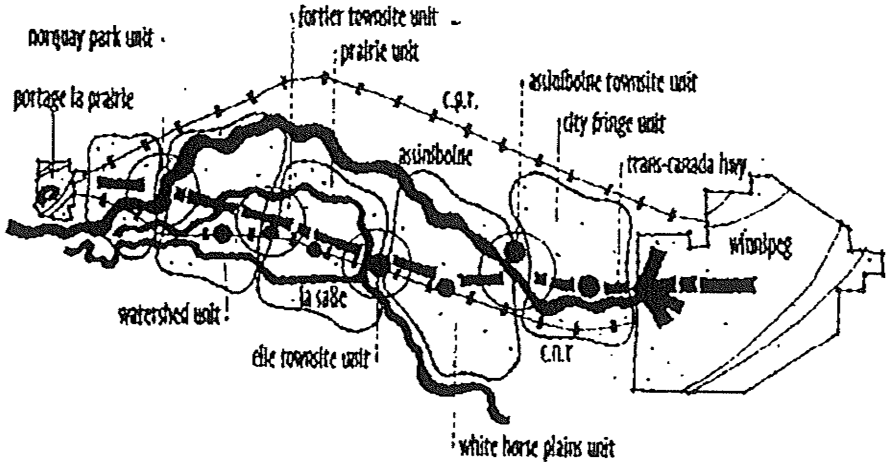
There are four secondary approaches to the Trans-Canada Highway corridor from within the region. These approaches are, from the Town of St. Francois Xavier via PTH 26, from the intersection of PR 248 at Elie and from the Carman - St. Ambroise intersection via PR 430 and PTH 13. All four of these intersections are from a within a rural context and are a strong visual break to the relatively open landscape of the region. The secondary approaches are part of the regional landscape structure and will be analyzed as such.

(2) The Trans-Canada Highway and the Regional Landscape Structure

The highway corridor can be evaluated in terms of how it allows the driver to establish his sense of position and direction in the landscape and how it provides the major middle ground-background visual experiences. Through visual analysis, the Trans-Canada Highway Corridor is described in visual segments and sub-segments known as landscape units defined by major landscape features, intersections and townsites.

To this extent the following major visual units have been identified:

a) City Fringe Unit — *b) Assiniboine Townsite Unit*
c) White Horse Plains Unit — *d) Elie Townsite Unit*
e) Prairie Unit — *f) Fortier Townsite Unit*
g) Water Shed Unit — *h) Norquay Park Unit*



A) *City Fringe Unit*

1) This section of the TCHC has a narrow R.O.W. with no median to buffer east and west traffic. The narrow corridor with cluttered development and scattered planting, maintains a weak image.

2) The modified rural environment entertains views of open agricultural land, residential development, commercial development and recreational facilities. This active environment captures the eye of the observer, however is difficult to interpret.

3) The roadside development of utilities and buildings define an edge creating a focal landscape that exists for 5 km. This highway environment offers no sense of where the City ends and the regional landscape begins.

4) The transition from City to highway landscape, to rural townsite is weak, no distinct separation occurs until the driver has passed beyond the Town of Headingley and the TCHC divides. This environment may be best identified if treated as an urban environment.

5) Beyond the major landscape views, secondary views to objects within the highway landscape eliminate any sense of image. Unrelated signage, parking lots, and utility lines all break up the observers view and emphasize the weak character of the highway landscape.

6) Limited highway speeds of 70 km/hr increases the observers sense of awareness and exaggerate the undefined landscape features.

7) Highly landscaped cemetery and recreational facilities create an artificial environment but are however pleasing to the eye.

8) A strong visual connection exists between the east and west bound traffic with no visual separation occurring.

9) Between the Town of Headingley and St. Francois Xavier, the panoramic landscape of open agricultural land is broken only by images of automobile graveyards and abandoned homesteads.

10) Travelling east towards Headingley the observers view north is blocked by the northbound lane travelling west, focussing the observers view forward or to the south.

B) Assiniboine Townsite Unit

1) Drainage swales and creeks prepare the observer for the approaching Assiniboine River corridor. The median headlight screen and safety reflectors direct the observers view into the enclosed landscape ahead.

2) The river corridor narrows the visual R.O.W. and focusses the observers view toward the bridge and the river itself. Special landscape features direct the observers view to the north and highlight a unique landscape of oaks. To the south the uncontrolled development has overpowered the corridor landscape and offers an unsightly view of modified environment.

3) As you approach the river corridor from the west, natural environment is more prominent and the focus towards the bridge is more gradual with the observers view first directed at the oxbow lake meander cut off.

4) Entering the river corridor from the east has a gradual development of residential acreage with well established vegetation. The western approach however, reflects the openness of the region it has just exited and cluttered buildings with little landscape fill the view of the observer.

C) *White Horse Plains Unit*

1) The White Horse Plains landscape unit best reflects the image of open prairie. Although no native prairie exists, often unrestricted views of the domestic agricultural crops emphasize the panoramic landscape to the north and south.

2) The undefined median planting at this point breaks up the view of the observer. Instead of framing the open landscape beyond, the planting distracts the observer and the image of open prairie is often lost.

3) The shelter belt program on the north side of the westbound lane is in an immature stage and currently does not distract from the panoramic view. In time, the shelter belt will create a visual edge and may have to be addressed as a component of the visual landscape and selective thinning may result.

4) The safety reflectors at the edge of the highway, although small in scale, create a somewhat focal landscape. The strong contrast to the highway landscape breaks up the panoramic view of the landscape beyond.

5) The rail lines to the south of the highway corridor do not interrupt the observers view. They blend into the distant horizon of shelter belts and drainage corridors created. However when in use the train itself does create a visual edge and focal point within the highway landscape.

6) One of the few curves in the roadway alignment occurs in this landscape unit. The curve being broken up by scattered median planting and safety reflectors is gradual and somewhat anticlimactic.

7) Beyond the curve to the south, the Town of Dacotah is a vegetative oasis with the prairie image of the grain elevator as a focal point.

8) The borrow pit area to the south of the eastbound travel lane is obtrusive and could become a more visually attractive area.

9) Scattered views of homesteads break up the horizon offering a strong contrast in visual landscape to the observer.

10) As the observer approaches from the west, distant power lines and vegetation merge toward the highway corridor directing the view forward. The river corridors treatment boundary blocks the observers view and an enclosed landscape is created.

D) Elie Townsite Unit

1) This landscape unit consists of two regional images, the townsite and the river corridor. Although occurring in close relationship, the townsite does not reflect a development characteristic of its location. Entering from the east the observers view is focussed on a spreading development to the south. Views of cluttered buildings, commercial signage and roadside commercial development are a stark contrast to either the prairie townsite or the river corridor negating any effective sense of town arrival.

2) In the centre a major intersection occurs connecting northbound and southbound lanes to the highway corridor. At this point the observer may exit or enter the highway corridor. This is a key area of development. Feature landscape view of entering the landscape unit from the west, the large scale view corridor is prominent with a brief focal and enclosed landscape occurring on the bridge. Early images of grain elevators, farmyards and signage prepare the viewer for the upcoming change in landscape types.

E) Prairie Unit

1) For a major part of the landscape unit, the highway continues in a straight line terminating only at the horizon. The observers panoramic view is broken only by feature views in the agricultural landscape.

2) Cars, railway lines, townsites and power lines dot the landscape, with observers view being only slightly screened at times by scattered median planting.

3) Set in the middle of this panoramic landscape is located a fertilizer plant and highway construction site breaking up a potentially excellent view. There are no visual buffers to break up the uncharacteristic element and regional character in this viewshed is lost.

4) The Town of Bernard is a focal point in the open landscape. A prominent grain elevator in the well planted townsite holds the attention of the observer, however a sense of entry is lost when the effect does not reach into the immediate highway R.O.W.

5) Travelling west of Bernard, the open landscape begins to enclose the observers view. Bordered by a river corridor to the north and power lines and planting to the south, the observers view is directed towards the intersection of river and highway.

6) Travelling east the landscape opens into a panoramic landscape beyond power lines and the Town of Bernard. The landscape has a gradual transition from river to prairie.

F) Fortier Townsite Unit

1) The townsite in this unit is small and almost indiscrete. The primary view is that of the river corridor. The observers attention is directed to the scattered plantings, bridges and the open landscape beyond as a good example of a prairie river corridor landscape.

2) To the south the Town of Fortier is almost unaddressed. Hidden among vegetation, there is no sense of a townsite other than the associated signage indicating one.

3) Transformer towers break up the image of open prairie and direct the observers view beyond the enclosed landscape.

G) Water Shed Unit

1) The eastern section of this landscape unit is characterized by a panoramic landscape view of open prairie and the highway corridor obstructed only by power lines. The landscape is broken up by a feature view of a homestead and distant views of clustered farmyards and drainage swales.

2) The R.O.W. contrasts strongly in this landscape unit and throughout the highway landscape with the layout of the adjacent agricultural fields.

3) As the observer approaches from the west to the centre of the landscape unit, he crosses a drainage corridor signalling a change in landscape type and revealing the river corridor to come. This enclosed landscape first directs the observers view forward and then dramatically expands his view to the open panoramic landscape beyond. The strong contrast from river corridor to open landscape holds the attention of the observer.

4) As the observer moves west, the landscape begins to close. The tree masses grown in small shelter belts border the highway and median planting thickens, signalling a change. The observers attention is directed forward along the highway corridor and the river corridor landscape unit.

5) Exiting the river corridor unit from the east is exactly opposite to the observer. The tree plantings thin, the landscape opens and the view becomes panoramic instead of focal.

6) Another major intersection occurs west of the drainage corridor connecting Highway #430 and Highway #13 to the Trans Canada corridor. The intersecting highways create a window of landscape beyond emphasizing the interaction of river, prairie and the settlement of man.

H) Norquay Park Unit

1) The Norquay Park unit is the last major landscape feature of the regional landscape. Beyond is the City of Portage la Prairie and a highly modified environment. The presentation of existing vegetation and the meandering Assiniboine River corridor serve as the focal point.

2) The highway corridor right-of-way widens here showing a sensitivity to the highway landscape. Maintaining the existing vegetation in the widened median develops a buffer from east and westbound traffic. Enclosing the landscape to the observer the transition between prairie and river corridor is emphasized.

3) The view of the river from the bridge is brief but a safety rest stop area located within the median provides the observer with a closer look at the landscape. However its location in the river corridor offers little sense of entry and does not address the river itself and becomes almost lost in the right-of-way.

4) To the south a KOA registered campground facility takes advantage of the river corridor landscape but once again a sense of entry is not addressed and is only visible to the westbound traveller.

5) Beyond the Norquay and to the east the landscape opens up briefly then closes to a well defined space bordered by access roads, scattered development, greenhouses and businesses.

3) The Trans-Canada Highway and the Detailed Landscape:

The Trans-Canada Highway suffers from a consistent and repetitive series of detailed problems dealing with *(A) right-of-way design, (B) uncontrolled development, (C) scale and speed, and (D) road alignment.*

A) Right-of-way design

Existing right-of-way design has resulted in a wide, manicured, non-variable space along the alignment. The right-of-way contrasts strongly within the landscape units and throughout the highway landscape, with the layout of adjacent agricultural fields and existing natural factors. The straight edge of the right-of-way does not reflect vegetation changes, topography, or emphasize existing spaces along the highway. The result is a bland non-variable experience along most of the highway corridor.

Undefined median planting breaks up the view of the observer, and instead of framing the open landscape beyond or blending with the landscape, the planting distracts the observer and the image of open prairie or riverbottom forest is often lost.

The grading within the right-of-way results in a further separation of the observer from the detailed landscape and the creation of a feeling that the highway " pushes through " the landscape instead of becoming a part of the landscape.

B) Uncontrolled Development

The uncontrolled development along the highway corridor often overpowers the corridor landscape and offers an unsightly view of a modified environment. Cluttered buildings with very little landscape, fill the view of the observer. The open landscape is frequently disturbed by an uncharacteristic element which often breaks up a potentially excellent view. The lack of a visual buffer or thought out location results in the regional character of the viewshed being lost.

Uncontrolled roadside commercial signage occurs frequently within the boundaries of the townsite units and break up the image of the open prairie and direct the observer's view beyond the landscape, while distracting from the natural elements and 'cheapens' the effect of the regional character.

C) Scale and Speed

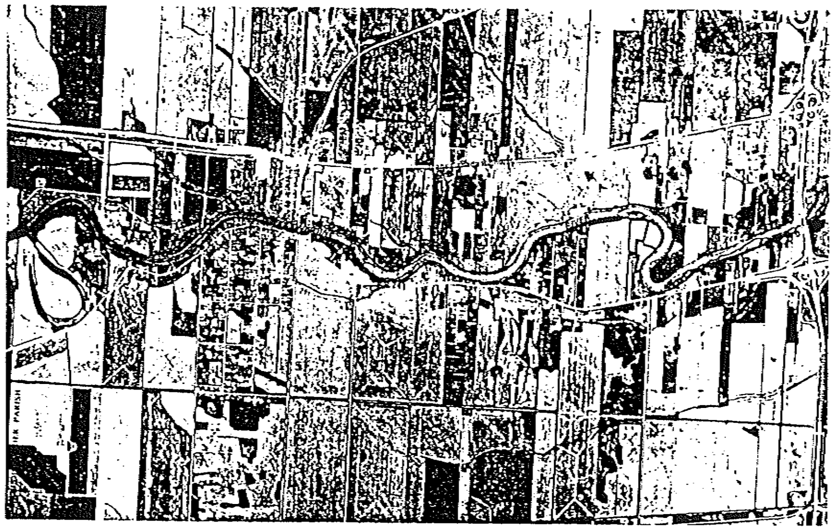
The scale of the right-of-way design allows for extremely long site distances along the alignment. This feature, in association with the observer's obvious detachment from the landscape, increases the desire for higher speeds despite the design speed inherent in the existing horizontal alignment design. The higher speeds not only reduce safety but serve to further detach the driver from the landscape.

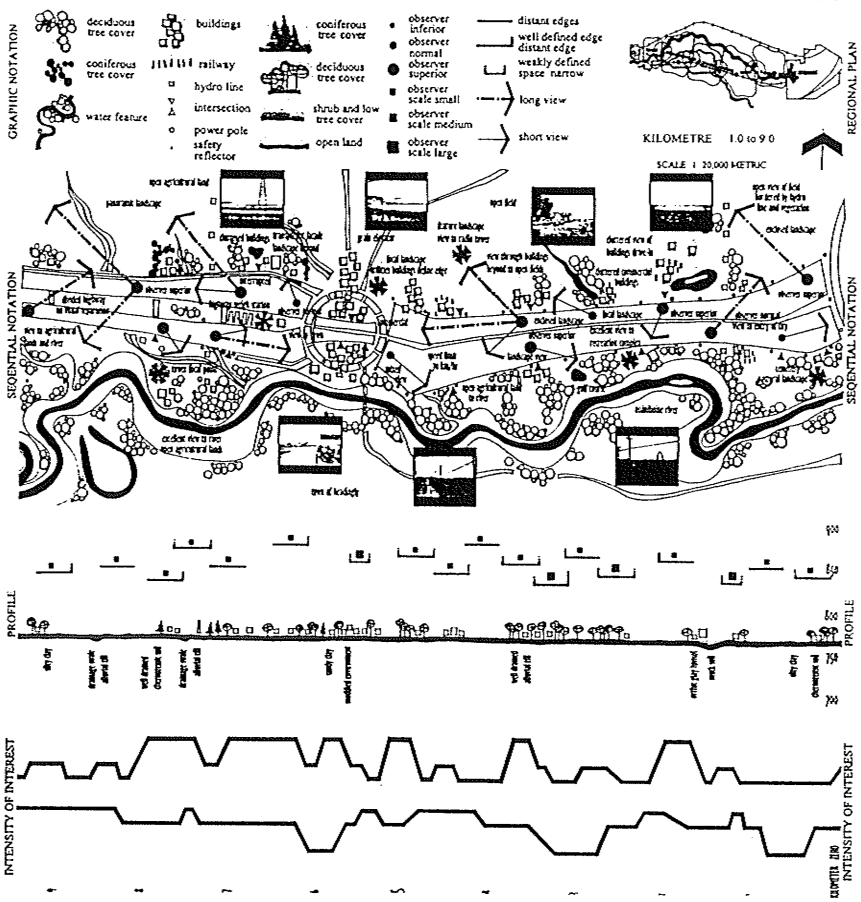
D) The Road Alignment

For a major part of the highway corridor the highway continues in a straight line, terminating only at the horizon. The alignment, in addition, slips past the majority of the highway landscape's visual features and tends to slice through many of the existing natural features along it's way. Any dramatics of change in the corridor are lost when the curves are broken up by scattered median planting and safety reflectors, making the experience somewhat anticlimactic.

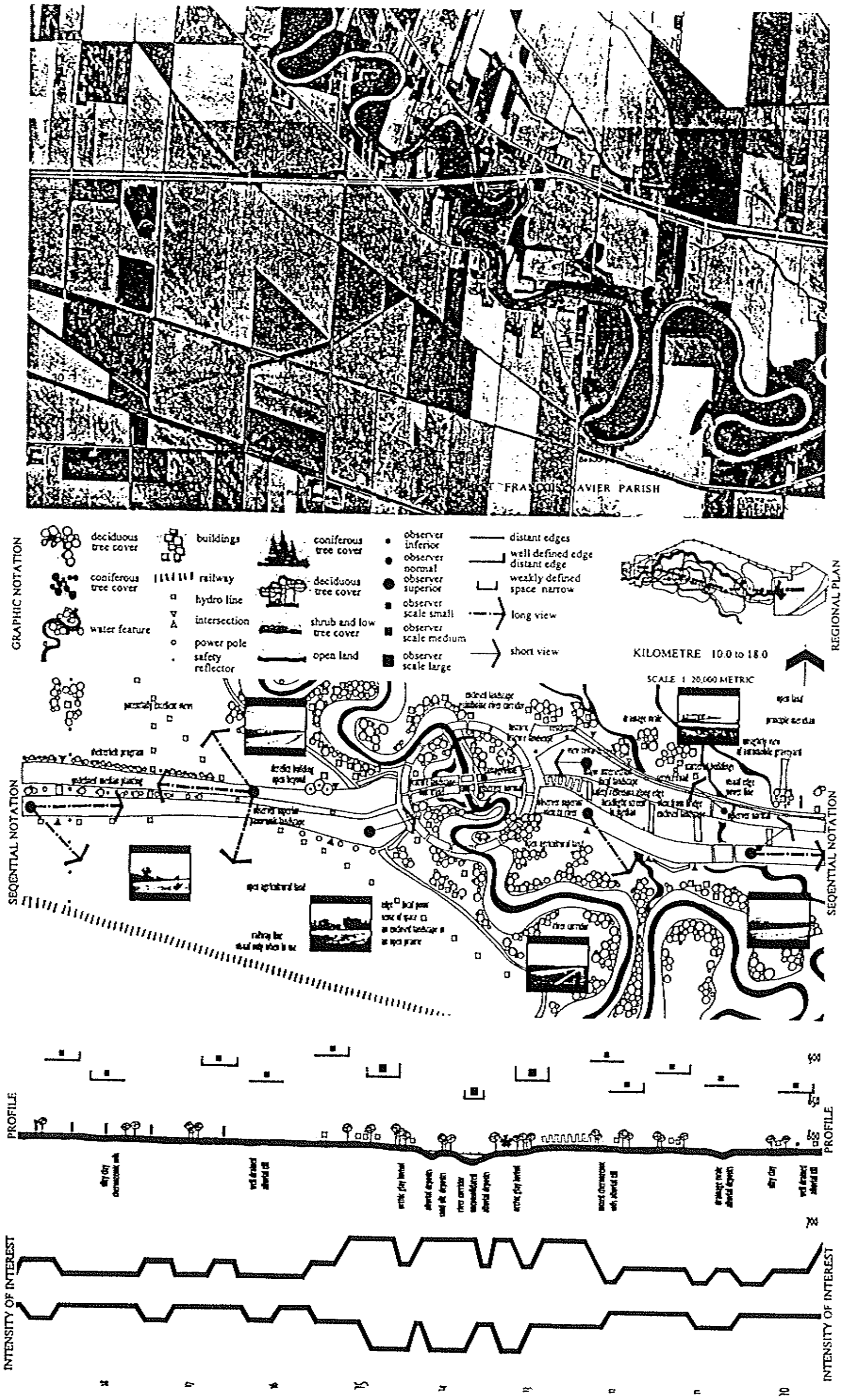
Following is the graphic portrayal used in the presentation of the Inventory Analysis Technique as applied to these regions of the Trans-Canada Highway Corridor.

The Trans-Canada Highway Corridor

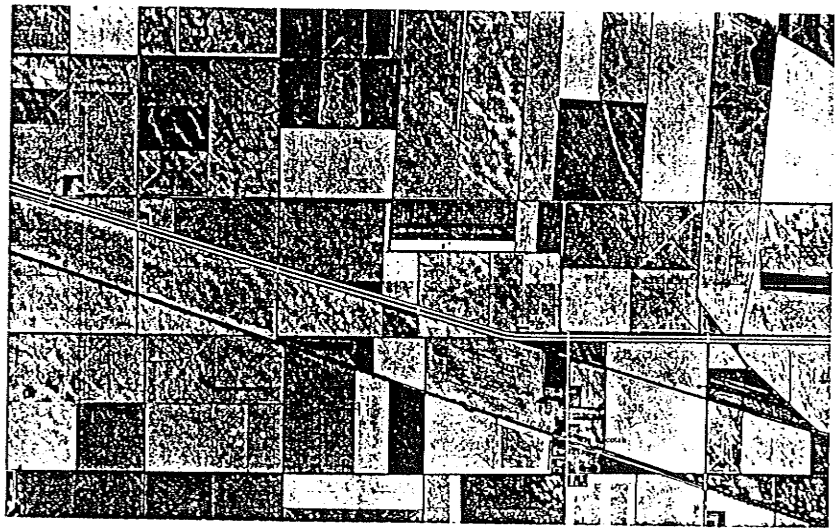


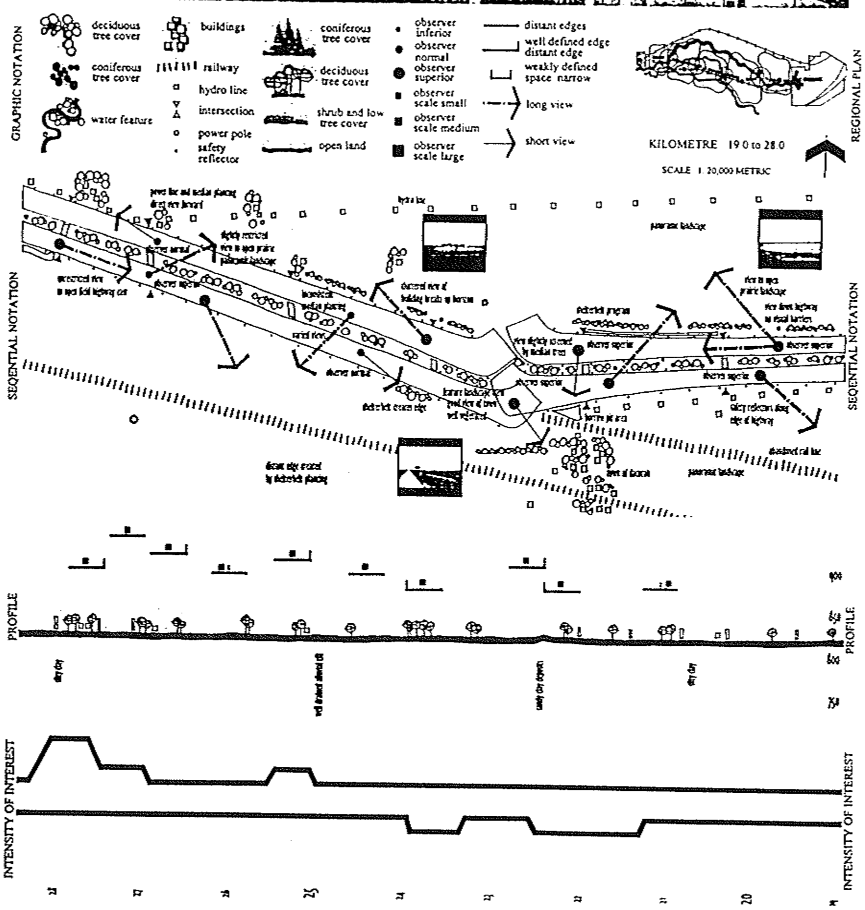


The Trans-Canada Highway Corridor

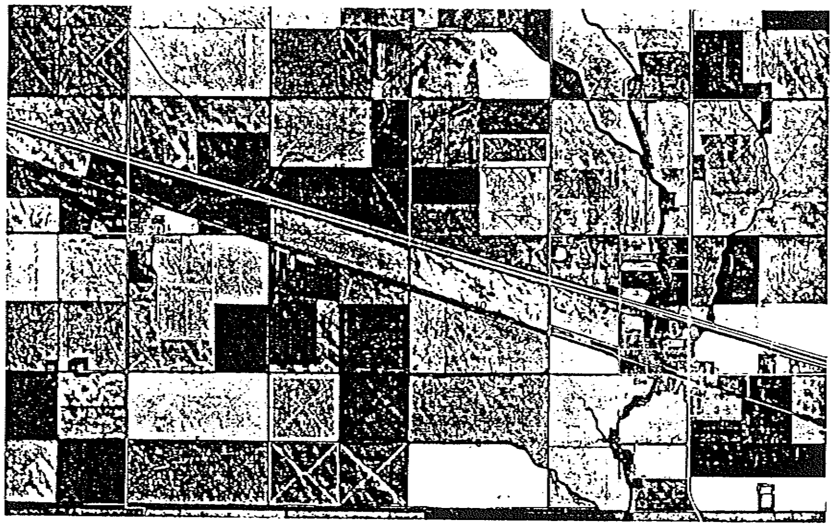


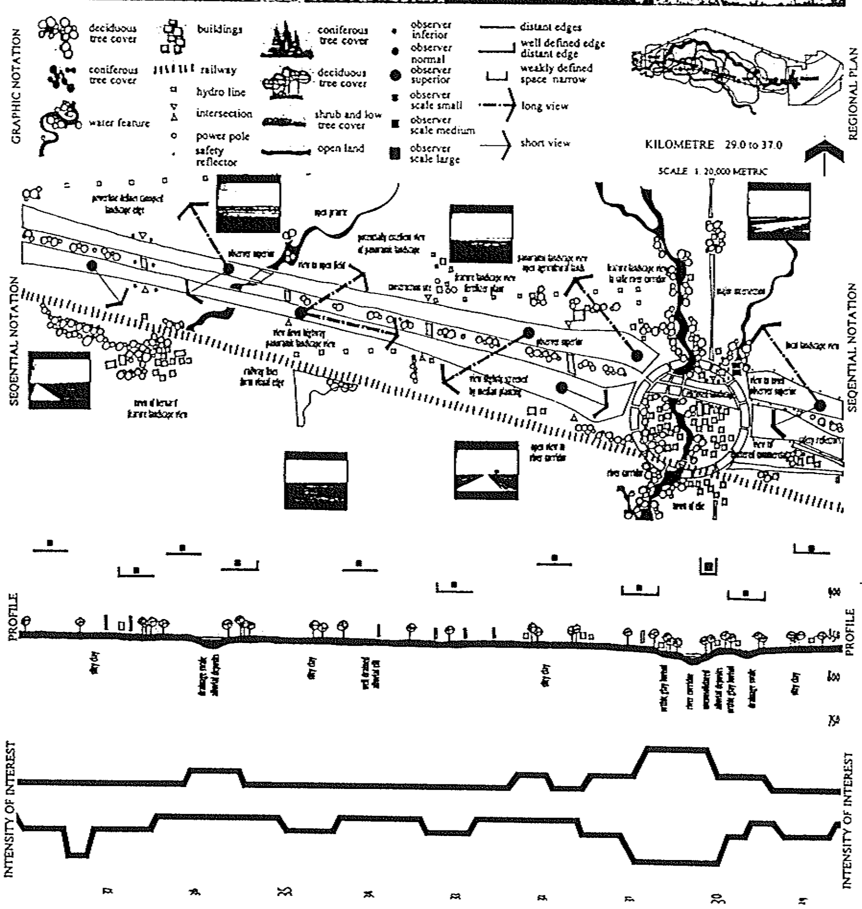
The Trans-Canada Highway Corridor



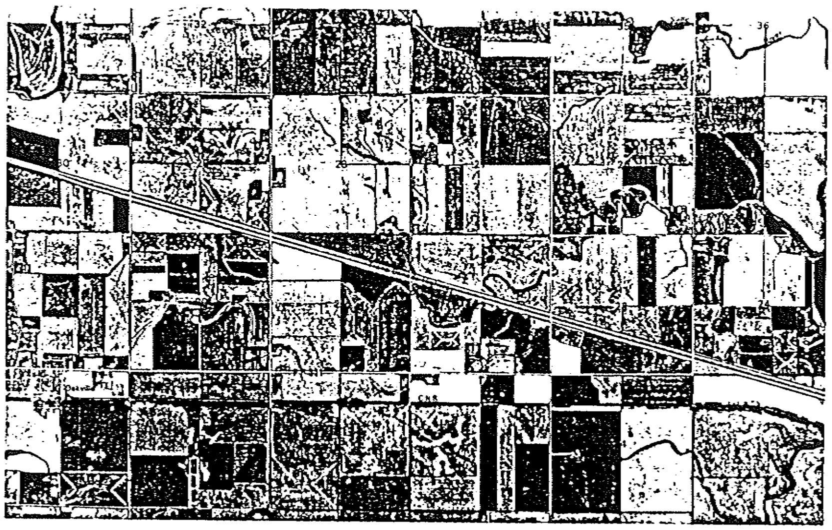


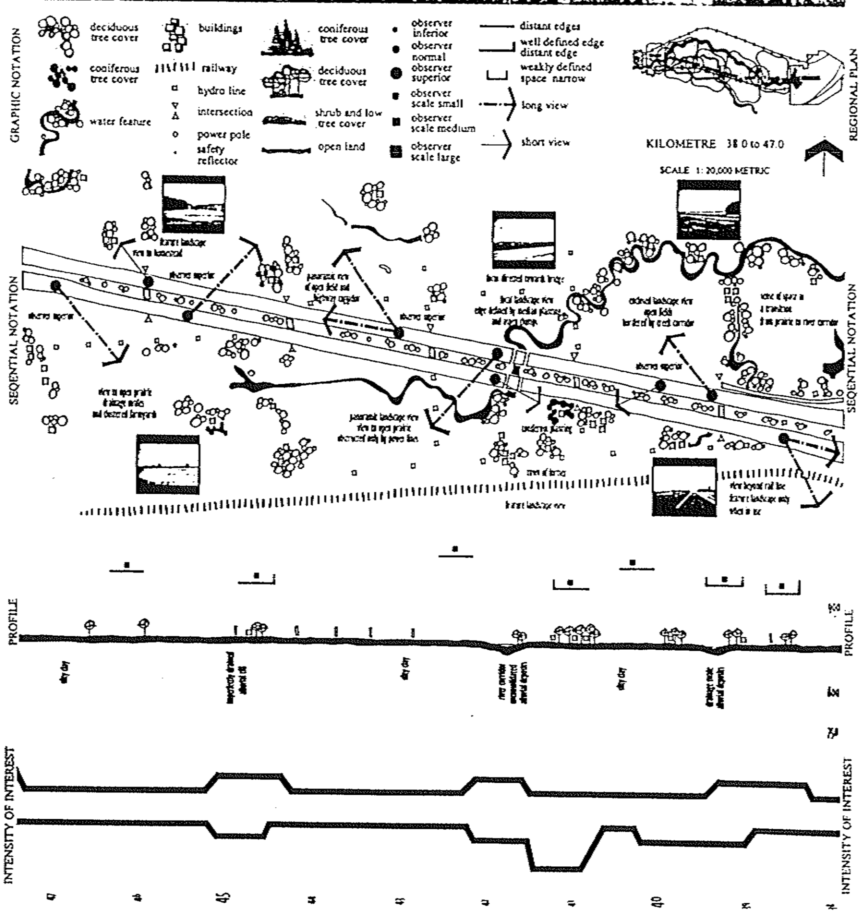
The Trans-Canada Highway Corridor



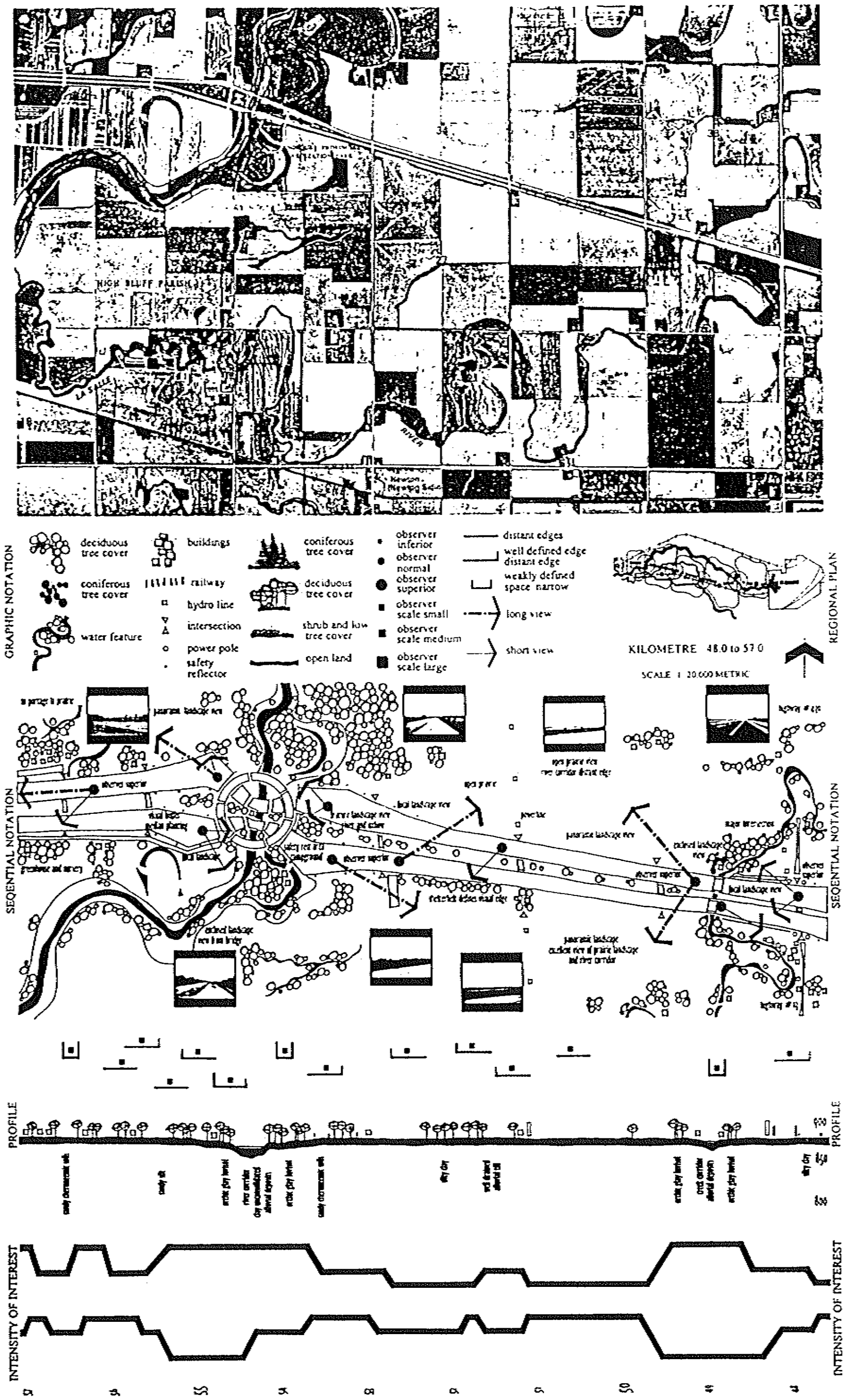


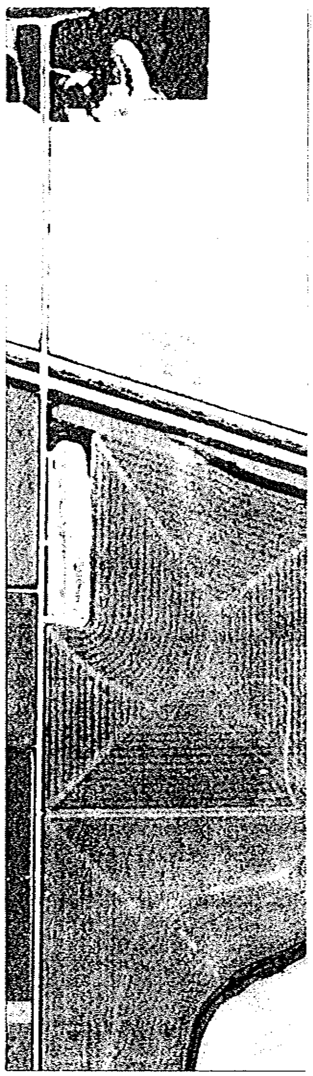
The Trans-Canada Highway Corridor





The Trans-Canada Highway Corridor





PART FIVE

Design Guidelines

Specific design guidelines may be required to mitigate, enhance, or rehabilitate the activity to conform with the characteristic landscape.

In the context of the prairie regional landscape the following design guidelines have been adapted and modified from the following sources:

- *U.S. Bureau of Land Management (1980a);*
- *U.S. Forest Service (1974);*
- *Litton etal (1974);*
- *AASHO Operating Committe(1970)*
- *McHarg (1969);*
- *Blair (1980); and*
- *Yeomans (1983).*

GENERAL GUIDELINES

1 As a first principle, design with nature, not in opposition to it. The designer of landscapes should not forget sky and animals, smell, sound, taste and feeling. (Litton 1979). All affect the environment by association. For example, a dramatic scenic viewing experience is enhanced by clean air, the sound of wind or rain, or perhaps a chance observation of wildlife.

2. In theory, the design principles which promote either conspicuous or inconspicuous man made changes can be equally satisfactory: both can have high quality through design control. For example, a well designed sewage treatment plant, though conspicuous, can blend well

with its surroundings or be a positive factor by enhancing the site, if planned to reflect the characteristic form, texture, colour, and scale of its surrounding.

3. Distribute management activities over space and time to reduce immediate negative visual impacts. Each stage should have minimal visual impact but long-term effects are of primary design concern.(McHarg 1969)

4. Curves are less prominent to the eye than straight lines, therefore less obtrusion and easier to work with. There are few straight lines in nature. For example, undulating or sinuous river and valley systems are easier to design with than straight canals, dykes, or man-made channels. Conformity with natural gradients gives fewer visual problems than straight and level lines.

5. Roads, paths, trails and railways are all directive. Design with constraint and in a manner that does not intrude on the natural landscape. Parking lots and entrance roads to a management activity should hold interest in themselves, that is, be designed for movement without confusion. Road systems are keys to regional "*images*".(Litton 1974)

Form

Irregular arrangement of forms, natural or man-made, may offer great variety but are generally less memorable than regular, imposing arrangements.(Smardon, Palmer, Fellsman 1986). Also the more regular the land form, the greater the contrast of an introduced project. A large structure is impossible to screen or disguise, and becomes a memorable visual expense. Irregular forms should be designed to blend rather than contrast their surroundings.

Line

1. Boundaries (lines), whether natural or man-made, particularly straight sectional boundaries superimposed on irregular landscapes, are critical design features.(Smardon, Palmer, Fellsman)

Any proposed development should be located to either harmonize or blend with the direction of line or to contrast strongly with it.

2. Screening or softening in terms of colour and texture can be effective. As an example, a strongly linear highway can dominate the natural landscape. Its design calls for sensitive vertical and horizontal curve alignment, median strip treatment, and sculpturing of cut banks to blend with adjacent side slopes.

3. Linear tree plantations can enhance and offer contrast to flat landscapes. For example, an introduced line of poplars or similar, highly vertical plantations serve to break the surrounding flatness, slow the eye and create visual interest.

Colour

In rural and wildland settings, colour is usually the most dominant factor when in contrast with the landscape. The opposite is true for colours selected to visually link an object to its background context. Colour accents function and can usually be seen from great distances. For living elements, colour indicates season, age, organic health, soil condition, and other biophysical factors.

Texture

Texture is readily apparent in foreground distances, less so in middleground, and seldom seen in the background.(Smardon, Palmer, Fellsman 1986). Therefore, vegetation, land surfaces and water textural patterns, although often subtle, should be recognized and reflected in the design of any imposed development seen at the foreground level. In this way, surrounding texture may be either complemented or contrasted.

Others

Roadside Details

1. Signs are a significant force in the visual environment. There are two primary types of signing: promotional and official. Promotional signs (advertising places and events of a commercial nature) should be located within public information centres and/or screened from the main road. Special zoning may be required. Official signs (highway, information, park and public area directional information) should be discreet and yet clearly legible. Generally, light coloured letters on a dark background blend most readily with the natural landscape (University of Michigan, 1967).

2. Man-made elements can present satisfying visual images when forms are properly limited to the scale of their surroundings and also reflect their functional requirements where these become visible through external design.

3. The more simple and straightforward the design, configuration, or development, the more easily its symbolism will usually be understood.

4. Roadside detail, colour and texture of road surface, shape of objects at shoulders, retaining walls, bridges, over-passes - all set visual tune and are important in contributing to legibility/imageability of the landscape.

Water

Water makes the landscape more ' *visible* ' by extending vistas or by becoming a foil for surrounding landforms. Reflections and wave action create motion and variety in the landscape. Allow full play on these highly visible factors - particularly along edges in the landscape. Water edges in the landscape are generally ' *fragile* ' environments capable of withstanding little alteration. It is usually the most characteristic and imageable element in the landscape.

Diversity in the Landscape

1. Vegetation diversity, either natural or man induced, creates both visual variety and biological diversity.

2. Principles of diversity: in the foreground, texture and colour adds the most diversity in the middleground, line is the most outstanding element; in the background, form is usually the most important element creating diversity. Segregation (combinations) and gradation (building toward a climax, or a sequence of events) are examples of repetition which can be used in creating diversity through design.(Smardon, Palmer,Fellsman 1986)

Edges

1. Major landscape elements can best be analyzed through consideration of edge. Each edge conveys a distinct feeling depending on scale, mass, quality of elements, and manner in which elements come together.

2. Edges become extremely important as organizational feature. Some examples where edges are visually important include stream banks, fencelines, and forest edges. It is important to design in accordance with these natural configurations.

3. Edges can maximize the potential of features with high legibility/imageability and minimize those that do not.

Contrast

1. Depending upon site specifics, contrast in landscape pattern elements)form, line, colour, texture and scale) can either be emphasized or subdued, depending upon naturally existing dominance factors.

2. Man-made elements, such as monuments, towers, elevators and so forth, are more immediately apparent to the eye than their surroundings since they are focal and draw the eye from their surrounding. Restraint in placement should be practised to keep the eye focused on the environment and used when only wanting to highlight or focus the view.

3. Extreme conditions in form, line, colour and texture in the introduction of development activities to the landscape should be avoided.

4. Man-made elements not intended to be boundaries (power poles and lines, canals, highway alignments) are highly visible and deflect attentions and interest by presenting extreme contrast in the landscape. They should either be relocated, screened or accepted as necessary negative deviations.

5. Structural materials should not be directly imitative of nature (for example, using concrete to suggest rock masses) but should stand on their own as introduced elements designed to blend with nature.

6. Visually unique elements give the greatest contrast in the landscape (for example sand dunes and river valleys). When dominant, they should be allowed prominence and not constricted or opposed by structure.

Enhancement

Another option is enhancement of visual attributes of a project or project area by design or improvement of existing site conditions.(Smardon, Palmer, Fellsman 1986) For example, additional visual interest can be created by introducing vegetation to soften harsh edges, removing it at critical viewpoints and, in some cases, by screening. Highway access routes can be visually enhanced with native plantations along median-strips, by blending cutbanks with adjacent landforms, and through design of alignments to create variety and interest.

Imageability/Legibility

That quality in a physical object which gives it a higher probability of evoking a strong image in any given observer. It is the shape, colour, or arrangement which facilitates the making of vividly identified, powerfully structured, highly useful mental images of the environment (Lynch, 1960.9).

HIGHWAY LANDSCAPE DESIGN

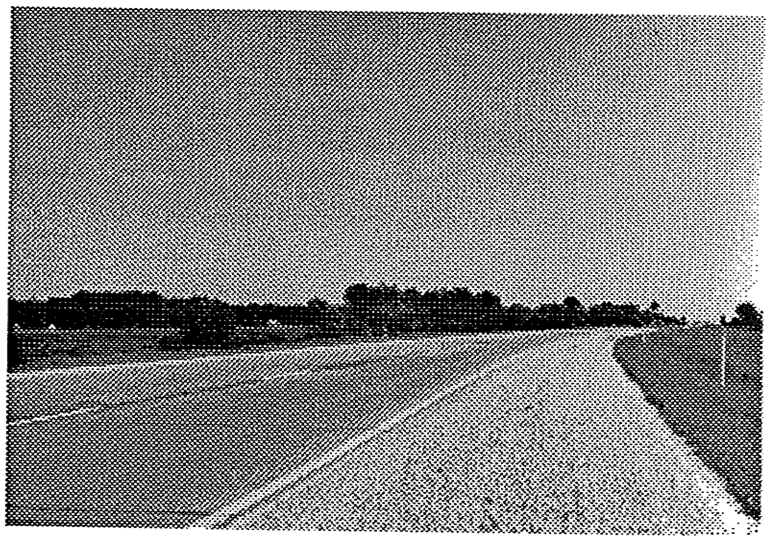
It is important that consideration be given to the effect the highway facility will have on the quality of the environment through which it passes. Highway landscape design should be considered in the entire highway corridor, which includes the amenities beyond the right-of-way and the adjacent land use. Improved perceptual qualities and appearance, enhanced aesthetic values, the preservation of historic features, appropriate plantings, and reduced roadside maintenance requirements are within the scope of the landscape design.

Highway Landscape Design Guidelines

A. ***Right of Way***

Determination of the character and extent of the existing and proposed landscape development should precede acquisition of the right-of-way. Near highly urbanized areas where landscape development and open space are important, the economic, aesthetic and recreational benefits of the landscape areas should be compared to the cost of the land necessary for sub-development. Each project will require a different landscape treatment. Projects may require rather intensive functional planting, necessitating adequate right-of-way for the purpose. On Projects that are located close to a lake, streams or river, it may be desirable to acquire all the land between the highway and the feature in order to preserve the natural landscape of the area.

Other projects may benefit both highway and the adjacent areas by complete separation. Boulevard conditions may be unsightly and screen plantings desirable. Such plantings not only will obscure the view for the traveller, but may help to insulate the traffic from the area. It is not always possible to provide wide bands of naturalistic screen plantings, mostly in urban areas, because of land cost and availability. However, some of the same degree of separation may be obtained with dense planting within the highway right-of-way. Similar treatment on the adjacent public properties will increase the effect.



' The conservation of natural features through which highways are constructed are important to the appeal of the highway environment.'

When property is acquired for highway purposes, there are instances when entire parcels are acquired because of severance or other damage costs and only a portion used for actual highway construction. These unused fragments have a potential landscape value. They may be used as planting areas within the right-of-way; when so used, they may serve to provide *"depth"* in certain situations. It may be possible during planning of some local project to co-ordinate the purchase of such areas by the local community for small park development. The use and purpose made of these fragments of the right-of-way, as well as the quality of their co-ordinated development will determine the character and attractiveness of the highway and adjacent portions of the community.(A.A.S.H.O. 1970)

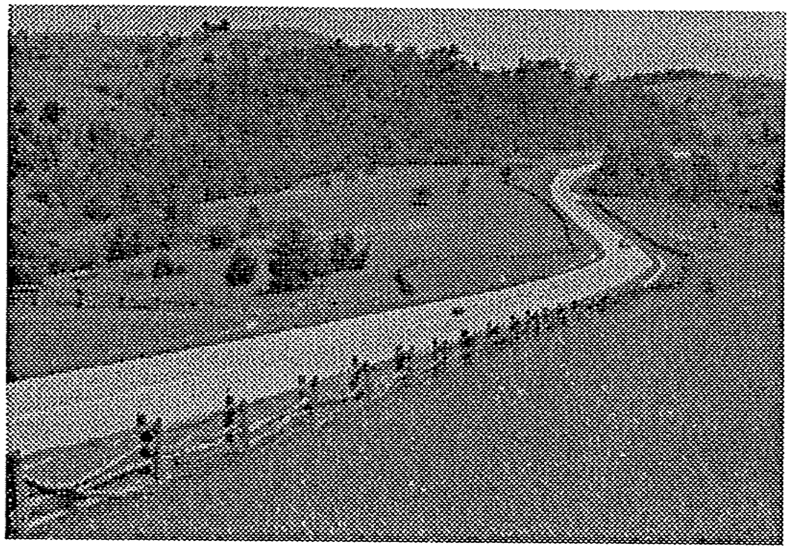
It should be noted that only through advance study of the entire highway corridor and its immediate environs, will it be possible to determine and acquire the widths of right-of-way needed for appropriate development of the highway. Such development will have long and important influence on the area (region).

Frontage roads may be essential to carry local traffic and to provide access to local properties. The landscape development along them should be part of the development of the main line highway. Frontage roads may offer an opportunity for a row of tress which would improve the appearance of the main highway and frontage road.

The conservation of natural features through which highways are constructed is important in the acquisition of highway right-of-way. It is desirable to save scenic areas or wooded strips of limited width as these are seldom found in certain areas.

The width of right-of-way or easement needed for a highway corridor facility maybe influenced by many factors. These may be the type of road, traffic requirements, including intersections, weigh stations and maintenance areas; the cost of land; natural conditions; adjacent land use and development (natural, agricultural, commercial, residential and industrial); safety rest areas and scenic overlooks; scenic protection (easements); erosion control; and planting for specific purposes.(A.A.S.H.O. 1970) These requirements are seldom satisfied by a fixed width right-of-way for any length of highway.

Where circumstances permit, a width of 30 meters on each side should be provided. This will permit some conservation of natural features and the development of buffer planting.

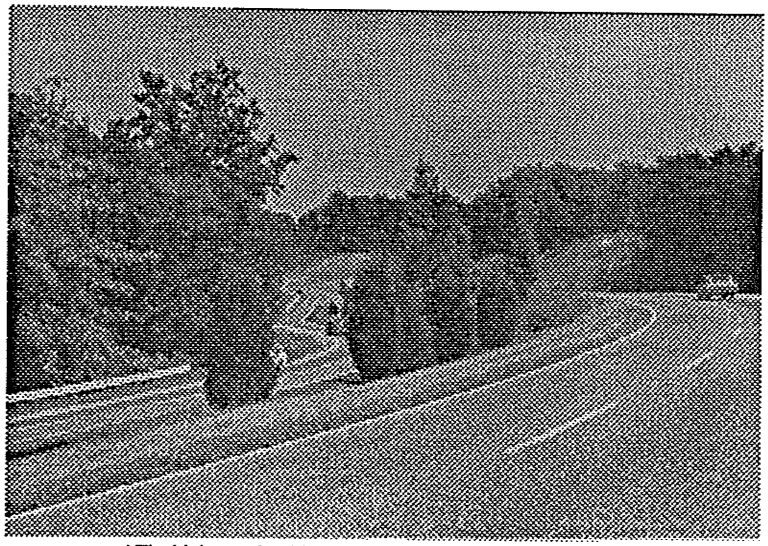


'Scenic easements maybe used where applicable and warranted.'

B. Alignment and Profile

Generally, the alignment and profile of a highway are major manmade effects visible to the motorist. They compete for the interest and attention of the driver with various other manmade effects or structures. They are frequently determined to a degree by the right-of-way and engineering requirements.

If modifications are to be examined every effort should be made to blend a highway corridor into its existing topography. The highway should have the appearance of flowing through the landscape instead of being forced through it.(A.A.S.H.O. 1970) This may be accomplished by the use of easy curves in alignment in preference to long tangents which sometimes result in unnecessarily high cut and fall slopes and variation in gradient for two roadways.



' The highway should have the appearance of flowing through the landscape instead of being forced through it.'

Independent roadways designed with flowing alignments and profiles at different levels to fit the topography will provide variation in the cross section, add interest, and improve aesthetics. The advantages of independent roadway design to be considered are the possible reduction of cut and fill quantities, the utilization of natural drainage channels to eliminate the possible needs for costly construction of storm sewers required by medians of fixed width; the preservation of woodland, streams and other natural features in wide medians; the possible reduction of damage to adjacent land values by adjustments in roadway alinement and profile; the possible reduction in cost of erosion control in medians and on side slope areas of cut and fill: the reduction in maintenance costs, such as mowing, snow removal and ditch cleaning, by preserving natural growth and natural drainage ways; an increased safety because of reduced monotony; and the provision of greater flexibility in roadway location and interchange design.

C. *Cross Section and Grading Design*

The complete cross section of the highway is an important part of the entire highway design as it determines the relationship of the roadside and surrounding region (environment) to the pavement and other component parts of the highway.(Yeomans 1983)

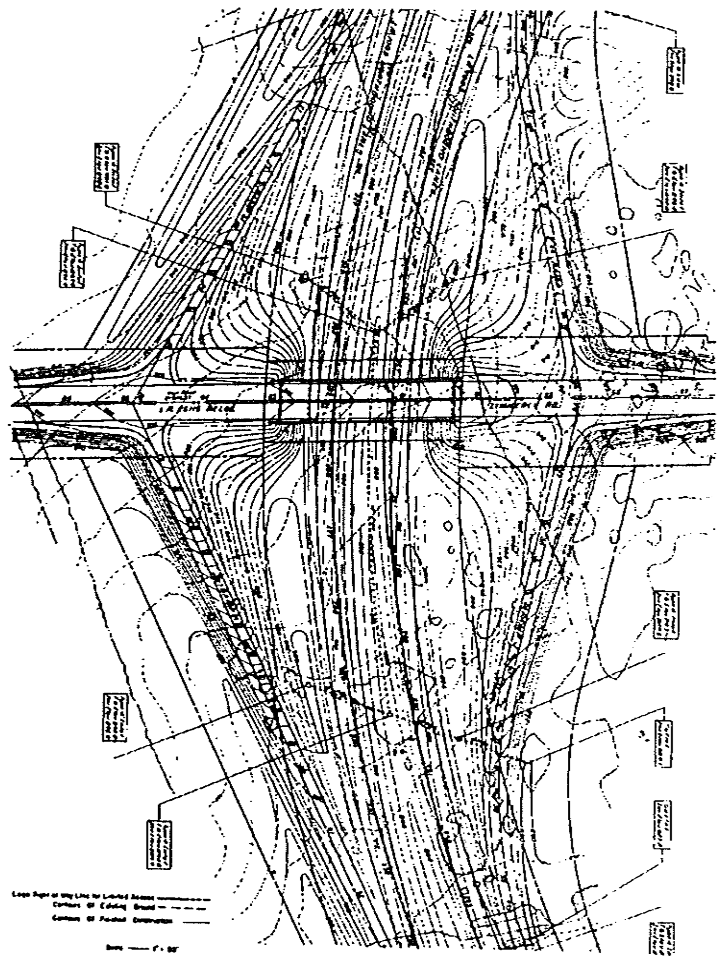
Where possible for safety reasons, the distance from the edge of travelled way to a fixed object should not be less than 12 meters.(A.A.S.H.O. 1970)

In some situations, an earth berm may serve as a safety barrier between roadways, abatements and other structure, as a barrier, as a screen for headlight glare, as a noise deflector and as a year round screen of unsightly areas.

Cross section design should consider the problem of drainage and adequate space for the desired type of planting. It is desirable for the designer to work closely with the engineer to achieve mutually satisfactory and attractive effect.

The grading design of the cross section will affect both the appearance and maintenance of the areas concerned. In those areas where the slope ratio changes, the transition between the two should be smooth and avoid intersecting planes.

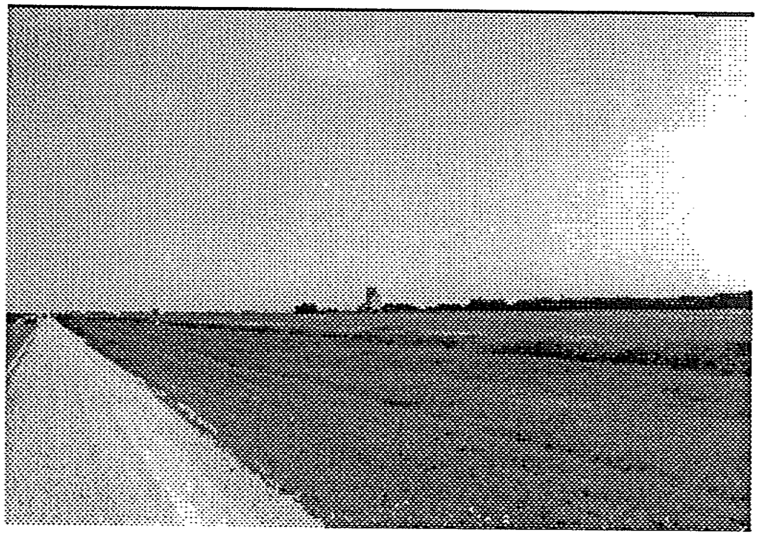
Contour grading plans should be used on all projects, as they enable the designer to express his concept of the final land form. This practice will avoid most of the inadequacies of the grading which frequently results when only cross sections are used. The grading should always be smooth enough to meet safety requirements, permit easy mowing and adequately serve the needs of surface drainage.



' Contour grading plans should be used on all projects, as they enable the designer to express his concept of the final land form.'

Slope grading, drainage, erosion control and future maintenance are closely related, and are a necessary and important consideration in the design of the cross section.

The proper shaping of slopes can benefit drainage, erosion control, appearance and maintenance operations. Centre grading plans should be used where feasible and warranted. Transition grading between cut and fill slopes should be accomplished in order to blend the highway into the adjacent terrain, to encourage rapid establishment of vegetative cover, and to provide for economy in maintenance.



' The proper shaping of slopes can benefit drainage, erosion control, appearance and maintenance operations.'

Slopes with 3:1 (3 horizontal to 1 vertical) and flatter ratios favour the establishment of turf growth and other natural vegetation as a protection against erosion. They also permit the economical use of power mowers. Slopes with 4:1 and flatter ratios add to highway safety. In some regions, slopes 2:1 or steeper may require special attention because of soil and road conditions.(A.A.S.H.O. 1970) Power mowing should be avoided because it may rut the slope and destroy its integrity. In some cases, retaining walls must be considered.

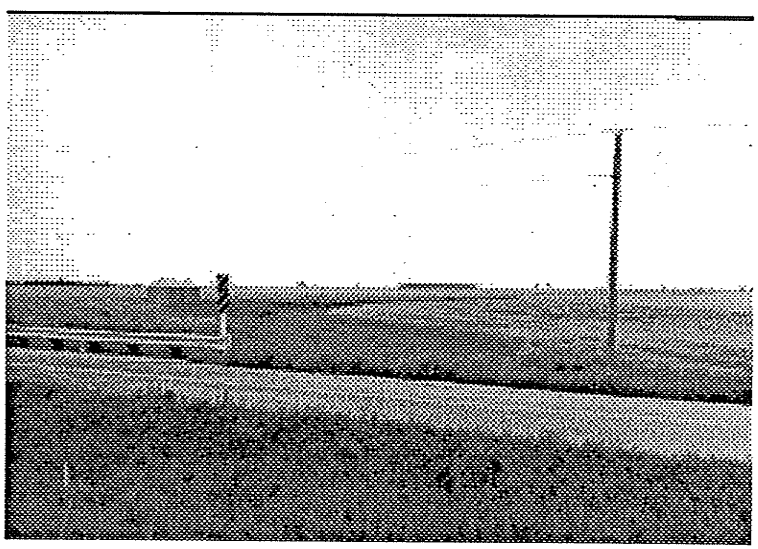
Where earth embankments parallel or cross streams or shorelines, planting, rip raping, stone fill, masonry wall construction or other special protection against stream erosion should be provided. A protective strip of adequate width for existing vegetation should be saved wherever possible, thus reducing the need for artificial protection against erosion.(Litton 1974)

D. *Drainage*

In rural areas, where drainage installations are required to supplement normal watershed ares, provisions should be made to ensure motorist safety and proper erosion control. Rounded gutters and drainage channels may be provided and should be designed for ease of vegetative establishment and maintenance. Drainage channels may be protected by a turf cover. In cases where water volumes and velocities are likely to cause erosion, suitable lining material may be advisable. Intercepting channels, ditches, dikes, swales or silting basins may be constructed at suitable locations to protect against surface water erosion. Restricted narrow channels may require paved, steep, side slopes.

Changes in existing stream channels should be avoided. Where necessary, they should be given careful attention to prevent increased stream velocities and erosion of streambeds. Excavation may cause excessive siltation and the formation of sand and gravel bars in addition to increasing stream velocity. Care should be taken to protect plant and aquatic ecology.(U.S. Forestry Service)

Interceptor ditches or dykes should be used only where required to prevent erosion. They should be inconspicuous and should blend with the natural contours. Where right-of-way is restricted, wing ditches or erosion checks may be used to interrupt the flow. When lining is required, the construction materials should blend with the natural ground material.

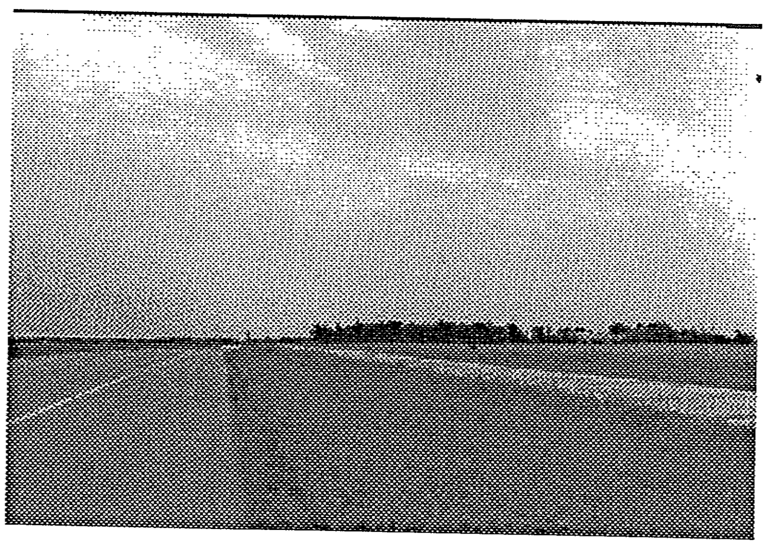


Interceptor ditches should be inconspicuous and should blend with the natural contours.'

E. *Erosion Control*

Appropriate means of controlling erosion of the earth surfaces along highway roadsides are necessities. It is important to prevent soil from silting ditches and natural drainage ways within the highway corridor.

Lack of effective erosion control on slopes, or some flat surfaces, may result in unsightly channels or eroded areas which are costly to repair. Effective erosion control should begin early in the construction phase, before the final grades are reached. It is essential that grades be protected as soon as possible. A rough finish on slopes, after construction of final cross section, will deter erosion. A temporary vegetative cover will reduce erosion until a permanent cover is provided.(U.S. Bureau of Land Management 1980)



' While grass is commonly used for preventing erosion, woody plants or certain shrubs can also be used effectively

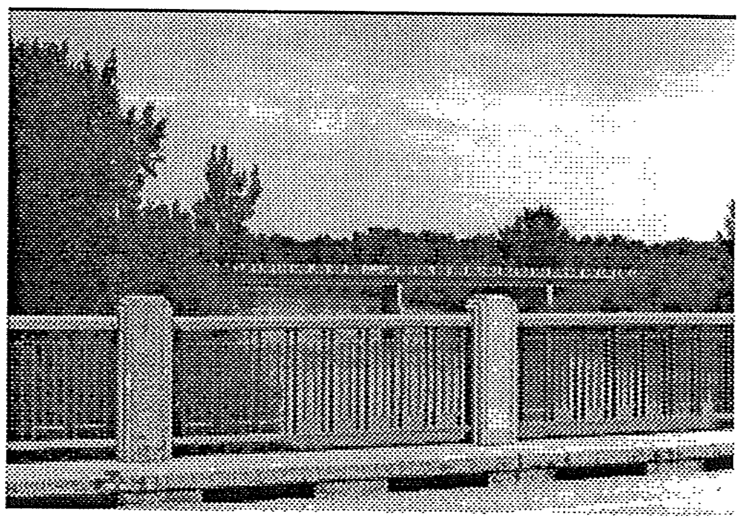
While grass is commonly used for preventing erosion, woody plants or certain shrubs are also used effectively. On slopes beyond the designated mowing limits, vegetative growth requiring little maintenance should be established. The most commonly used cover is turf produced from grass seed and mulch.

Slope grading, drainage, erosion control and planting should be correlated with the design of all roadways and structure, not only to enhance the appearance of the area and improve safety, but also to keep construction and maintenance costs to a minimum. Planting for each site should be designed separately on the basis of the effect sought, soil, site, ecology and other considerations.

Consideration should be given and adequate specifications provided to minimize erosion of newly graded areas and the subsequent siting of ditches and natural watercourses during construction. Generally, the specifications require the establishment of a vegetative cover or effective mulch on the newly graded area as the work progresses instead of waiting until the project is complete.

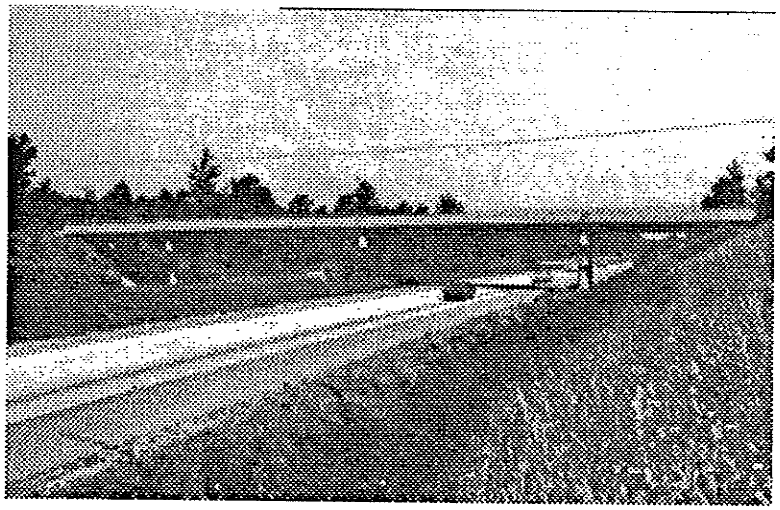
F. Appearance of Structures

Bridges on highways should be designed and built with a variety of span proportions and profiles, using materials in keeping with the site of the structure. Bridge structure should be light in effect, and plain in profile, with simple functional piers and simple inconspicuous railings of an appropriate height. Light, clean functional qualities found in some bridges fit into the highway scene without adding a monumentally ponderous note. These qualities of simplicity and proportion are preferred.(Blair 1980)



' Light, clean functional qualities found in some bridges fit into the highway scene.'

Adequate planting and other types of landscape development, including earth berms, in proximity to the bridge or on the bridge approaches can often do much to improve safety and enhance the area.



Retaining walls offer an opportunity to contribute to the landscape effect by having a simple design of appropriate scale executed in concrete masonry or masonry faced with stone or brick.

Details such as light standards, signs, guardrails, walls, rip raping and curbing are important in the overall appearance of a highway and should be given thorough study during the design stage.

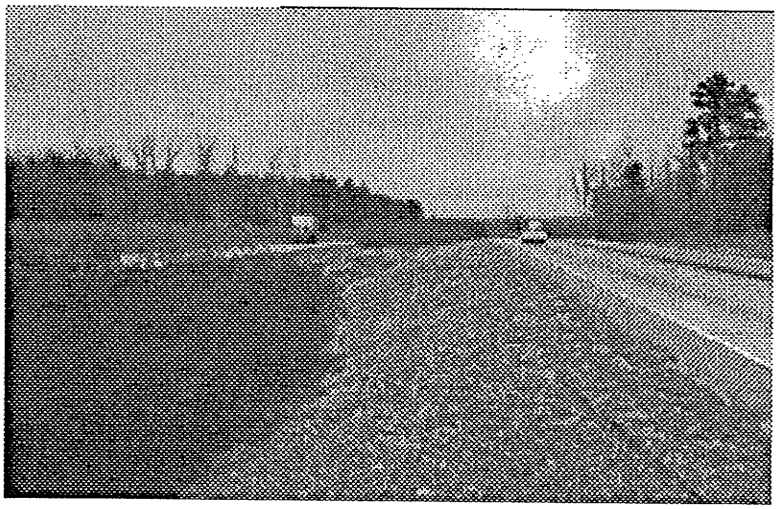
G. *Planting*

The highway offers opportunities for planting design under a wide variety of conditions. The width of right-of-way may vary from an extremely narrow area, providing only scattered minor locations for planting, to areas of completely adequate width that provide all the space required for appropriate landscape development and safety. Whatever the situation, the highway offers a real challenge to the landscape designer.

Planting on a highway may be designed for special purposes such as:

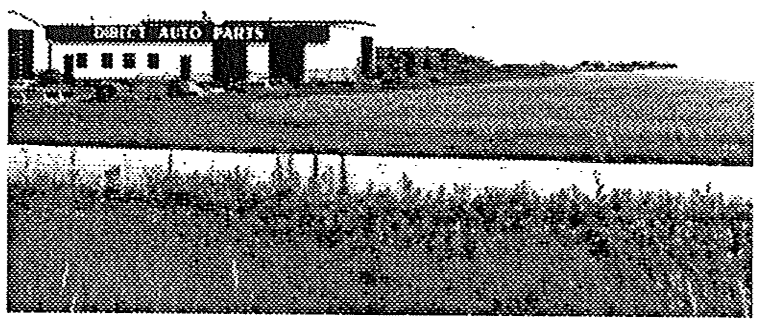
a) *Screening for Headlight Glare*

This can be of considerable value in certain areas depending on road alignment, ground forms, existing vegetation, and width of median separation. In some situation, materials other than plants may be appropriate. Where needed, planting should form a continuous screen and avoid intermittent glare.



b) *Screening of Undesirable Views and Objects*

This is a commonly used and effective method of obscuring undesirable views seen from and toward the highways. In some cases, effective screening with plants will take a period of years to achieve but this should not prevent the accomplishment of such work. The sight lines from and toward the highway to the object to be screened should be studied. Occasionally, there will be an opportunity to utilize existing trees and other growth as the foundation of a screen planting. Action should be taken early in the design stage to protect existing vegetation. In some instances a year round screening is necessary. Effective screening may be accomplished by using fencing or other structural materials. Whenever possible, consideration should be given to the removal of the objectional development.



c) Planting for Traffic Indications

Functional planting can assist in making it evident to the motor vehicle operator that a change in alignment of the road in imminent or that the operator is approaching an exit or a bridge. Such plantings should be designed with consideration for traffic safety, inexpensive maintenance and ease of mowing.

d) Planting to Control Snow Drift

Snow fences made with plants appropriate to the environment may reduce drifting and eliminate the cost of erecting and maintaining other types of fences. Maintain existing vegetation to serve as a natural snow fence and control snow drifting.

e) Planting to Provide a Crash Barrier

Dense shrub masses, by their slower decelerating effect, catch vehicles and cause less damage and injury to car an driver than solid barriers. However, they may require two to three years to become firmly rooted and well grown. In the median, multiple rows of dense shrubs are effective.

f) Offset Distances for Trees

New plantings of trees whose trunks' diameter at maturity will exceed 4 inches, should not be made closer than 12 meters from the edge of the travelled way except in special circumstances. However, the 12 meters distance for vehicle recovery area is not to be considered a fixed single-control dimension. Variations in cross-sections design and traffic speed may increase or decrease the dimension. Shrubs and ground cover may be planted or be retained within the recovery area for safety and aesthetic purposes. Existing trees may be retained (1) on the high or cut side of the roadway, not in the likely path of an uncontrolled vehicle, (2) on the low or fill side if protected by a guardrail or not likely to be hazardous to an out-of-control vehicle, and (3) if important historically or aesthetically and protected by a guard-rail.(A.A.S.H.O. 1970)

Minimum setbacks for newly planted trees with an ultimate trunk diameter of more than 4 inches should be as follows:

1) 100 km/ph or greater design speed.

a) Minimum setback from edge of the traffic lane should be 12 meters unless on the following reasons will allow for a lesser distance.

i Cuts of 3:1 or steeper - 4 meters behind the point of vertical intersection at the toe of the slope.

ii Where concrete barriers, walks, abatements, or other rigid obstructions are used 2 meters behind the obstruction.

iii Where a flexible guard-rail(box-beam, w-beam, or cable) is used 2 to 8 meters behind the face of the guard-rail, depending on guard-rail type.

iv Where there are barrier curbs near a travelled lane 2 meters behind the face of the curb, adjacent to a parking lane - no definite set-back distance.

v Where limited right-of-way or the necessity for planting would result in less clearance, all factors in the particular problem area should be weighed to decide if a special exception is warranted.

2) 100 km/ph or less design speed

Minimum set-back from the edge of the traffic lane may be 10 meters unless one of the reasons set forth under (1) will allow for a lesser distance.

3) On curves, adequate sight distance for the design speed of the highway must be maintained.

4) Modification of the minimum set-back may be required by special considerations:

a) An east-west orientation necessitates a greater offset of vegetation from the south side of a road than the north to prevent shading and ice formation in winter time.

b) Occasionally, special conditions warrant planting slightly closer to the pavement in order to fulfill some limited specific function, but most functional planting should consist of low growing shrubs below the sight line.

c) The characteristics of the plant material used affect the amount of offset needed.

Some plants are damaged by salt spray from the pavements. Only those plants which have proved themselves adaptable to the difficult growing conditions found in such situations. (U.S.Forestry Service 1974) Good planting soil is one of the necessary requirements for successful plantings.

H. Median

Aside from topography, the following factors may have an influence on the width of the median:

a) Preservation of natural landscape features;

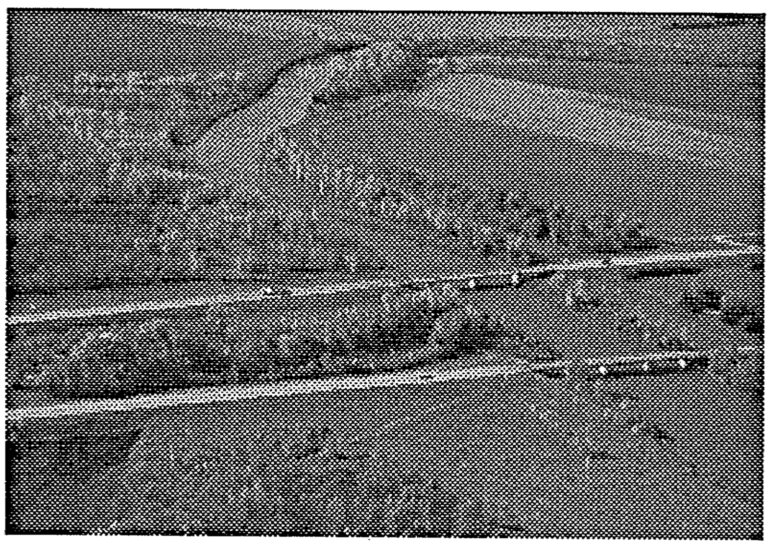
b) Preservation of natural drainage features;

c) Traffic safety:

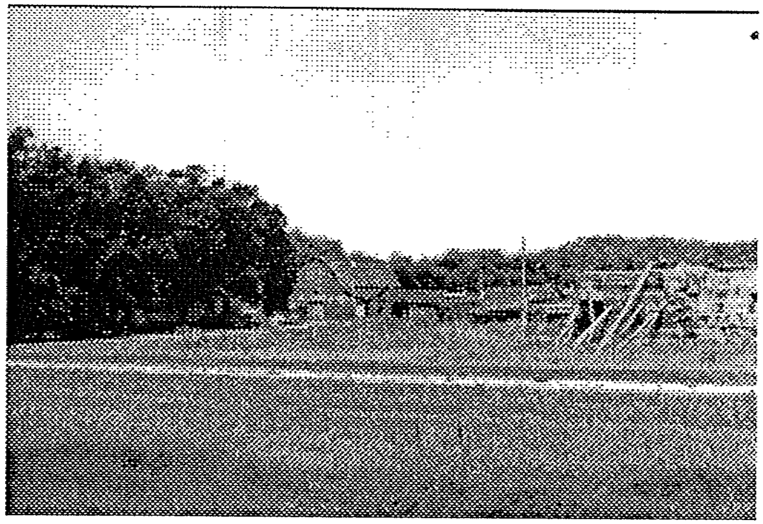
1. Control headlight glare.
2. Elimination of the danger of vehicles crossing median.
3. Reduction of snow drifting.
4. Movement of cross traffic.

d) Economy of construction and maintenance;

e) Land needed for future expansion.



A median wide enough to allow for two distinctively separate roadways may result in less cost for both construction and maintenance. A wide median may also provide best means to minimize headlight glare as opposed to an artificial structure that is more costly and detracts from ecological identity.

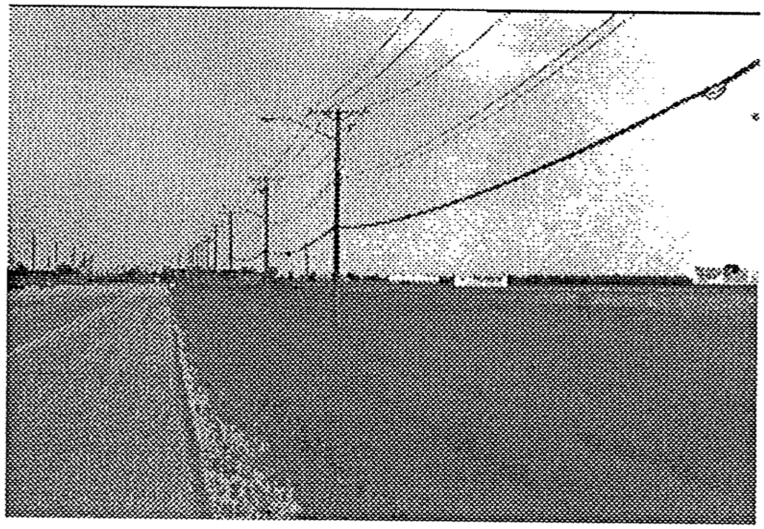


I. Roadside

These include all unpaved areas within the right-of-way. Space as necessary or desirable, should be provided for grading and damage, traffic safety, the establishment of a screen of trees and/or shrubs (either planted stock or natural growth preserved at the time of construction) for highway purpose, the preservation of natural landscape feature, historic sites, landmarks, and possible vistas, meeting natural topographic lines of demarkation such as borders of water courses, cliffs, hill tops, existing development of abutting real estate, etc. new planting or treatment of existing growth to relieve monotony, planting to control snow drifting or icing, and special features such as rest areas, scenic overlooks, weigh stations, maintenance facilities and other special uses.(U.S. Bureau of Land Management 1980)

J. Highway Hardware

Hardware may range from luminaries to directional and interpretive control devices, and should be compatible with the surrounding environment. Utilization of a proper background may mean the success of a device. Appropriateness to the adjacent surroundings should be considered on location and height of luminaries. There should be close co-operation between landscape and architectural personnel, structural and lighting engineers and traffic engineers on colour and location when installing devices in conspicuous places, such as in or on structures, or in accordance with highway requirements.

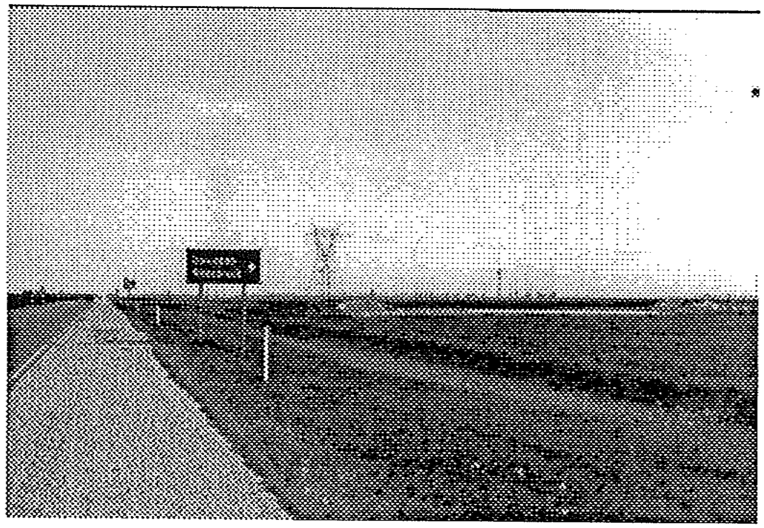


K. Construction Considerations in Design

a) Borrow, Waste Areas and Haul Roads

Every effort should be made to treat them so that they will blend into the roadside landscape. Disturbed areas should be regraded and revegetated to ensure erosion control and improve unsightly or undesirable conditions. Borrow pits may be shaped with side slopes of 3:1 or flatter and developed as roadside ponds for recreational use. Borrow may be obtained by removing an entire knoll or small hill.(A.A.S.H.O. 1970) When property located and treated, borrow areas and waste areas may improve the finished appearance of the total project.

Appropriate planting may partially obscure an area, but to be effective, it must be used in connection with the proper grading of the area.



If suitable, spoil may be used on fill slopes, shoulders or in other selected areas. Contour grading plans may be used to obtain desired results.

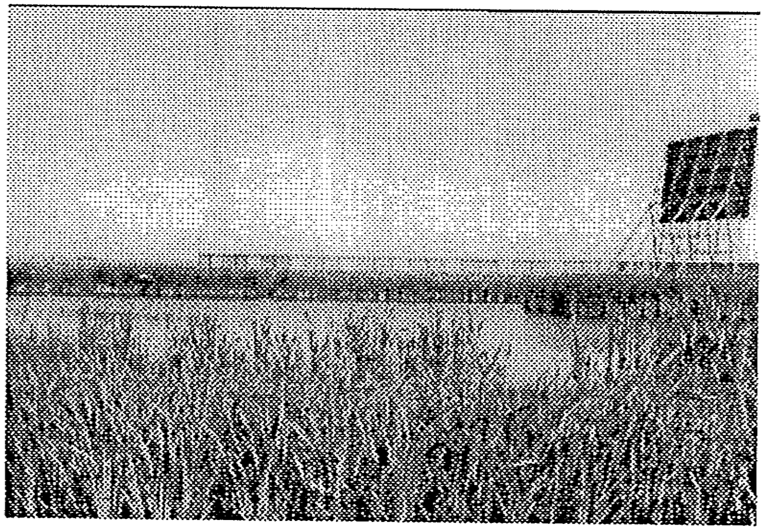
Suggested practices in regard to the location and treatment of borrow areas and waste areas are:

- i Provide contour grading plans where feasible and warranted;
- ii Provide adequate space to allow for the conservation of existing screening or permit the installation of screen plantings;
- iii Locate so that the area will not be below eye level or in exposed locations so that screening is impossible;
- iv Cover stumps, logs and other little in areas exposed to view from the highway;
- v Grade, plant, fertilize and mulch exposed borrow areas and waste areas;
- vi Locate access roads at right angles to highway against the angle of vision;

vii Place fill around trees in a manner that will not kill or injure them;

viii Place waste material in a place it will not interfere with surface drainage;

xi In certain situations, it may be advisable not to drain borrow pits in order to retain them as ponds or marshy areas.



b) Clearing and Grubbing

The site of a project should be cleared only within limits of construction, or as required for safety. The ground surface should be cleared of all trees, brush, weeds, roots, matted leaves, small structures, debris and other unsuitable matter within the construction prism.

Trees, shrubs and landscape features to be preserved should be protected during the progress of the work.

Specifications for clearing and grubbing should require that all trees be felled toward the centre of the highway and away from trees and shrubs to be preserved.

Dead trees and those which die during the life of the contract, along the edge of the wooded areas remaining after clearing the site, should be removed. Individual free-standing trees within the right-of-way but outside the limits of construction, which area dead or have died during life of the contract, should be removed.

During clearing and grubbing of the site, the contractor should be responsible for the preservation of all public and private property, existing trees, plants and other vegetation that are to remain within or adjacent to the highway. He should be required to restore to their original condition all areas beyond the limits of construction which have been damaged by his operations. He shall not remove or cut trees or shrubs outside the limits of construction without authorization.

c) *Excavation and Grading*

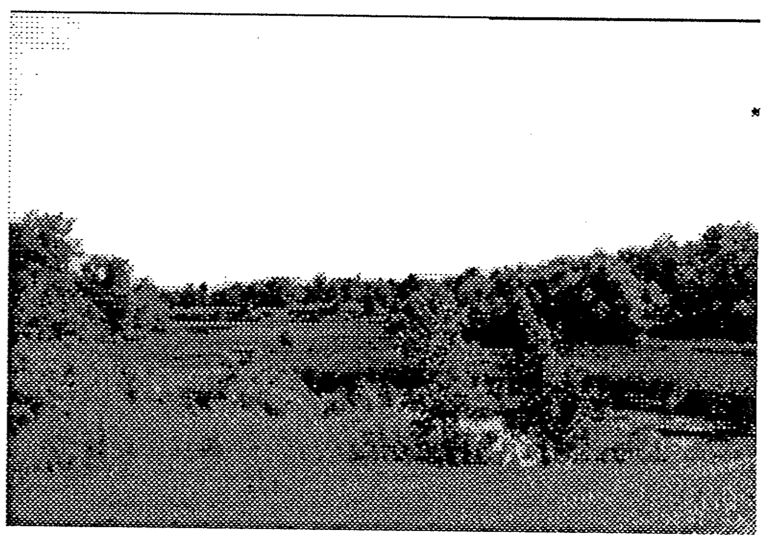
Occasionally, materials from excavation and grading may be used in the construction of embankments on the project, but if they are to be disposed of in another manner, they should be placed at locations or used in a manner that will not adversely affect the design. Flat slopes are usually desirable. Flat slopes reduce the amount of guardrail required; thus there is an initial saving as well as a reduction in maintenance costs. Flat slopes also reduce erosion; thus reducing maintenance costs over the years.

d) *Topsoil Salvage and Use*

Before grading work begins, acceptable topsoil within the excavation and embankment areas may be stripped off to a depth of not less than 100 milimeters below the existing ground surface, if shown on the plans and as directed by the Landscape Architect. Stripped material should be stockpiled and used as required. Stripped topsoil in excess of the quantity required for the project should be stored at locations specified or shown on the plans, for future use.

e) Selective Thinning

Trees, selected for thinning may be removed to produce irregular foliage lines, to create a natural transition between the open clearing of the site and the undisturbed woods, to form bays and open areas in woods, to thin heavy stands, to remove undesirable species, and to open views and vistas. Unless an area is specifically designated for clean up, trees shrubs and other natural debris within the area may remain to become humus. Trees, shrubs and other vegetation to be removed under selective thinning should be specifically designated for removal. Trees should be carefully felled to prevent damage to adjacent vegetation, structures and property. Stumps should be removed in areas to be mowed. The excavation should be backfilled to the adjacent ground surface. In wooded areas, stumps should be cut off at the existing ground surface. Live stumps not to be removed, should be treated with an appropriate herbicide.



f) Sod

Sod may be used in areas that are difficult to stabilize, such as berms, areas at the entrance to drainage inlets, ditches, and steep slopes. Cultivated sod, suitable to the locality, should be specified.

g) Tree Removal

Trees should be removed in a manner that will prevent damage to adjacent vegetation, structures, utility wires and other property.

h) Vistas

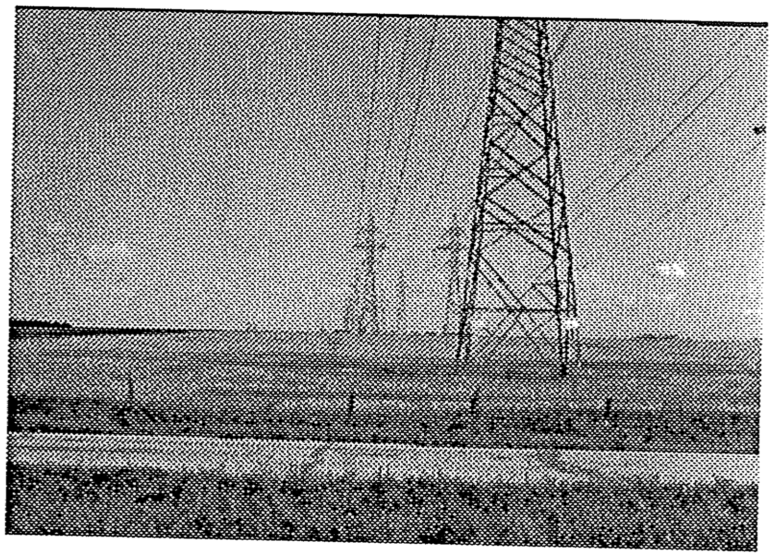
Vistas fall into two categories, stationary and moving. A stationary vista provides off-highway parking to permit observation from a parked motor vehicle or from a provided observation area. A moving vista permits the observation of points of scenic interest from a moving vehicle without providing stopping or parking facilities.(Litton 1974)

The extent of clearing to be accomplished to provide either type of vista depends upon a consideration of the time-space relationship between the vista and the observer. If a moving vista is to be developed, careful consideration should be given to safety and the potential effect upon the driver of a moving vehicle.

Moving vistas and views should not be developed, or if existing, be permitted to remain immediately beyond a highway point of curvature. A vista developed at such a location, permitting observation of a river or another roadway in alignment with the extended highway tangent centreline, may confuse a vehicle operator at night and create a hazard. Extreme care should be taken to assure that vistas and views do not distract the driver.

i) Utility Locations

Utility installations that are to cross or otherwise occupy highway right-of-way, should be located and installed in a manner that will preserve the safe and free flow of traffic, ease of highway maintenance, visual quality of the highway, and integrity of the utility facility. Ground buried utility facilities are preferred and should be located and be of a design compatible with the visual quality of the specific highway section being traversed. Installations, particularly aerial structures, should be avoided through those areas that have been acquired or set aside for their scenic enhancement and natural beauty. Such areas include scenic strips, overlooks, rest areas, recreation areas, right-of-way of highways adjacent thereto, and the right-of-way of highway sections which pass through parks and historic sites.(U.S. Bureau of Land Management)



j) Maintenance Considerations in Design

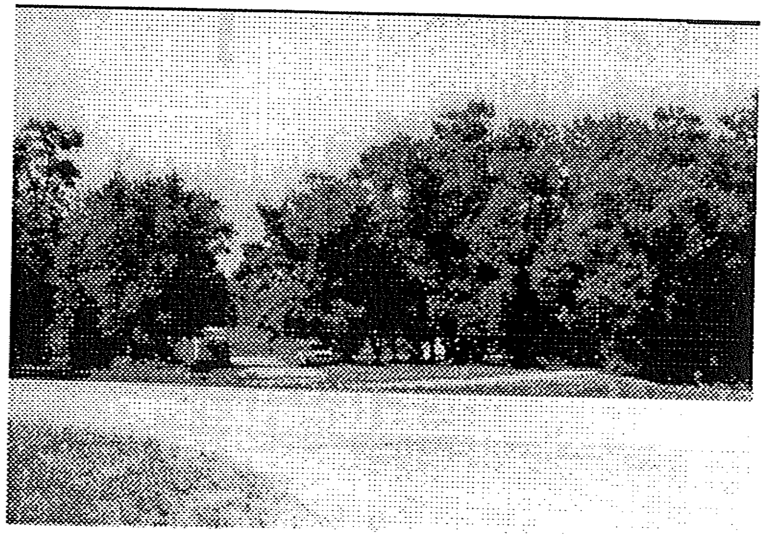
Maintenance of roadsides in the years following construction is an important consideration in highway roadside design. This will have an influence on the design of the highway and the general appearance of the roadsides. Maintenance is a factor in determining the most effective and economical design for roadside grading, drainage, erosion control, and planting appropriate to the local soil, climatic and other conditions. Mowing, fertilizing, and the use of herbicides in maintaining grass areas in some regions should be weighed against the higher initial cost of planting and establishing long-lived, low-growing types of vegetation to eliminate continuous and repeated mowing of turf.

a) Turfed and Planted Areas

Areas of mowing may be reduced by appropriate planting. High headed trees that do not obstruct sigh distance in the vicinity of paved ramps may also be combined with a planting of ground cover to reduce areas of mowing. Along rural highways, natural regeneration should be encouraged.

The growth retained or planted should be selected species to favour re-establishment of a natural cover. The planting of hardy, low maintenance growing materials in groups, or as widely scattered individual plants, will induce local plants to establish themselves because of favourable seed bed conditions, protection from winds, snow and erosion.

Problems in maintenance should be anticipated when the planting plans are prepared. Changes in environmental conditions should be anticipated. Hardy plants should be selected that are suitable for the planting requirements and adaptable to roadside conditions.



A long-range maintenance consideration in design is to use plants that will grow to an ultimate size without requiring removal, topping, or frequent pruning. This applies to such considerations as sight distance, views, existing and anticipated utility lines, and the future widening of pavements. Do not use materials that require special care to prevent or control insects or diseases. Avoid plants that are weak, brittle or easily broken by wind or snow load.

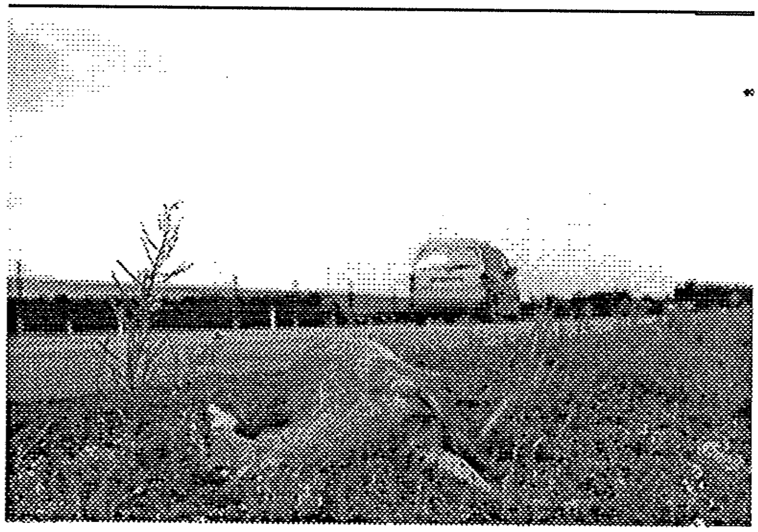
Where a tree-lined effect is desired in rural situations, space the trees at irregular intervals with offset from a uniform alignment. Trees in evenly spaced rows may be expensive to replace. The loss or unusual growth of any one tree is not as apparent in an informal planting.

Plants should not be used where they may encroach upon drainage ways and impede their functional value or will increase maintenance.

b) Roadside Maintenance Plans

The design, preparation, and use of maintenance plans provide an essential tool for maintenance forces to use in following a design concept.

Roadside project plans should be developed so that, with minor modification, they may be used as maintenance plans. Maintenance plans should show mowing limits, areas of naturalization, refertilization schedules, areas for herbicide, turf and plant re-establishment, utility locations and other management operations necessary to carry out a design concept.(A.A.S.H.O. 1970)



L) Wildlife Safety and Preservation

Viewing wildlife from the highway is a pleasurable experience for the observer. Many varieties of wildlife travel across or along the highway corridor and animals destroyed on roadways account for two percent of the population, with the most common accounts involving deer, skunks, and domestic pets. Accidents occur throughout the year with frequency peaking for different species at different times.

Deer crossing signs demarcate highly probable deer crossing areas and wildlife travel corridors, these signs warn the observer to slow down and pay attention. Dawn and dusk are '*high risk*' times because deer, like most wildlife, are more active and visibility of the observer is reduced.

For night travel modern headlight reflectors placed in the right-of-way reflect the headlight away from the highway corridor freezing the approaching wildlife temporarily and allowing the observer to pass without conflict.

Proper assessment of wildlife corridors can help the designer locate high frequency crossing locations. Identification of these key areas can be accomplished with signage and a reduced speed limit.

PART SIX

Site Treatment within the Highway Landscape

Certain areas along highways require detailed study and special treatment because of their importance in the highway system, their value in the landscape, and their unique character or use. Special treatment is required to insure that these areas will be of optimum benefit to the motorist and the immediate environs. Areas may include interchanges, safety rest areas, information centres, historic sites, weigh stations and maintenance areas.

The identification and evaluation of these special areas should be made as early as possible in the design process. This will enable the necessary design (or determination of use) of the areas to be developed concurrently with the other phases of the highway design.

Every effort should be made to avoid standardization of design. Each should be designed (or use determined) according to its specific character and needs.

A. SAFETY REST AREAS

Planning a safety rest area system is part of a site treatment development process. In which at least three major planning parameters should be considered when locating a safety rest area.

First, planning should include a regional overview. It is essential that the existing or proposed rest areas in adjacent provinces be considered.(Reierson 1981) Contact and co-ordination with adjoining provinces will ensure that the service provided to the motorist along the Trans-Canada Highway corridor will be consistent and evenly spaced and avoid repetition of existing services. This co-ordination is especially important where travel information centres will be located at provincial borders.

Second, normal rest area spacing intervals should be one hour driving time or about 100 km. This distance should be the standard except where traffic volumes are abnormally high or low. If volumes are so high that sites 100 km apart would be too large to be manageable, sites closer together should be used.(A.A.S.H.O. 1970) If travel information centres are located at border entry points, the spacing to adjacent safety rest areas might also vary. The site spacing may also vary if it makes sense to locate the safety rest area adjacent to a townsite, taking advantage of full services.

Finally, the emphasis in safety rest area planning and location should be in selecting the highest quality site possible. Wherever possible, rest area planning should be done with initial roadway alignment studies.(Reierson 1981) By selecting the best available site, the process of site design becomes much easier. By locating a safety rest area adjacent to a unique feature, historic or heritage site, the opportunity exists to incorporate an interpretive facility into the design. Available sites selected early in the planning process also reinforce the relationship between tourism and rest areas. The better the rest area site, the better the image that the rest area presents to the public. This positive image is enhanced by developing rest areas with complete facilities including an adequately sized building with display space, and appropriate quantities of picnic tables, parking spaces, and picnic shelters.

The sites should be selected and developed with emphasis on safety, relaxation and withdrawal from high speed driving. All elements should tend to slow the pace of the motorist, physically and emotionally. The transition should result in a passive environment. Conducive to this are facilities for comfort, resting, walking, and picnicking.(A.A.S.H.O.1970)

Plans and specifications for the preservation of existing vegetation and natural features should be made during the stages of site selection and early design. The retention of natural features in or adjacent to the area may give it a distinctive character. The preservation of existing vegetation, particularly large trees, gives a mature landscape effect that is highly desirable.

Some areas, due to existing design or construction necessities will be partly or completely cleared of trees. In this case, the area should be replanted with trees to provide an attractive appearance and to provide shade. Consideration should be given to the orientation of picnic areas and the location of trees for a maximum amount of shade during the period of heavy use. In those areas where trees do not grow readily, open-sided, roofed shelters will provide shade for tables. Shelters should be considered for protection against rain.

Paths and walks should be provided as required to provide all weather access to picnic areas, toilets and other facilities and to prevent undue wear of the planted areas. All facilities should be accessible to handicapped persons by means of ramps, wide doors, specially equipped toilets, handrails, and other items. Provision should be made for grass areas and should be able to withstand considerable foot traffic. Sprinkling systems may be considered in certain circumstances. The design of the area should include the location of trash containers in a manner that provides an adequate number and makes collection as easy as possible.

In order to develop a complete system of rest stop areas, it is necessary that a systematic approach be developed. Site planning, location and design, when looked at in detail will provide a comprehensive planning program that will result in a thorough, well-designed system of rest stop areas.(Reierson 1981)

B. INTERCHANGES

A number of basic considerations are equally applicable to rural, and urban, single and two-level interchanges. Interchanges need special landscape treatment. They are often the only place to obtain a large-scale landscape effect along the highway and often the only place to create a break or focal point in the visual landscape

Contour grading plans for all classes and types of interchanges are important and are preferable to the grading of those areas by the use of standard cross sections.(A.A.S.H.O. 1970) It is extremely difficult for a person, no matter how experienced, to fully anticipate the grading results when standard cross sections are used. The contour grading plan enables the entire interchange or any major portion of it to be seen as a basic grading unit and shows how the drainage will be treated. The grading obtained by the use of contour grading plans will look better and usually provides a more efficient drainage system.

The structural treatment of a two-level interchange structure in urban areas probably has more of a visual impact than the site landscape treatment.(A.A.S.H.O. 1970) The landscape architect should work closely with the architect and engineer designing the structure in order to provide a landscape treatment. In urban areas, roads and buildings adjacent to an interchange should be evaluated for their effect on the possible interchanges landscape treatment which not only compliments the structural design but becomes an integral component of it's visual appeal. Often an urban interchange offers a unique opportunity to provide natural beauty in the forms of berms, trees and other plants. Heightened topography and increased grade changes provide greater diversity and allow for various site conditions.

The landscape planting of an interchange will depend on whether it is urban or rural and whether or not there is existing vegetation. Design objectives must be clearly determined before the planting plan is made. Safety and maintenance must be recognized and considered in the preparation of the planting plan.

Every opportunity to preserve existing vegetation should be utilized. Evaluation of existing vegetation and of changed site conditions should be made to determine whether or not the existing vegetation will thrive. Interchanges in rural areas usually offer an opportunity to open prairie, preserve existing vegetation and sometimes existing natural features such as small marshes, streams, rock formations, aspen bluffs and others. These features also should be evaluated as to how they will be affected by changed conditions caused by a highway.

The drainage of interchange areas must be designed with preservation, ecological and landscape effects in mind. Lack of consideration can result in the destruction of existing vegetation due to flooding or drastically modified drainage conditions. Natural drainage channels should be retained where possible.(Litton 1974) Necessary new drainage channels should be constructed with flat slopes for appearance, safety, and ease of maintenance, where possible, new channels should have a curvilinear alignment in order to be more in keeping with the natural landscape.

C. INFORMATION CENTRES

Such centres may vary greatly in size and may be incorporated within other site treatments (Safety Rest Stops and Historic Sites). They are usually located at carefully selected locations on a highway in order to be convenient to the greatest number of tourists.

Centres may be operated by an agency other than the highway department. Centres may have a separate development or may be located in a safety rest area in conjunction with other facilities. In the latter case, there should be a close collaboration between responsible agencies at the early design stage because of the functions of the information centre and other facilities of the area.

Where an information centre is located in a safety rest area, consideration must be given to the additional parking space required. Separate parking space for the information centre may be provided if the site permits. Pedestrian circulation and walk capacity between the parking areas and the information centre must be studied and adequately provided for.

Benches and other forms of seating outside the information centre building may be useful to permit people to study or read informational literature which they may receive. The design of the facility should be sensitive to the environment it is located in and reflect a character of the local region.(A.A.S.H.O. 1970)

D. HISTORIC SITES, BUILDINGS AND MONUMENTS

The identification, evaluation, preservation and appropriate development of historic features is the subject of directives from the Federal Government (Historic Resources and Parks Canada). The question of responsibility for moving, preservation or other consideration of a particular feature will vary greatly according to the historical importance of the feature. Proper Government agencies should be advised of proposed work in the vicinity of known historical, archeological, paleontological, or other features and request evaluation and recommendations. This should be done so that highway corridor development may be guided by the advice and recommendations of the proper agencies.(A.A.S.H.O. 1970)

Buildings affected by highway construction may be moved if their historical significance warrants such action and their structural condition will permit. In certain instances, it may be necessary to dismantle the building and reassemble it at an appropriate site. The landscape architect may advise as to the appropriate setting for the relocated building. If possible, a determination of the original setting of the building should be made prior to moving in order to recreate the setting.

Historic or other sites in the path of highway corridor development obviously cannot be moved. Situations may arise where the importance or unique character of a site will justify locating or relocating the aliangment of the highway to avoid the site. In other cases the highway may provide a roadside park in the approximate area with an appropriate marker identifying the site. In some instances, it may be possible to develop a safety rest area or scenic overlook around a site, building or monument.

Historic and Cultural Factors

The accounting of historic and cultural characteristics, essential to the understanding of the landscape in it's role and it's formation process, is made in a double sense.

Global Character of the Landscape

Landscape character has it's roots in the historical development of the landscape that has determined specific uses that give it, it's own sense. The history of the process of land taking, the beginning of the different settlements, and the evolution of the person-environment relationship (especially farming systems and woodland uses) are essential to the understanding of the future problems of compatibility and land uses.(Smardon, Palmer, Fellsman 1986)

Special-Value Areas and Sites

Special-value areas and sites have an historical, cultural, traditional and archaeological interest and function as focuses of experience, organizing the person-environment relationship and giving the special sense that transforms nature into landscape.(Smardon, Palmer, Fellsman 1986) These historical and cultural values, associated with specific sites or elements, are preserved by means of including them in protected areas. The criteria for selecting these sites, elements or areas to protect are:

Uniqueness

Buildings, monuments or places of unique or rare character.

Tradition

Areas with strong significance at the local level, used a common references and being themselves regional symbols.

History

Relevant monuments in the regional history.

Aesthetics

Buildings, monuments, and areas recognized by their inhabitants and visitor to have aesthetic value.

E. SCENIC OVERLOOKS AND TURNOUTS

These areas are located primarily to take advantage of a beautiful, spectacular or unique view characteristic of the regional landscape. They should be selected and developed with this basic purpose in mind. Occasionally, there may be safety rest areas with unique scenic values. These scenic values should be developed as regular safety rest areas with due consideration given to the scenic view so it will not be blocked by the intrusion of certain types of development. They must be carefully designed to fit into the landscape and not distract from the view or scene to be observed. The scenic overlook may or may not provide facilities for picnicking, washrooms and water. A walk or area from which photos may be taken is desirable. An informational sign describing the area viewed is an appropriate item.

F. NATURAL AREAS

For the purpose of this guide, ' *natural areas* ' can be considered to mean major portions or complete units of such features as marshes, streams, rivers, lakes, dunes, wetlands, woodlots, natural meadows, open prairie, unusual or typical geological features and plant communities.

The acquisition and determination of use of natural areas is closely associated with right-of-way acquisition for new or redeveloped highways and for the acquisition of scenic strips along completed highway corridors. The acquisition of some natural areas in their entirety along highways maybe dependent upon the action of other agencies and whether or not they are in a position to co-operate with the highway department in this manner.(Conner 1976)

After a decision on the determination of the acquisition or use of natural areas and method of procedure, an inventory of the natural features along the route of the proposed highway is desirable. This inventory and subsequent evaluation should be made by a landscape architect, an engineer and a naturalist working as a unit.

Scenic strips are usually additional areas taken to preserve a natural setting for the highway corridor rather than a complete natural area in the broadest sense of the term. However, there will be instances where the scenic strips can be extended in depth to include complete natural features. In situations where the acquisition of a considerable depth of land is essential, it is important that there be collaboration with other agencies.(A.A.S.H.O. 1970) Some highway departments are restricted as to the extent of land that can be acquired for highway purposes.

The developing interest in national and provincial systems of scenic highways demonstrates the need to preserve natural areas along such corridors. Steps must be taken by the highway department and associated government agencies, to preserve the natural areas and landscape features responsible for the character selection of the highway corridor. This may necessitate the protection of the entire corridor.

There are a number of protective measures which should be taken during the actual design of the highway corridor to protect natural features. Appropriate steps should be taken during location and design to avoid marshes and other wetlands whenever possible. In situations where this is not possible, protection must be provided to minimize disruption of the ecology.

G. WEIGH STATIONS

Facilities for weighing trucks and trailers for load determination and for tax purposes are generally located on primary highways. They are usually long narrow developments with a small building and a scale platform. Although strictly utilitarian, the weigh stations can be made to fit into the regional and highway landscape by appropriate design and by using simple and inexpensive treatment. The area should be set back far enough from the outside edge of the shoulder of the adjacent highway to be safe and still permit surveillance by the operator of the station.(A.A.S.H.O. 1970)

The development of a weigh station facility may include landforms, berming or vegetation to incorporate the design into the existing environment. If suitable to the regional character trees may be planted around the weigh station building where suitable setbacks can be maintained.

I. SIGNAGE

Signs might be used for something more than giving directions or pressing a sale. They could point out the meaning of the scene: what is produced there, who lives there, how it grew, what it stands for. Even where they are used as advertisements, they may be grouped or controlled to enhance environmental meaning and site character. Advertisements may be needed which relate to the structures they are attached to or which herald the approach of a facility or service, however, billboard advertising is often unsightly and discouraged. Local broadcasts can serve as commercial advertising and might be made to explain the history or function of an area, or local environment to the passer-by.

Within the highway corridor traffic signage should be held to a minimum to avoid confusing the driver. Regulatory traffic signage should simply identify the direction of traffic movements and site locations. Regulatory and information highway corridor signage should comply with standard traffic control devices outlined by the Highway Traffic Board. Colour schemes to address site or region specific areas may or may not be appropriate depending upon the design.(A.A.S.H.O. 1970)

Site specific signage should be considered as part of the site treatment process. Metal signs or metal on wood posts which use the same colour scheme as traffic signing may not be appropriate. Signs should be designed as a feature of the site treatment and the materials and finish should be co-ordinated with other site design elements.(Reierson 1981)

PART SEVEN

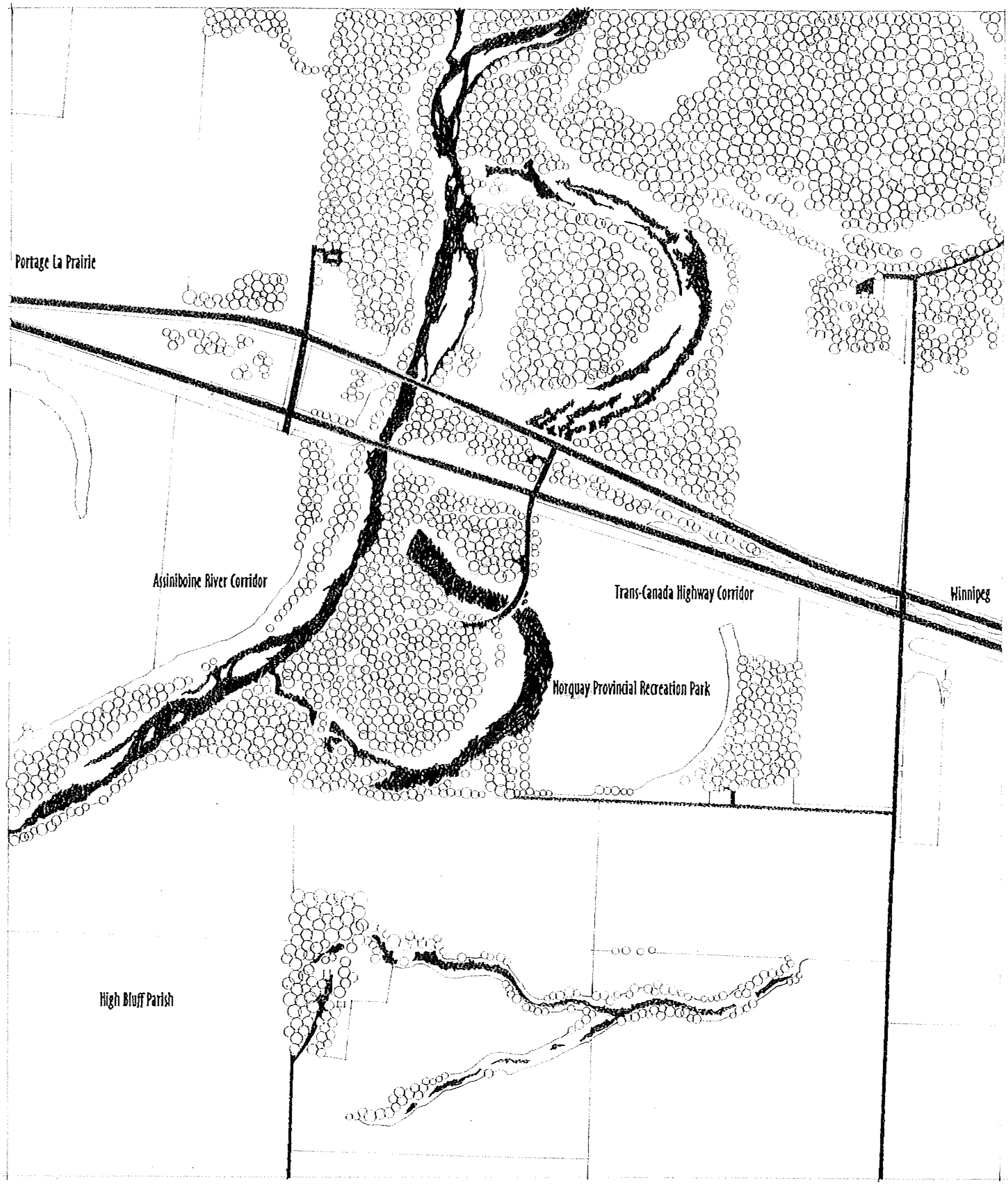
Design Process

The design and development of site treatment areas involve a special design process which is more intimate than that required in highway construction and detailed in the Design Guidelines. The process stresses preservation and utilization of many of the site features identified. The scale is more intimate and the design process must pay attention to details which are not normally appropriate to highway design.

The design process involves a thorough analysis of the proposed site, a diagrammatic analysis of the functions of proposed site treatment components and alignment studies relating the roadways to the site. The designers last step should be a concept plan of the proposed site which begins to show the relationship of the site's physical features to the site treatment program requirements. This design process allows site features such as topography, vegetation, water, etc. to dictate the design development, thus providing an regional solution to the design. The conceptual development of a Safety Rest Area will be used to illustrate this design process.

Site

After a review of the Trans-Canada Highway corridor, a site was selected for the reasons of location and site resources. The site selected for the development of a safety rest area is located east of Portage la Prairie along the Assiniboine river corridor and adjacent to Norquay Provincial Recreation Park. The site currently contains a safety rest area located in the centre median and a KOA campground in the park facility. The development will occur along both the north and south sides of the Trans-Canada Highway corridor. The north side development is designed to handle westbound traffic while the south side development, located adjacent to the existing



Site
Horquay Park Site

campground, will handle the east bound traffic. The selected site offers regional characteristics easily visible to the highway traveller. Aspects of natural and cultural heritage combined with the existing site facilities and interpretive potential, make the selected location suitable for a safety rest area development. Also, the existing central median rest stop is known within the highway corridor and the development of a new rest stop facility outside the median would be an easy transition for highway travellers to make.

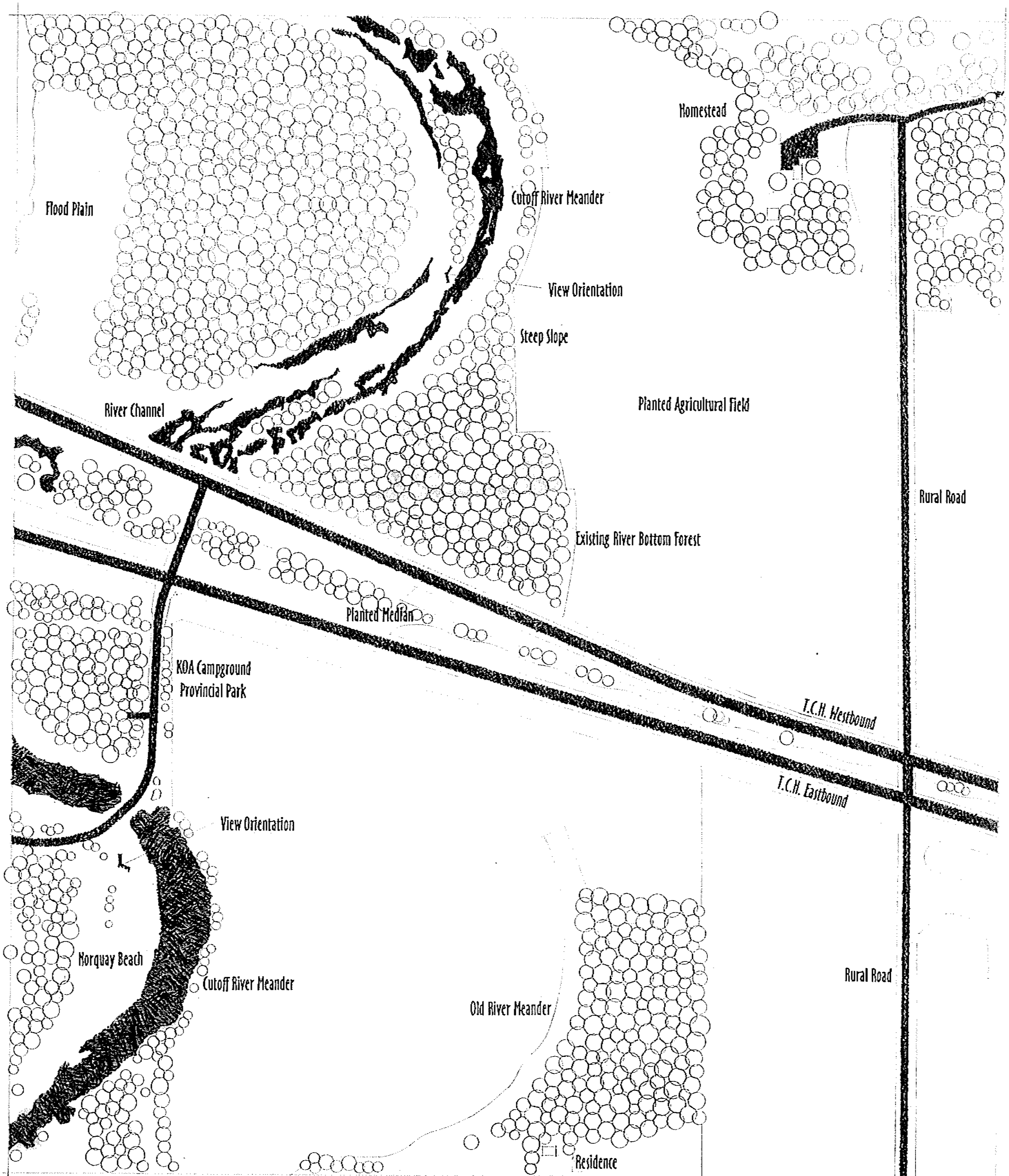
Site Analysis

The ability to ' *read* ' the site, to identify what makes it special is central to the design process. Items like slopes, natural forces acting upon the site, soils, wind direction, drainage patterns, and perceptual characteristics such as views, scenic qualities, and spatial patterns must be identified. It is imperative that the landscape architect visits the sites selected for the safety rest stops. Without the ability to gain a ' *feel* ' for the site, a designer will always be working in a vacuum.

A quality site will accept minimal development features, while providing a pleasant positive impression for travellers using the area. The availability of natural river features, historic land use and cultural settlement features on or near a potential site rest area will add considerable interest.

Situated near a bluff overlooking the Assiniboine river, the site's natural wooded slope drops to the river with the cultivated field above creating a pleasant open feeling. The site allows parking areas and the building structures to be developed at the edge of the woods, offering sanctuary of the river while still maintaining a direct connection to the open prairie region. The woods, sloping topography, and river access, present a quality site. Because of the site qualities the detailed design solutions can be simple without effecting the overall rest area appearance.

The site analysis provides a tool which permits the landscape architect to indicate impressions of the site. The analysis becomes an extension of the site reconnaissance and builds geographically on the information recorded and offers an opportunity to record specific elements which will affect the design solution.



Site Analysis
Norquay Park Site

Relationship Diagram

The relationship diagram builds on the information identified in the site analysis. It represents the functional relationships in a diagrammatic form. The ideal relationship between major use areas and existing site components are studied.

Major rest area components which will occur in the rest area include:

- Parking lots for cars, trucks and recreational vehicles. These can be separate or trucks and R. V. ' s combined.

- Buildings including restrooms, picnic shelters, maintenance

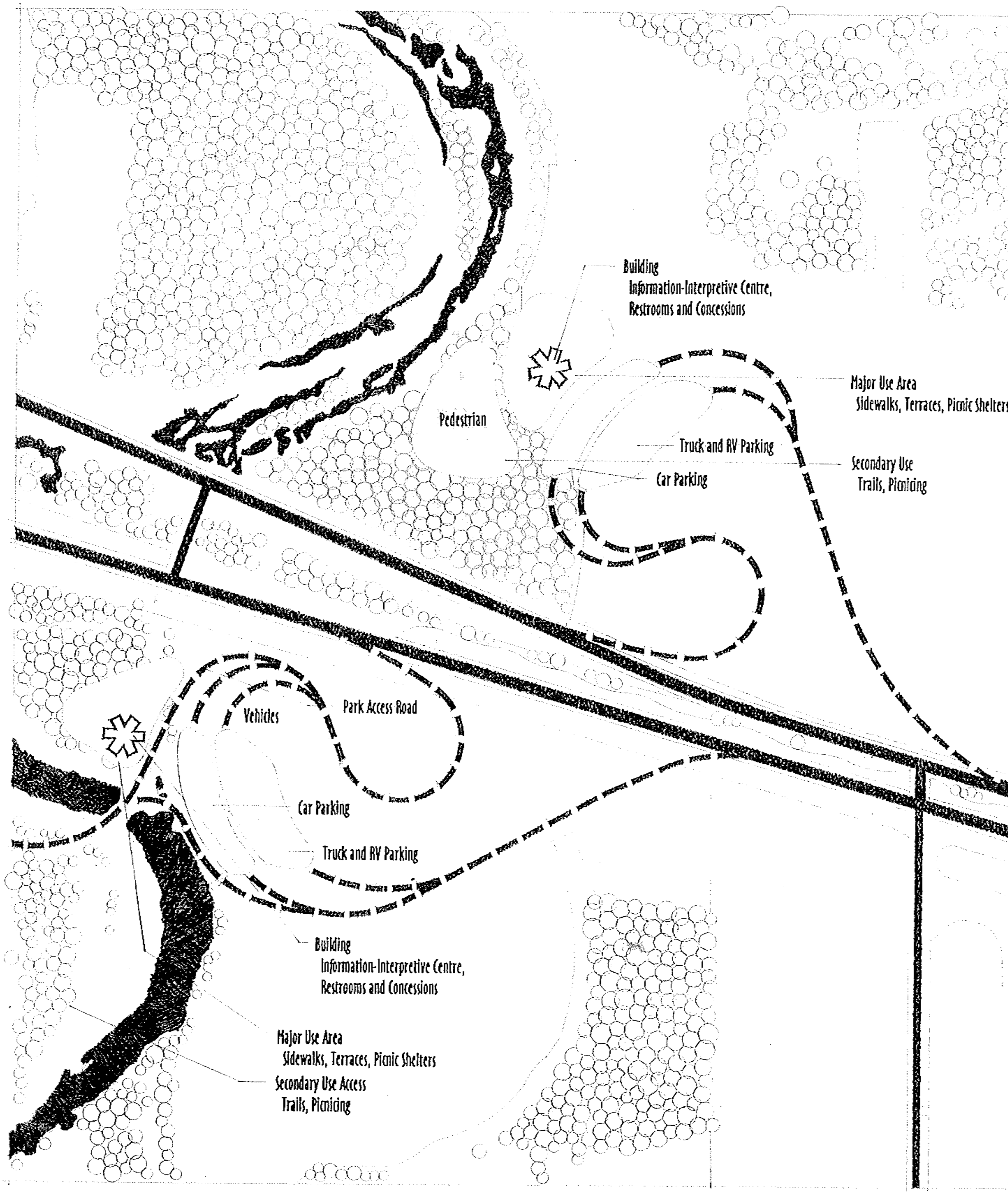
- Secondary uses include special points of interest beyond or adjacent to the major use area. These areas include overlooks, historic elements, interesting river corridor topographic features, and special vegetation areas such as the oxbow lakes, river bottom forest and prairie homesteads. They are not essential to the function of the rest area but add to the interest of the site.

- Special use facilities incorporate an information or interpretation area in the design.

All components are considered in the alignment design and the relationship of these features control the alignment of the site and geometrics.

The term ' *geometrics* ' encompasses a great many related factors, including horizontal and vertical alignments, site distances, traffic merging movements and the relationship between the highway corridor and the rest area.(Reierson 1981)

The Landscape Architect should explore all geometric solutions, no matter how unusual, within the limits of the potential site. The qualities of the site, prairie and riverbottom tree masses, interesting man made and natural land forms or other scenic qualities affect the type of geometric studies that are developed.



Relationship Diagram

Norquay Park Site

The existing development of a rest area in the median between eastbound and westbound lanes of traffic is discouraged. It is not considered safe to bring traffic, especially trucks and recreation vehicles, onto the left high speed lanes of the highway corridor. The potential exists for dangerous merging problems with this existing arrangement.

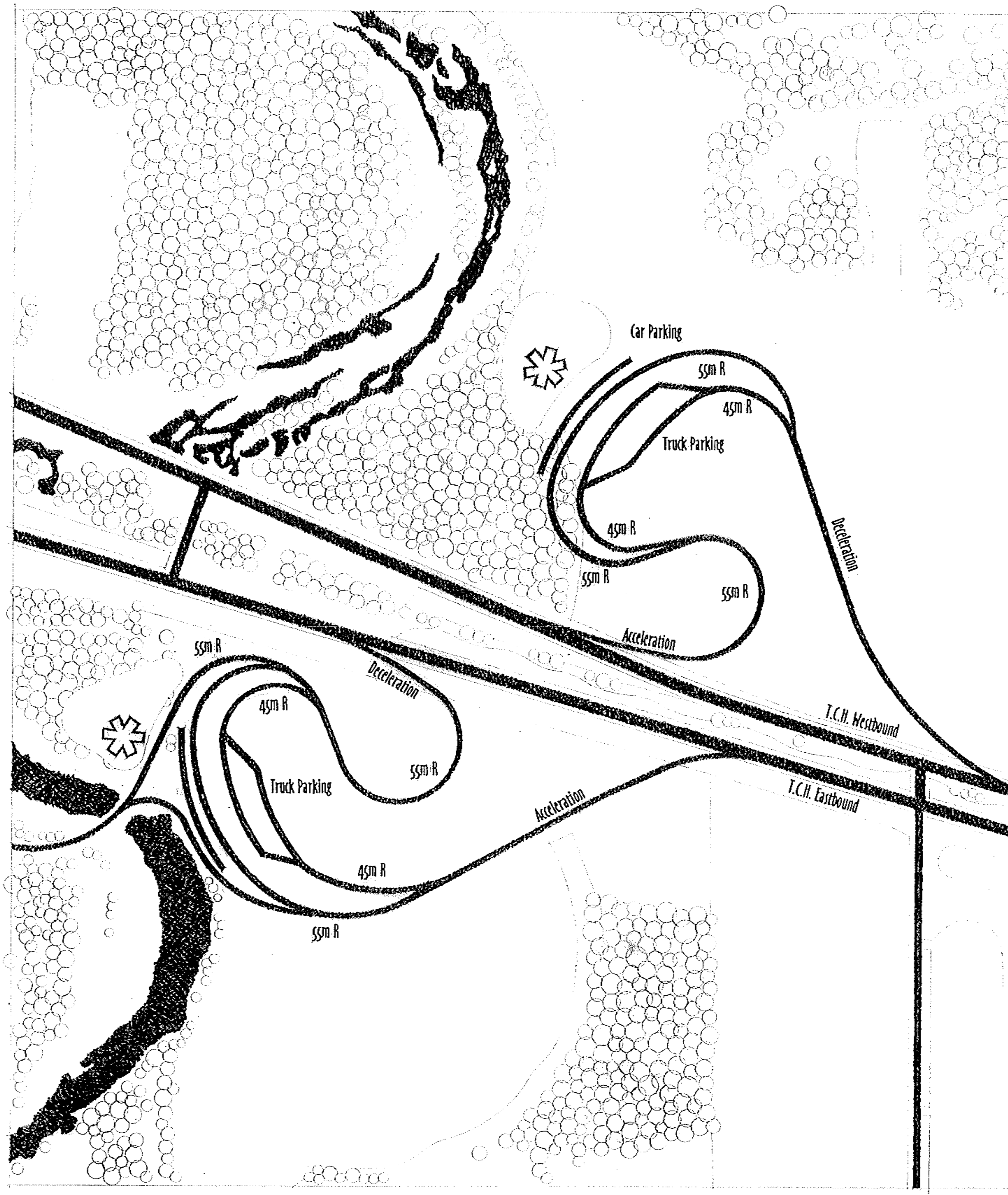
The Landscape Architect must anticipate the effect of rest area construction on the potential site, determine if it is manageable or if adverse environmental effects can be mitigated through construction procedures. These procedures could include controlling drainage channels, building ponds, revegetating slopes, or many other techniques.

By developing the rest stop areas on opposite sides of the highway corridor, eastbound and westbound , each utilizes the same landscape while offering a different use to the environment. The westbound rest stop would serve as an information and utility centre for westbound traffic (transient traffic). The eastbound rest stop becomes an extension of the river and prairie environment, incorporating an existing K.O.A. campground facility as an anchor for the traveller that wishes to explore the region (providing history, nature, and culture) to a greater extent.

The removal of the existing central rest stop area from the median increases highway safety and reestablishes the natural median while at the same time allowing the traveller easy recognition of the new rest area locations and access to the sites.

Alignment Study

There are two geometric alignment designs which are commonly used for rest area developments. These alignments are the ' *inward oriented plan* ' and the ' *outward oriented plan* '. These two designs are adjusted to suit specific site conditions. Each has obvious advantages and disadvantages. With the ' *inward oriented plan* ', the building and major use area is located between the car, truck and recreational vehicle parking lots. This concept permits easy access to all features within the rest stop area. Distances from the parking lots to site features are relatively short. The critical design control which must be considered when using a centre island concept is the space provided for the major use area.(Reierson 1981)

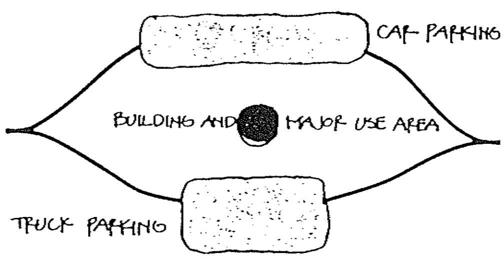


Alignment Study

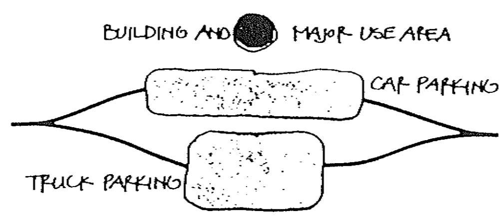
Norquay Park Site

Enough space must be included to allow use of the site without excessive impacts on the vegetation or grass. If two closely spaced in a small area, the entire site will suffer from concentrated activity caused by foot traffic. These impacts can result in long term maintenance problems.

The inward plan can be a very effective one when the site is large enough to accommodate concentrated use and when site conditions permit construction. Easy access within the site is it's biggest advantage.



INWARD ORIENTATION



OUTWARD ORIENTATION

The '*outward oriented plan*' is an alignment concept which is best suited to penetration into the site. The parking lots are located adjacent to one another and pedestrian traffic flows away from the parking lots and toward the building and major use area. Roadway crossings are minimized and much larger, unrestricted use areas are permitted. This alignment design allows more development flexibility and is particularly suited to sites with variable topography. It also allows for easier future expansion.(Reierson 1981)

Design Concept

The final step in the preliminary design process involves laying out a skeleton framework which shows the workability of the various design elements. The actual relationship of the various site elements are drawn to scale and the graphic form of the concept is the final product which shows that the site can be successfully developed as a rest area, uncovering the regional character of the environment as it is related to the highway.

Design Concept

Norquay Park Site

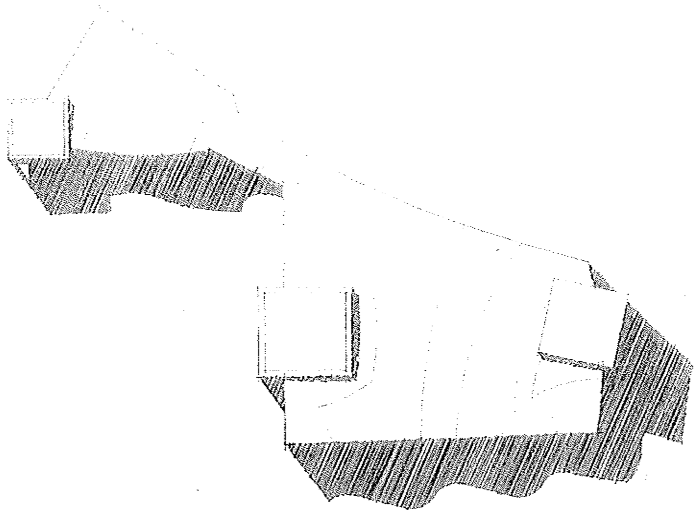
In order to complete the rest area development a thorough detailed design procedure, which takes full advantage of each site, is utilized. A good design solution can create a positive experience for highway travellers. The traveller will recognize a good design solution as a positive feeling about a place, or as a desire to spend a moment longer at a special feature. A thorough design process which permits the Landscape Architect to fully utilize the site and create a sense of space or a pleasant experience for the traveller is a continuation of the requirements first expressed when the practicum was initiated.

The key to good rest area alignments is flexibility. Flexibility allows the Landscape Architect to take advantage of the site and it's features by varying the alignment and create a positive experience for the motorist.

The sanctuary of river is the refuge to the development. The landscape changed by human and animal is a blend of the meandering river with the prairie landscape. The movement of earth has an impact on the visual perception of the site, views can be screened and land formed giving the traveller a sense of direction. Mounds between roads reinforce separation and direct vision to approaching road separation. Within the rest stop area the proposed mounds define the edge of site use and parking while at the same time directing the motorist to exit and enter the highway. Landscaped areas of mass planting reflect the adjacent river bottom forest, reducing visual impact and the apparent size of parking lots while breaking up open views and emphasizing the proposed landform.

The building evolves as a notation of the existing prairie topographic condition. The proposed geometry of the project is derived from the memory of the site's geological formation and is conceived as being of the land. The site offers views of the region that have contributed to the local memory of the place, the river, the prairie, agriculture and settlement. Both human and environment exists in the same extent of time. The basic shelter, a geometric structure with a morphic cover is a place where humans recognize different aspects of time and environment. Living on the edge both man and animal adapt to their environments manipulating the prairie environment to create shelter and provide safety.

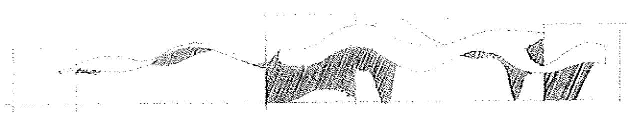
Land



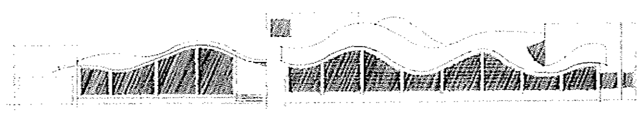
PLAN

Man

Nature



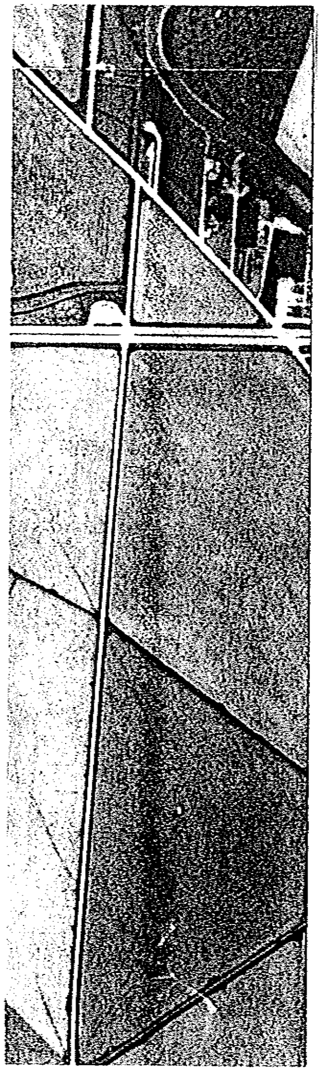
RELATIONSHIP



ELEVATION

Design

Norquay Park Site



PART EIGHT

Conclusion

Within this practicum are techniques of inventory, analysis, and design to be used in the development of the Trans-Canada Highway corridor, first efforts toward improving the highway experience. The crucial test will come in applying these ideas to an actual design situation, and in evaluating the results obtained. Here, techniques of design and of analysis can be refined, and our understanding of principles strengthened.

Not only would we learn much of technical interest from a design solution of this type, but also a road built with the regional landscape in mind would be a concrete example of what the highway experience could be, an example far more powerful and evocative than any number of paper projects. It may be possible to lay out such a highway design as a natural experiment, if resources for design and execution could be provided.

To some extent this practicum has discussed the issue of regional meaning in the landscape, or the way in which this meaning is communicated to the driver. But the greatest emphasis has been on landscape design, visual form, and on meaning primarily in reference to the meaning derived from what the driver sees and of the road itself. The meaning in the highway landscape is a untouched subject and there are many possibilities of analysis and design that remain untouched in regards to it.

The ability of the landscape architect to resolve many design questions and blend diverse site elements together will determine how well an area serves the travelling public. The highway environment becomes more pleasing and less monotonous if it has goals or destinations, places of importance to blend both culture and environment.

The highway environment is an important issue, one we must deal with as a part of our environment and everyday life. Integration of the highway landscape within the environment will help us to understand a sense of place as well as to perform a common function of movement.

The study identifies a process that establishes the presence of the highway within the environment and allows the traveller to become more aware of the natural and cultural features through which they are passing. The process is intended to increase the visual enjoyment and contribute to the understanding of the natural and cultural forces that created this landscape.

This practicum reveals that there is more to a highway corridor than a conveyor of traffic, it shows that through careful planning, design and appreciation of the landscape the highway can become an interpretive, educational, and enjoyable part of the regional environment. The guidelines of this practicum have only been touched upon in their application. Development of a complete landscape unit would begin to express the true character of the highway landscape and only then do we begin to understand and perceive the true meaning of the regional environment and the beauty of the highway corridor itself.

There are unlimited visual resources in the highway landscape of the Trans-Canada Highway corridor. This practicum has begun to uncover the opportunities to develop, experience and comprehend what this landscape is all about. To further develop these opportunities the design process can continue. A needs assessment priority rating can be undertaken to best determine the suitable development process for the region in question.

The practicum's process could extend programs for highway development into other regions to develop a complete highway system, not only applicable to Manitoba, but other provinces as well. As an extension of the highway corridor this study could lead to the analysis of scenic support sites, townscapes, historic resources, parks, and recreation areas with additional support information and interpretive systems. These areas can link into the highway corridor and allow the user to explore at a greater detail, not only the highway landscape, but the entire region that gives it meaning.

In respects, this practicum is only a beginning to the subject and it's gains must be consolidated and extended by further study. But enough has been developed to expose the possibilities of a highway aesthetic.

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Appendices

The Purpose of this section is to provide the reader with relevant background information on the development of the Trans-Canada Highway corridor. The Trans-Canada Highway Act is the parent to the development of the Trans-Canada Highway. This Report of Proceedings lays the groundwork and sets the initial design guidelines in the highway corridors design process. The provincial Highways and Transportation standards for highway design are used in current design build practices which exist in the engineering of highways within the Province of Manitoba. Aside from these standards no other guidelines effect the development or construction of the highway, its alignment and regional landscape. The need for a qualitative process for highway landscape design led to the development of this practicum, the process it followed and the product created. It is intended as a guideline for future highway and rehabilitative highway construction to follow.

561233

DEPARTMENT OF PUBLIC WORKS

ANNUAL REPORT

PROCEEDINGS UNDER

THE TRANS-CANADA HIGHWAY ACT

FOR THE PERIOD

DECEMBER 10, 1949 to MAY 31, 1971

Issued under the Authority of the
HONOURABLE ARTHUR LAING
Minister of Public Works
OTTAWA

- 1

REPORT OF PROCEEDINGS UNDER THE TRANS-CANADA HIGHWAY ACT

FOR THE PERIOD DECEMBER 10, 1949, TO MAY 31, 1971

The Trans-Canada Highway Act

"An act to encourage and to assist in the construction of a Trans-Canada Highway" more simply "The Trans-Canada Highway Act," became law on December 10, 1949, and was to remain in effect for seven years after that date. The original legislation placed a ceiling of $150,000,000 on the federal contributions to be paid to the provinces and a limit of 50 per cent of the cost of construction.

Subsequent amendments extended the life of the act to December 31, 1970, and eventually increased the ceiling of the federal payments to $825,000,000. Final payments were made to the provinces under the act by May 31, 1971.

The original agreements covering the construction of the Highway were executed on April 25, 1950, with the Provinces of Ontario, Manitoba, British Columbia, Prince Edward Island, Saskatchewan and Alberta. The Province of New Brunswick signed on May 27, 1950, the province of Newfoundland on June 27, 1950, the Province of Nova Scotia on May 15, 1952 and, following the passage of legislation extending the construction period beyond the original objective of December 9, 1956, the province of Quebec entered into the Trans-Canada agreement on October 27, 1960.

The original act of 1949 not only provided for the federal government sharing costs equally with the provinces but provided that the entire cost of construction of those portions of the highway passing through national parks would be entirely a federal responsibility.

Administration of the Trans-Canada Highway Act was at first the responsibility of the Department of Resources and Development. This responsibility was transferred to the Department of Public Works in September 1953. "An act to amend the Trans-Canada Act", assented to on June 7, 1956, took cognizance of the great variation in construction costs of different sections of the highway by providing, over and above the original 50 per cent federal contributions, an additional 40 per cent to each province of one-tenth of the mileage.

This legislation also increased the ceiling of the federal share to $250,000,000 and the deadline was extended to December 31, 1960.

The 1956 amendment grew out of a federal-provincial conference held in November, 1955, to discuss the uncompleted mileage.

Further legislation was passed in 1959 and 1960, extending the construction period to December 31, 1963, and increasing the authorized federal contribution to $400,000,000.

Then, in 1963, the construction period was again extended, this time to December 31, 1967, and the federal share increased to $625,000,000. A final extension of the construction period to December 31, 1970, and an increase to the maximum federal contribution to $825,000,000 was authorized in legislation passed in 1966.

Total Highway Cost

Final payments to the provinces which had been made by May 31, 1971, were within a few dollars of the authorized ceiling and totaled $824,999,950. In addition to this amount the federal government spent $76,604,668 in those portions of the highway within the boundaries of national parks. Thus, the total cost of the highway to the federal government, by the time outstanding accounts were settled exceeded $900,000,000.

The total commitment for construction of the highway, a sum indicating costs incurred by the provinces and including Canada's share of nearly $825,000,000, between December 10, 1949, and December 31, 1970, came to some $1,400,000,000.

The World's Longest Highway

In return for this expenditure of almost one and a half billion dollars, Canada has the longest paved highway in the world, passing through some of the most spectacular mountain scenery to be found, through and around busy sites, along lakes and rivers, through pastoral settings and across the seemingly limitless prairies.

Construction of the Trans-Canada highway was no easy task. The Canadian Shield north of Lake Superior, Newfoundland's rocky terrain and the towering Rocky Mountains offered formidable barriers.

Since the days of the fur trade, the extension of means of communication across vast distances has been of vital concern to Canada, the more so since the normal economic patterns and travel routes tend to lie in a north and south direction in much of the country, rather than paralleling what is for the most part an arbitrary and artificial boundary line between this country and the United States of America.

Water routes were first followed by primitive roads. Then came the great achievement of a trans-continental railway, which gave the first real assurance that Canada could exist as an independent and unified country.

Highway and road construction in Canada is primarily a provincial responsibility. However, the federal Government, as far back as 1919, showed an interest in sharing in the construction highways to tap the country's land and mineral resources. Nothing the federal government had previously done matched in extent and cost the prospect of building a highway almost 5,000 miles long from Newfoundland to Vancouver Island through all 10 provinces.

The actual construction was done by the provinces except for these portions within national parks, but design, tender calls, contract awards and construction were subject to review by federal authorities and arrangements were made for federal inspection of the work as it proceeded.

Because of revisions of route as construction proceeded to provide better grades or bypass urban centres the mileage total for the highway has varied from the original route proposed. The following table shows the mileages reported at the termination of the Trans-Canada Highway legislation. (See Table 2)

TABLE 2

TOTAL MILEAGE OF DESIGNATED ROUTE

Province	Total Mileage
Newfoundland	539
Prince Edward Island	71
Nova Scotia	278
New Brunswick	378
Quebec	375
Ontario	1,453
Manitoba	310
Saskatchewan	406
Alberta	282
British Columbia	552
National Parks:	
Terra Nova	25
Banff and Yoho	80
Glacier and Revelstoke	35
Totals	4,784

Urban Centres Served

Important urban centres which are found along the highway between the terminals at Victoria, B.C., and St. John's, Nfld., include Nanaimo, Vancouver, New Westminster, Kamloops and Revelstoke, in British Columbia; Banff, Calgary and Medicine Hat, in Alberta; Swift Current, Moose Jaw and Regina, in Saskatchewan; Brandon, Portage de Prairie and Winnipeg, in Manitoba; Kenora, Thunder Bay, Orillia, Peterborough and Ottawa, in Ontario; Montreal, Levis and Riviere du Loups, in Quebec; Fredericton and Moncton, in New Brunswick; Charlottetown, P.E.I.; Truro and North Sydney, in Nova Scotia, and Corner Brook and Gander in Newfoundland.

The route is broken by ferry routes, linking Newfoundland and Nova Scotia, Prince Edward Island with the mainland, and the western mainland terminus in British Columbia with Vancouver Island. In Nova Scotia, Cape Breton Island is joined to the rest of the province by the Canso Causeway, 4,000 feet long which was built as a project separate from the Trans-Canada Highway.

Many stretches of the highway exceed the requirements set out in the specifications for the highway (See Appendix). Where practical from the standpoints of cost and location, the standard right of way is 100 feet wide, with a pavement width of 24 feet. In the vicinity of Vancouver, Calgary and Montreal, for example, the highway follows the route of modern multi-laned limited access highways for considerable distances, the provinces being responsible for costs of additional lanes.

Official Opening

The official opening of the Trans-Canada Highway took place on September 3, 1962, in Rogers Pass, the back drop to the ceremony being the lofty snow-covered peaks of Glacier National Park. The significance of the opening was not that the highway was physically completed, but that a formidable gap in the chosen route had been closed and that the site of the ceremony was not far from the site of another historic opening ceremony at Craigelachie, B.C., where in 1885 Sir Donald Smith drove the last spike in the Canadian Pacific Railways trans-continental line. Neither ceremony implied that the work was done but then both meant that the routes were open for use and both ceremonies took place in a portion of the route where the greatest obstacles to construction were encountered.

A brochure prepared in connection with the 1962 official opening of the highway had the following to say on the Rogers Pass portion of the route and the steps taken to control avalanches:

"The route through Glacier National Park from the viewpoint of the engineer as well as the tourist, is the "Showplace" of the entire Trans-Canada Highway. Here, the Highway clings to the mountainsides as it cuts through the heart of the towering Selkirks and provides motorists with some of the most magnificent scenery to be found anywhere in the world. And when you combine towering mountains with heavy snowfall, the result is dangerous avalanches. However, this danger has been well taken care of by the ingenuity of the highway builders who have designed and constructed in the area a unique system of avalanche defences. The result is a standard of safety at least as high as that for the best mountain highways in the world. The route is fully protected from avalanches of known intensity and should a slide of unexpected severity occur, an elaborate system of warnings will give sufficient time for the route to be closed before any real danger exists.

"The mountain route from Golden to Revelstoke traverses Rogers Pass and 27.3 miles of it lie within the boundaries of Glacier National Park. Here, the work is entirely a Federal responsibility and the Department of Public Works has spent $24,000,000 constructing this section of the Trans-Canada Highway. Of that amount, over $3,000,000 has been for avalanche defences.

Avalanche Control

"In Glacier National Park, the average snowfall is 340 inches each season and in the winter of 1953-54, it reached a record total of 645 inches or almost 54 feet of snow. Little wonder the avalanche potential is high. The 27-mile route of the Highway is lined by massive snow-laden peaks that rise to over 10,000 feet in height.

"On less important roads through such terrain, there is a simple answer to the snow-slide problem. When the avalanche potential is high they simply close the route to traffic until the danger period is over. Then the highway is cleared of snow and the road is opened again until the next threat occurs. Such an arrangement did not satisfy the builders of the Trans-Canada Highway. Construction standards for the nation's "main street" called for an all-weather, all-season transportation system providing a maximum of safety and a minimum of interference from snow-blocked roads. In 1953, foreseeing the possibility that the Highway might follow the short route through Rogers Pass, Department of Public Works engineers began gathering snow and avalanche data in the Glacier area.

"When the route was definitely accepted in 1956, an Avalanche Research Group, which included scientific experts on snow conditions from the National Research Council, was set up to study the problem. This group had three main responsibilities. It was their job to locate each avalanche zone; to recommend the most practical and economical form of defence; and to establish an avalanche forecasting system.

"The task was anything but easy. A great part of the work, and all at high altitudes, had to be done on skis. This was often dangerous because of the ever-present risk of being trapped by slides. On more than one occasion,

APPENDIX

GENERAL SPECIFICATIONS OF THE HIGHWAY

1. Right-of-Way

The minimum width of the right-of-way shall be one hundred (100) feet. Where the highway runs through densely populated areas thus involving heavy expenditures, a minimum initial width of sixty-six (66) feet will be acceptable.

2. Pavement

(a) The width of pavement shall be a maximum of twenty-four (24) feet, except when special facilities such as acceleration-deceleration lanes are approved, and a minimum of twenty-two (22) feet.

(b) The pavement shall be a Bituminous-Mineral type generally described as a Bituminous Hot-Mix with graded aggregate.

(c) The compacted thickness of the bituminous-mineral pavement shall be a minimum of three (3) inches.

(d) Where it is desirable to lay concrete pavement, the thickness and type customarily used by the provinces will be acceptable.

3. Shoulders

The width of the shoulders on each side of the pavement shall be ten (10) feet, where it is economically possible to construct to this width. Lesser widths will be acceptable to a minimum of five (5) feet where terrain and/or economy makes this necessary.

4. Obstructions

The minimum distance between the edge of the pavement and any obstruction on the shoulders shall be one (1) foot less than the width of the shoulders.

5. Stone base course, sub-base, elevation of water table level

The construction of the stone base course, the sub-base and the drainage system controlling the elevation of the water table level shall be constructed in such a manner that combined, they will produce a roadway having a load bearing capacity for a repeating 18,000 pound axle load.

6. Curvature

The curvature of the centre line of pavement shall not exceed six (6) degrees, except where terrain does not permit this with reasonable economy. Where possible, it is considered desirable to reduce the maximum curvature to three (3) degrees.

7. Gradient

The maximum gradient on the Highway shall not exceed six (6) per cent, except in cases where this is not economically feasible, where seven (7) or eight (8) per cent will be acceptable for short distances.

8. Sight Distances

Where terrain permits, the minimum horizontal sight distance, and the minimum vertical sight distance shall be six hundred (600) feet. This means that a driver of a vehicle will be able to see an object six inches high on the pavement ahead of him at a distance of 600 feet, when his eyes are four (4) feet six (6) inches above the pavement.

9. Bridges

(a) Loading H20-S16.

(b) Overhead clearances, for full width between curbs, 14 feet 6 inches.

(c) For length of bridge of 30 feet or less, the roadway between curbs shall be the aggregate width of pavement and shoulders.

(d) For length of bridge over 30 feet and up to 100 feet, the minimum roadway between curbs shall be 27 feet and the minimum width of curbs on each side shall be 18 inches, or the deck design shall provide equivalent clearance.

(e) For length of bridge over 100 feet, the minimum width between curbs shall be 24 feet, and the minimum width of curbs on each side shall be 18 inches, or the deck design shall provide equivalent clearance.

BASIC DESIGN STANDARDS FOR PROVINCIAL HIGHWAYS

(ALL DIMENSIONS IN METRIC UNITS)

Manitoba Highways and Transportation

		1	2	3		4			5			6		
		ESTIMATED 20-YEAR ANNUAL AVERAGE DAILY TRAFFIC												
DESIGN CLASSIFICATION	EXPRESSWAYS	OVER 5000 (A)												
	PRIMARY ARTERIALS	OVER 5000 (A)	1000 – 5000 (2)	UNDER 1000										
	SECONDARY ARTERIALS	OVER 5000 (A)		1000 – 5000 (2)		500 – 1000			UNDER 500 (9)					
	COLLECTORS	OVER 5000 (A)				1000 – 5000 (2)			300 – 1000			UNDER 300		
DRAWING Nº (CROSS SECTION)		1	2	3		4			5			6		
NUMBER OF LANES		MULTI-LANE DIVIDED (1)	TWO-LANE	TWO-LANE		TWO-LANE			TWO-LANE			TWO-LANE		
TERRAIN (G)		ALL	ALL	FLAT	ROLLING/RUGGED	FLAT	ROLLING	RUGGED	FLAT	ROLLING	RUGGED	FLAT	ROLLING	RUGGED
DESIGN SPEED – km/h		130 (F)	120	120	110	120	110	100	110	100	90	100	90	80
CURVATURE – MINIMUM RADIUS (11)		800 (D)(F)	650	650	525	650	525	420	525	420	340	420	340	250
GRADIENT – MAXIMUM PERCENT (3)		3 (F)	3	3	5	3	6	7	3	6	7	4	7	8
STOPPING SIGHT DIST. – m		260 (F)	240	240	220	240	220	200	220	200	170	200	170	140
PASSING SIGHT DIST. – m (4)		NOT APPLICABLE	800	800	740	800	740	680	740	680	620	680	620	550
SURFACE TYPE		CONCRETE OR BITUMINOUS PAVEMENT	CONCRETE OR BITUMINOUS PAVEMENT	CONCRETE OR BITUMINOUS PAVEMENT		CONCRETE OR BITUMINOUS PAVEMENT			SURFACE TREATMENT (7) (9)			GRAVEL		
LANE WIDTH – m		3.7	3.7	3.7		3.7			3.7 (9)			N.A.		
SHOULDER WIDTH – m		2 – 3 RIGHT 1 – 2 LEFT (10)	3.0 (8)	2.5		2.0			1.3 (9)			N.A.		
ROADBED WIDTH – m		VARIABLE	VARIABLE	VARIABLE		VARIABLE			VARIABLE (9)			8	8.4	8.4
MEDIAN WIDTH – m	DEPRESSED (5)	12 MINIMUM 20 – 40 NORMAL	N.A.	N.A.		N.A.			N.A			N.A		
	CURBED (6)	6 – 10 NORMAL												
RIGHT OF WAY – m		AS REQUIRED	60	60		60			50 (9)			40	45	45
STRUCTURES – WIDTHS BASED ON THE ASSUMPTION OF 1.2 m INCREMENTS	CLEAR WIDTH m (B) – UNDER 60m LONG	PAVMENT PLUS SHOULDERS	13.2	12.0		12.0			10.8			8.4		
	CLEAR WIDTH m (B) – OVER 60m LONG	10.8 (C)	10.8	9.6		9.6			8.4			8.4		
	LOADING	MS 225												
	VERTICAL CLEARANCE	ALL 5.0m (ALLOWS FOR 0.1m RESURFACING DEPTH)												

NOTE: IN GENERAL THESE STANDARDS ARE A MINIMUM, TO BE BETTERED WHEN FEASIBLE, BUT TO BE LOWERED WHEN HEAVY ECONOMIC PENALTY RESULTS.

1. FULL CONTROL OF ACCESS WHENEVER POSSIBLE: Nº. OF LANES DETERMINED BY CAPACITY ANALYSIS
2. FOR VOLUMES IN THIS RANGE, USE FOUR LANES WHEN TWO LANES WILL NOT PROVIDE CAPACITY FOR 20-YEAR DESIGN HOUR VOLUME.
3. ON GRADES OVER 3%, NEED FOR TRUCK CLIMBING LANES TO BE CONSIDERED. SEE PAGE D3-41 OF HIGHWAY DESIGN MANUAL.
4. PASSING SIGHT DISTANCE SHOULD BE AVAILABLE ON A MINIMUM 25% OF ANY 2km AND A MINIMUM OF 50% IN ANY 15km.
5. MEDIAN WIDTH INCLUDES THE INSIDE SHOULDER.
6. MEDIAN WIDTH MAY INCLUDE A 0.3 – 0.5m CURB OFFSET.
7. BASE COURSE AND ASPHALT SURFACE TREATMENT OR CALCIUM CHLORIDE ON WELL DRAINED A3 OR BETTER SOILS; HEAVIER PAVEMENT, IF WARRANTED, ON POORLY DRAINED A4 – A7 SOILS.
8. PAVE 0.9m OF SHOULDERS IF 20 YEAR A.A.D.T. OVER 2000.
9. CONSIDER STAGE CONSTRUCTION, IF SURFACE TREATMENT NOT POSSIBLE FOR 5 – 10 YEARS OR IF THE FUNCTION OF THE HIGHWAY SO WARRANTS.
10. SURFACE TREAT OR PAVE 0.6m OF RIGHT SHOULDER FOR EXPRESSWAYS AND ARTERIALS.
11. HORIZONTAL CURVE DATA BASED ON MAXIMUM SUPERELEVATION OF 6%

(A) IN ADDITION TO THE A.A.D.T. OTHER FACTORS SUCH AS HOURLY FLOWS, SEASONAL VARIATIONS, THE FUNCTION OF THE HIGHWAY, ETC., MAY HAVE A BEARING ON THE DECISION TO FOUR LANE. DIRECT PROPERTY ACCESS NORMALLY ELIMINATED ON EXPRESSWAYS.

(B) OTHER FEATURES IN THE VICINITY OF THE STRUCTURE SUCH AS INTERSECTIONS, ROAD CURVATURE, THE NEED FOR A SIDEWALK, ETC., COULD AFFECT THE REQUIRED STRUCTURE WIDTH. CLEAR WIDTH IS "IN TO IN" OF CURBS.

(C) WIDTH OF 2 LANE, 1-WAY OVERPASS. FOR MORE THAN 4 LANE DIVIDED OR FOR UNDERPASS CONSULT PLANNING & DESIGN.

(D) MINIMUM RECOMMENDED RADIUS 1000 – 1200m ON T.C.H.

(E) STANDARDS FOR FRONTAGE / SERVICE ROADS AS PER DRAWING Nº. 5 OR 6 (EXCEPT FOR RIGHT OF WAY REQUIREMENTS.

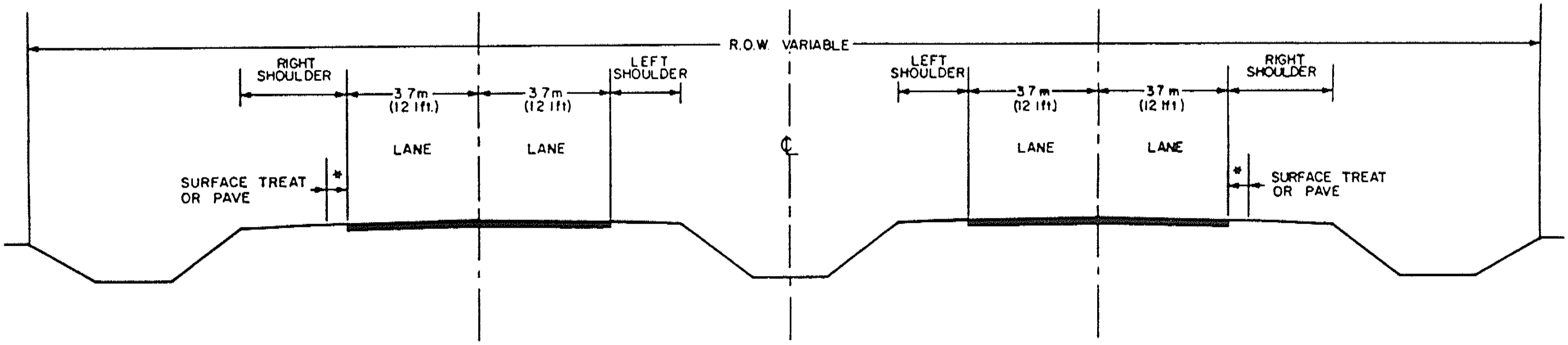
(F) FOR DESIGN SPEED AND ASSOCIATED PARAMETERS ON MULTI-LANE COLLECTORS CONSULT PLANNING & DESIGN.

(G) USE OF RUGGED TERRAIN STANDARDS MUST BE JUSTIFIED ON BASIS OF SUCH FACTORS AS SIGNIFICANT REDUCTION IN CONSTRUCTION COSTS & ENVIRONMENTAL IMPACTS. ONLY TO BE CONSIDERED FOR LOWER CLASSIFICATION HIGHWAYS WITHIN SUCH AREAS AS THE WESTERN UPLANDS, DEEP RIVER VALLEYS AND THE CANADIAN SHIELD.

March 1986

TABLE I

4-LANE DIVIDED (20YR. AADT>5000)

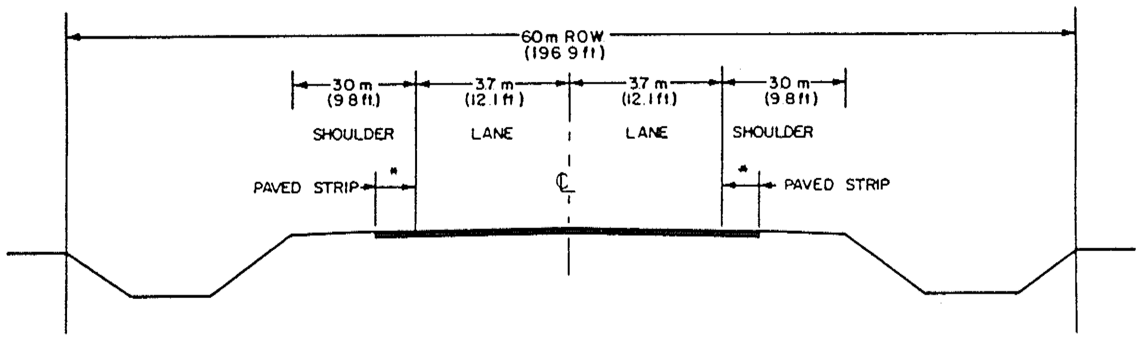


	LEFT SHOULDER	RIGHT SHOULDER
EXPRESSWAY	2.0 m (6.6 ft.)	3.0 m (9.8 ft.*)
ARTERIAL	1.5 m (4.9 ft.)	3.0 m (9.8 ft.*)
COLLECTOR	1.0 m (3.3 ft.)	2.0 m (6.6 ft.)

*SURFACE TREAT OR PAVE INSIDE 0.6m (2.0 ft.)

DWG № 1
MARCH 1986

PRIMARY ARTERIAL (20YR. AADT > 1000)



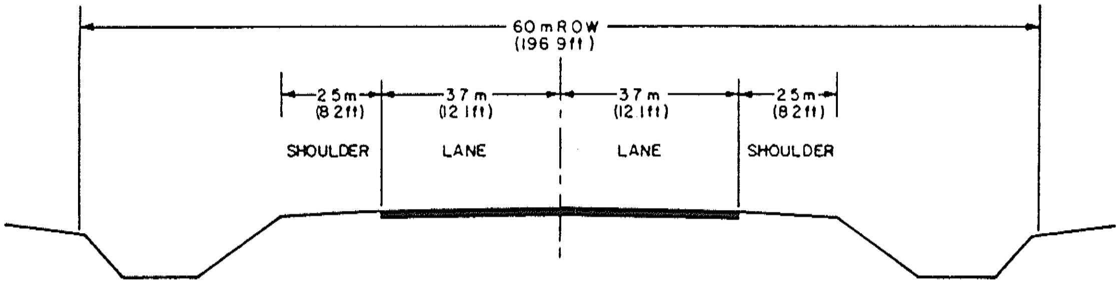
*NOTE: FOR 20YR. AADT > 2000, PAVE INSIDE 0.9 m (3ft.)

DWG. Nº 2
MARCH 1986

·22)

PRIMARY ARTERIAL (20YR. AADT < 1000)

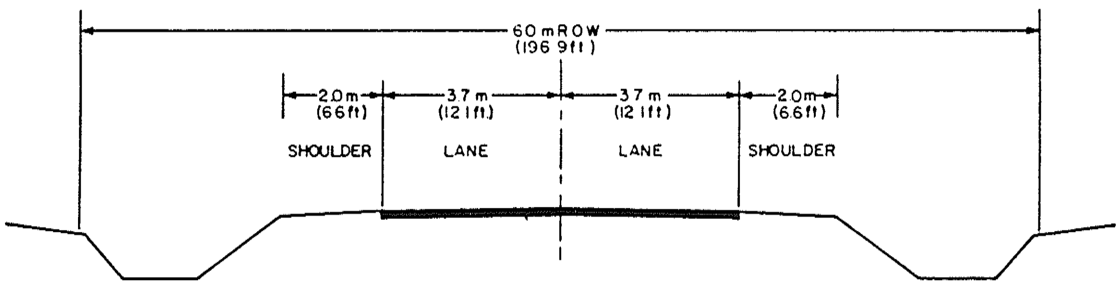
SECONDARY ARTERIAL (20YR. AADT > 1000)



DWG. Nº 3
MARCH 1986

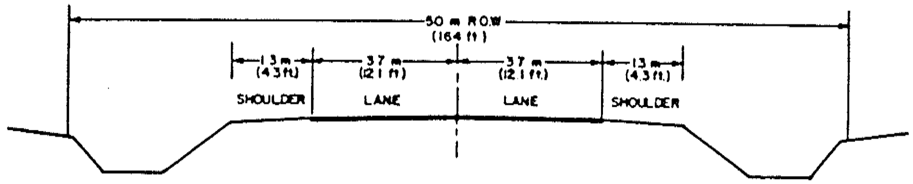
SECONDARY ARTERIAL (20YR. AADT < 1000)

COLLECTOR (20YR. AADT > 1000)

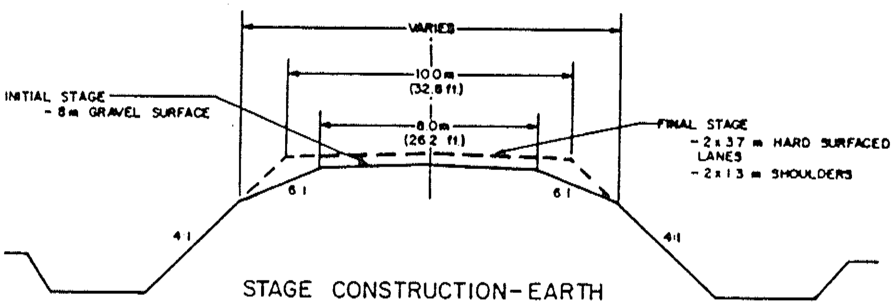


DWG. Nº 4
MARCH 1986

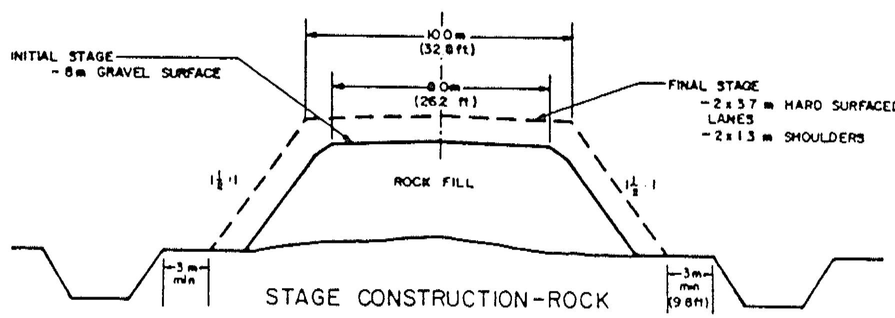
SECONDARY ARTERIAL (20YR. AADT 300 TO 500)
COLLECTOR (20YR. AADT 300 TO 1000)



SECONDARY ARTERIAL (20YR. AADT < 300)
COLLECTOR (20YR. AADT IN 300 RANGE)



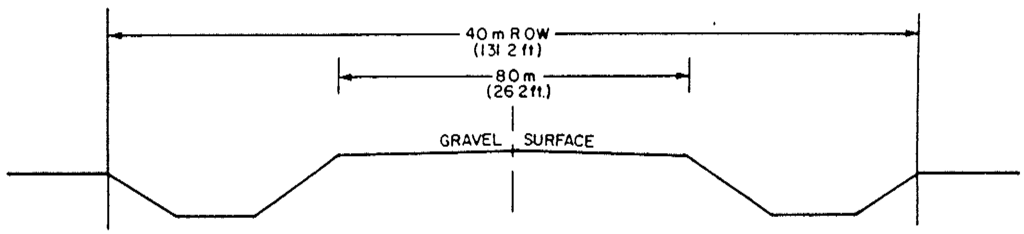
STAGE CONSTRUCTION-EARTH



STAGE CONSTRUCTION-ROCK

DWG. Nº 5
MARCH 1986

COLLECTOR (20 YR. AADT < 300)



NOTE: FOR ROLLING TERRAIN TOP WIDTH TO BE 8.4m & R.O.W. TO BE 45m

DWG. Nº. 6
MARCH 1986

CHARACTERISTICS OF RURAL HIGHWAYS

TABLE 2

	COLLECTORS		ARTERIALS		EXPRESSWAYS	
	TYPES "B & C"	TYPE "A"	SECONDARY	PRIMARY	STAGE 1	STAGE 2 (Freeway)
Traffic Service	Traffic movement secondary function	Traffic movement and	Traffic movement primary function	Optimum mobility	Optimum mobility	Optimum mobility
Land service	Land access primary function	land access both of equal importance	Land access secondary consideration		Access to selected municipal roads	No access
Characteristic of traffic flow	Interrupted flow	Interrupted flow	Uninterrupted flows except at traffic signals		Uninterrupted flow except at traffic signals	Free flow
Connects major centres of population	less than 500	500 - 1 000	1 000 - 10 000	Over 10 000	Over 10 000	
Assumed average running speed (km/h)	50 - 80	60 - 90	70 - 90	80 - 110	90 - 110	
Vehicle type	Mostly cars, light to medium trucks, occasional heavy trucks	Mostly cars with all types of trucks	All types of vehicles up to 15% trucks	All types with up to 20% trucks	All types with up to 30% trucks	
Connects to	Expressways arterials collectors and locals	All classes	All classes	All classes	All classses	All classes except locals
Minimum spacing of farm accesses	80 - 300 m		300 m	400 m	No direct approach	No approach
Desirable spacing of farm accesses	200 - 600 m		600 m	800 m		
Traffic entering & leaving access: Under 50 ADT	Direct access		Direct access		No direct access, access via service road	
Traffic entering & leaving access: 50 to 500 ADT	Direct access		Service road/turn lanes			
Traffic entering & leaving access: Over 500 ADT	Direct access/ turn lanes		Service road/turn lanes			