BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT

Toby, Russell, Buckwell and Partners Architects - Hat Creek Project - Detailed Environmental Studies - Aesthetic Considerations - July 1978

ENVIRONMENTAL IMPACT STATEMENT REFERENCE NUMBER: 22

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT
DETAILED ENVIRONMENTAL STUDIES

E4
AESTHETIC CONSIDERATIONS

JULY 1978

TOBY RUSSELL BUCKWELL & PARTNERS ARCHITECTS
CONSULTANTS
APRA - ADVANCE PLANNING AND RESEARCH FOR ARCHITECTURE
JUSTICE & WEBB LANDSCAPE ARCHITECTS
FOREST PLANNING SYSTEMS LTD.

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

TABLES

1.0 SUMMARY

The study of Aesthetic Considerations involves: the assessment of the present visual quality in the study area; an evaluation of the visual impact caused by specific elements of the Hat Creek Project; and the determination of measures to minimize the visual impact of project elements upon the visual quality of the existing landscape. Although project actions during pre-construction, construction, operation, and decommission were reviewed, this study focuses on the visual impact of elements that represent man-made components or disruptions on or in the existing landscape.

The inventory of the study area's visual quality was completed after a series of ground and air observations of the project site, and the analysis of topographic maps, aerial photos, and other photographs of the site. The study area is divided into ten visual units and two special features that were evaluated according to a set of comparative visual quality criteria. These criteria were used to assess all ten visual units. Those having outstanding visual qualities included Marble Canyon and Upper Hat Creek Valley while Cache Creek and Highway # 1 rated fair to poor.

The project elements whose visual impacts were analysed are described in a series of project reports prepared by B. C. Hydro and Power Authority, INTEG-EBASCO, and other consultants. Visual impact importance is assessed through the analysis of the impacted areas, the type of views, and the form and characteristics of the project element's impact.

The most significant visual impacts are caused by the elements associated with the open pit mine and the blending facilities. These project elements affected the visually sensitive junction of the Marble Canyon, Upper Hat Creek and Highway # 12 visual units. The recommended mitigation measures included the organization of the project elements to maximize the separation between this

junction and these elements. Berms are also used to provide visual screens between Highway # 12 and the blending facilities. It is also recommended that public access through the blending area be eliminated by providing alternative routes to the generation plant.

The next most significant impacts are caused by the elements associated with the generation plant. These elements dominate the surrounding landscape which includes the Trachyte Hills and the Medicine Creek Valley visual unit. Mitigation recommendations include the development of visual screens and the relocation of the access road to reduce the visual contact with the ash dump. The organization and development of the generation plant to express a high technology environment will provide an interesting contrast to the existing natural landscape.

The linkage elements such as the transmission corridor, the main conveyor, and the access road create a significant impact because of their linear forms. Careful modulation of the edges through the natural landscape will integrate the man-made cuts with the natural landscape. In addition it is recommended that the structural components of the transmission towers and the conveyors be designed to emphasize the linear linkages between the various project elements.

In Chapter 5.3 other alternative measures and concepts are proposed. These may or may not be achievable within the technical and economic constraints of the project. However, they should be considered and evaluated in terms of their feasibility as the project is developed since any mitigation measure will contribute to the overall reduction of this project's visual impact.

2.0 INTRODUCTION

2.1 SCOPE AND PURPOSE

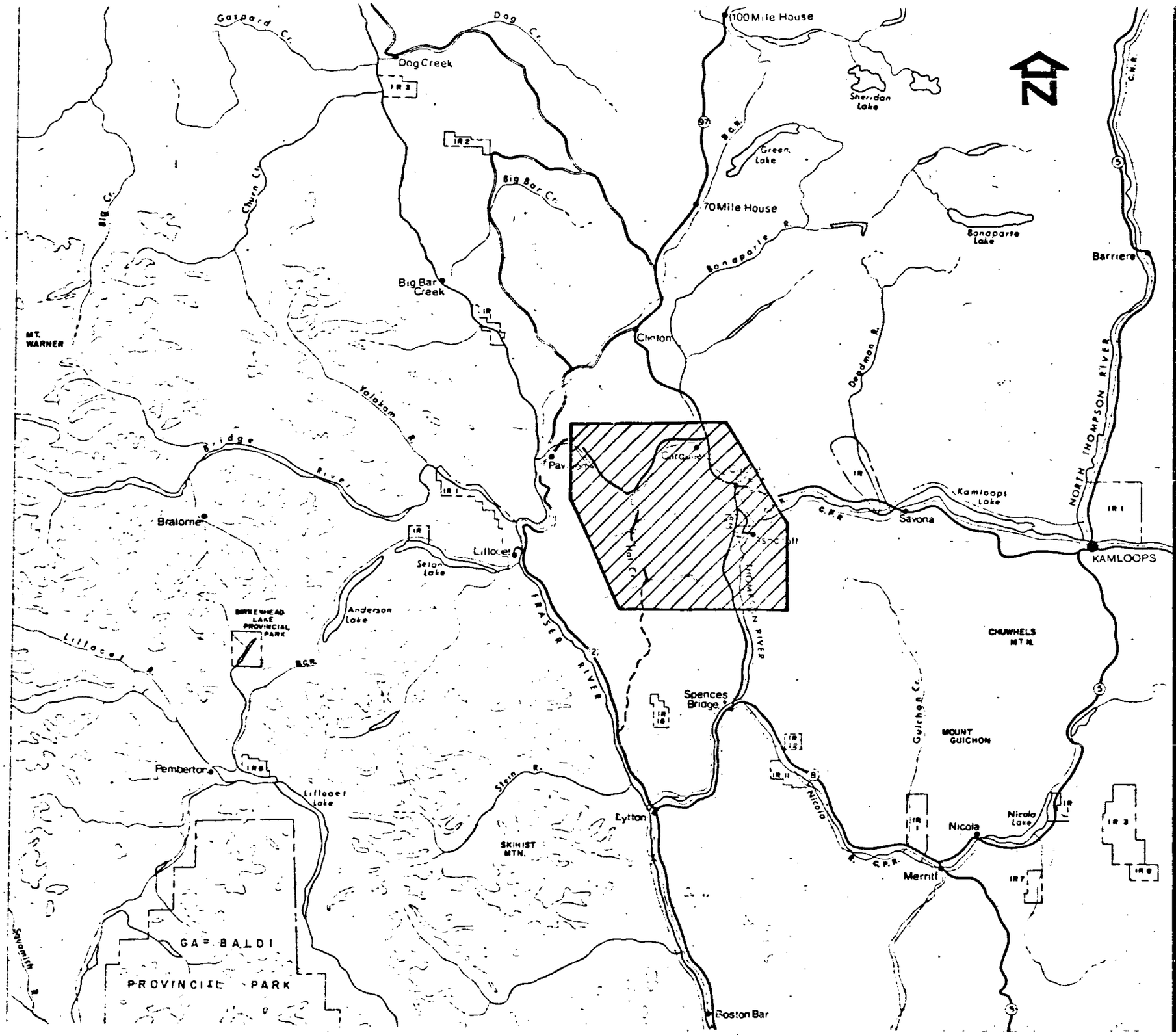
In September, 1977, B. C. Hydro and Power Authority provided Toby Russell Buckwell & Partners, Architects, with the Terms of Reference for Architectural Advisory Services on the Hat Creek Project. An essential part of these services involved the development of a visual impact statement for inclusion in the Environmental Impact Report being prepared by a team of environmental consultants under the control and co-ordination of Ebasco Services of Canada Ltd., Environmental Consultants. The report is to provide documentation for license application, public hearings and overall project approval.

The objective of the visual impact statement is to define the visual impacts associated with the Hat Creek Project, identify which feature causes the impact, when and where it occurs, its significance and mitigation recommendations. The principal impact causes are associated with project construction, project operations, and project decommissioning.

The statement follows an impact assessment approach which permits an inter-relationship of disciplines, and which provides the input information necessary for the resource evaluations.

2.2 STUDY AREA

The study area is bounded on the north by an east-west line through a point 5 km. north of Carquile; on the west by a north-south line through Pavilion and a line parallel to Hat Creek; on the south by an east-west line through a point 15 km. south of Ashcroft; and on the east by a north-south line parallell to the Thompson River and Highway #1. (See Figure 2.1 Study Area).



LEGEND

STUDY AREA

SCALE - 1:750,000

10 0 Kilometres 10 20 30 40 50

CONTOUR INTERVAL - 500 METRES

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
HAT CREEK PROJECT

DETAILED ENVIRONMENTAL STUDIES

FIGURE 2.1 STUDY AREA

2.3 PERSONNEL

The visual impact study has been carried out by a team made up of Dr. K. Shimizu of APRA - Advance Planning and Research for Architecture (Co-ordinator), Mr. R. L. Toby, Mr. T. S. Annandale, Mr. H. R. Ciccone, and Mr. J. Sumi of Toby Russell Buckwell & Partners, Architects, Mr. Clive Justice of Justice & Webb, Landscape Architects, and Dr. D. H. Williams of Forest Planning Systems Ltd.

3.0 STUDY METHODOLOGY

3.1 LITERATURE REVIEW

The purpose of the literature review was twofold. First, it enhanced the understanding of current visual analysis principles, techniques, and studies that have been documented in reports and periodicals. Second, it provided the opportunity to become familiar with aspects of the project that have a visual impact on the study area. The literature search and review was conducted at the libraries of the University of British Columbia, the University of Washington, the Resource Analysis Branch of the Provincial Government, the Thermal Division of B. C. Hydro and Power Authority, and the co-ordinator of the environmental analysis, ESCLEC.

A review of the methods for measuring and quantifying aesthetics, by Martin J. Redding[1], describes visual analysis methodologies as:

> "...tools to be used by a planning staff or decision maker to identify aesthetic attributes and forecast changes in the aesthetic characteristics in the environment, and to describe the implications of changes in terms of potential uses of environmental resources and environmental quality standards."[2]

The visual analysis methods that were reviewed ranged from studies that identified general principles and procedures to ones that developed a detailed method of visual impact measurement. For example, the U. S. Forest Service, which has completed a number of visual analysis studies, describe a general procedure in their publication, "Visual Management Systems."[3] Luna Leopold's[4] study for the U. S. Geological Survey is a very detailed analysis of environmental impact factors and is composed of a matrix containing 8800 cells.[5]

The Analysis/Interpretation Division of the Resource Analysis Branch in the Provincial Ministry of the Environment has also completed a number of studies on visual analysis. Their recent environmental report on the Northeast coal development contains a section on the visual resources of the area.[6] The methodology used by this Division reflects the current state of the art in visual analysis methodology.

From this review of the literature on visual analysis, it is clear that there is consensus about methods for classifying and recording the visual quality of the natural environment. There is, however, less agreement on methods for measuring the visual impact of man-made elements on the natural environment. The basis for the visual analysis methodology that was developed for this study is the result of previous work completed by R. Burton Litton, Jr.[7] and the Resource Analysis Branch. The parameters for using these two studies are given in the section on Study Methodology.

A comprehensive site plan illustrating the project elements that have a visual impact was developed from the reports and ongoing studies for all aspects of the project. For this initial analysis of visual impact, the level of detail is limited to one that clearly defines the project element's size, shape, and location. At this stage, detailed refinements are not required since they would be considered and integrated into the subsequent phases of the project's development.

3.2 STUDY METHODOLOGY

The visual analysis methodology that was developed for this study on Aesthetic Considerations meets the following criteria:

(a) The method should be as objective as possible and reflect the current state of the art in this field of study.

(b) It should cover a full range of aesthetic attributes including both man-made and natural components of the environment.

(c) The factors and variables used in the methodology should be appropriate to the scale and purpose of the study.

(d) The method should be straightforward and be reproducible by others familiar with visual impact analysis.

(e) The results of the study should be in a format that provides meaningful input to the total impact analysis.

There are three parts to the approach taken in this study on Aesthetic Considerations. The first task assesses both the existing visual qualities and the visual sensitivity to change of the landscape within the study area. The second task defines the visual impact causes and their effect upon the receptors of the existing environment. The final task determines the importance of the potential impact and develops courses of action to mitigate, enhance, or compensate for it.

Figure 3.1 illustrates the relationships and sequence of steps that are required to fulfill the terms of reference for this study. The initial analysis of the existing visual qualities and the visual impact of the project elements are conducted independently. The synthesis between the existing visual qualities and the proposed project elements occurs during the interpretive phase where the importance of a particular element's impact is

assessed and courses of action are developed to mitigate, enhance or compensate for the impact. The recommended courses of action are based on: the existing visual quality of a particular area; the relative importance of a project element's impact to a receptor when compared to other impacts; the feasibility of achieving a possible course of action.

Throughout this analysis on Aesthetic Considerations, the interpretation, evaluation and ranking of the visual quality, sensitivity, and impact, are assessed in terms of how a variety of observers are visually affected. This review of the study methodology describes the various tasks in the study, their linkages to each other, and to the recommendations. Each task is described in detail in the following three sections of the report.

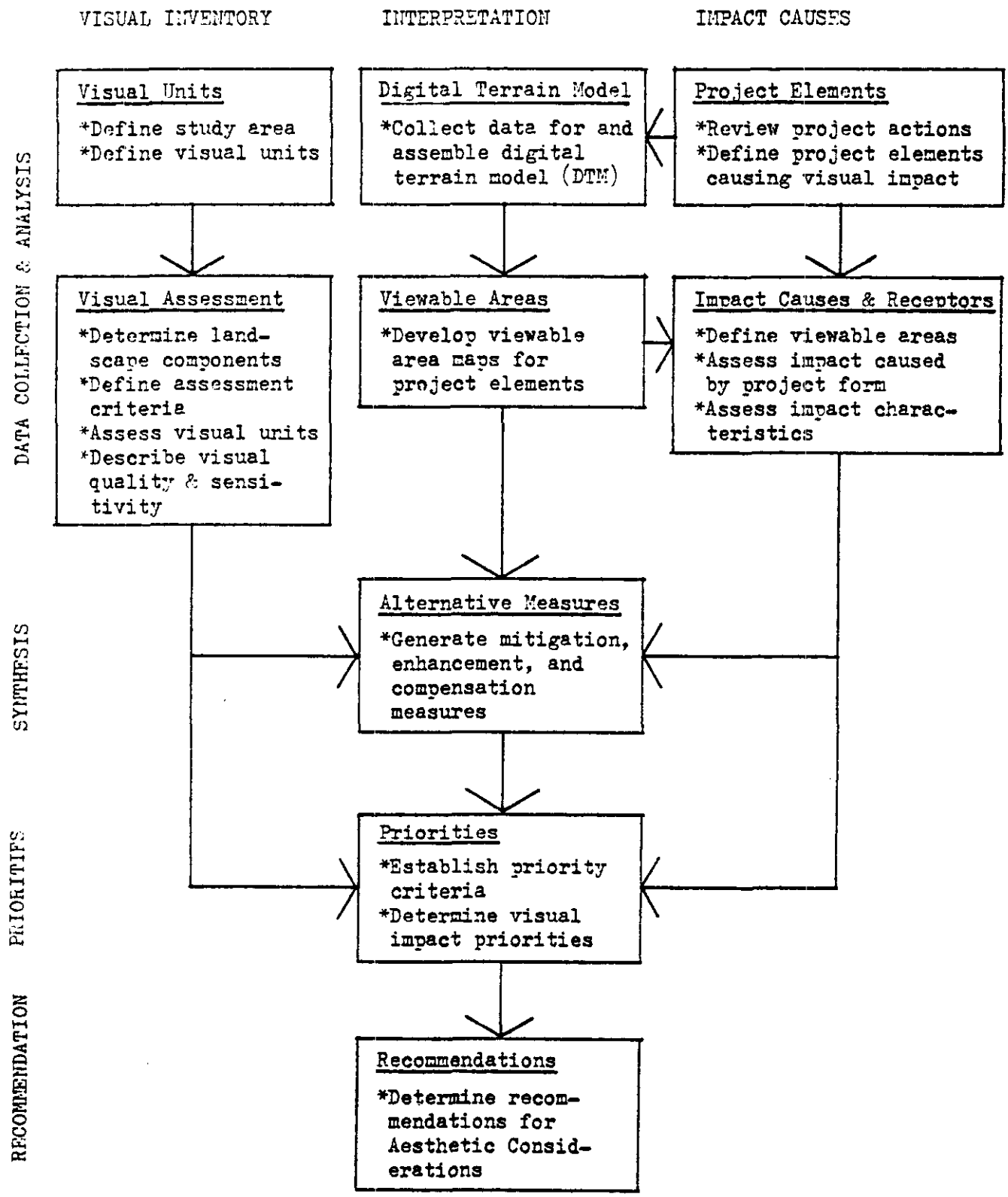


Figure 3.1 Process Model for Aesthetic Considerations

4.0 EXISTING VISUAL INVENTORY

4.1 COMPARATIVE ANALYSIS OF VISUAL QUALITIES

The evaluation of the existing visual qualities is based on the premise that the three major sources of visual reaction to the landscape are its variety, vividness, and unity. The dominant factors that stimulate this reaction are the form, line, colour, and texture of the landscape.

Variety holds the attention of the observer and provides a richness and diversity that maximizes the opportunities to visually stimulate different interest groups. Vividness distinguishes the intensity of the visual experience by giving distinction or producing strong visual cues to the observer. Finally, unity provides the expression whereby parts are joined together into a coherent and single harmonious unit stimulating a recognizable and memorable experience.

An objective evaluation of a viewer's response to the visual environment has been achieved, by using a system of classifying and rating landscape components, based on the degree of unity, variety, and vividness present.

The visual units, within the overall landscape of the study area, were identified in the first step of the visual analysis. The visual units were defined as areas having a continuous sense of enclosure and containing scenic elements which provide unifying or distinctive qualities to the landscape. A characteristic of visual units is the topographic features, such as ridgelines or distinct slope changes surrounding low lying areas or recognizable valley forms, that define their boundaries.

A transition zone or portal occurs at the junction between two distinctive visual units. The narrow gaps at valley mouths and the passes between

valleys are examples of portals. A portal may heighten the aesthetic experience of a visual unit's quality by defining a unique approach or spatial sequence to a visual unit.

The scenic elements or landscape components that define the characteristics of each visual unit are the boundary definition, general form, terrain pattern, visual features, vegetation patterns, water presence, and cultural and land use pattern.

(a) Boundary definition deals with those characteristics which visually establish the perimeter or edge of the unit within the general area. Edges are created by the interface between skyline and ridge, horizon and plane, or other boundary conditions that provide a visual edge to a unit.

(b) General form relates primarily to the expression of the landform such as mountains, planes and depressed or bowl-like containments such as valleys and basins.

(c) Terrain pattern emerges through repetition of form-shape-colour-texture variations. It can vary from soft undulating hills to mountainous terrain.

(d) Visual features are those elements within the visual unit that stand out through dominant scale, isolation, distinctive shape, or other special characteristics such as surface contrast and variation.

(e) Vegetation patterns assist in determining landscape character by defining particular kinds or composition of vegetation cover having distinctive colour, texture, and density.

(f) Water presence within the visual unit provides another distinguishing feature that generally enhances the observer's aesthetic

experience.

(g) Cultural and land use patterns indicate the presence of human occupation as characterized by field crops, pastures, grazing areas, roads, and other man-made elements. The form, texture, scale and colour of the man-made changes can enhance or degrade the quality of the visual experience.

Within the defined visual units (Fig. 4-1), the degree of unity, variety, and vividness present in each landscape component was evaluated. The basis for the evaluation was the comparative visual qualities described in Appendix A. The higher quality was assigned a numeric rank of 7 and the lower quality a rank of 1. A numeric rank of 4 indicated an average quality for the study area. Each landscape component of each visual unit was ranked. The sum of the scores for unity, variety, and vividness within each visual unit determined its ranking relative to the other units in the study area.

Although this numerical ranking represents a quantifiable procedure for establishing the overall visual quality, it still required subjective value judgments and reflects the biases of the observers in terms of their cultural background, the context of their observations, and the sensitivity of the observers to different environmental stimuli. The numeric ranking of each visual unit was qualified by a description of its overall visual quality created by the combination of all the landscape components. This combined experience could reinforce the visual concepts of enclosure, enframement, panoramic view, and focal point. It also identified how landscape components have been organized to enhance the visual experiences of spatial sequence, contrast, convergence, and an axial approach.

In conjunction with the description of visual quality, a visual unit's sensitivity to man-made changes was qualitatively evaluated. The visual sensitivity evaluation assessed the capability of the landscape to absorb change or modification.

One factor that defines a unit's visual sensitivity is the numeric ranking of its visual qualities. A high rank indicates a very sensitive area where man-made changes would disrupt the overall qualities of unity, variety, and vividness. However, this does not mean that a low numerically ranked visual unit is not sensitive to change. There are other contributing factors that affect sensitivity. These factors are related to the characteristics of the seven landscape components.

The sensitivity related to the landscape components is caused by the way change is displayed or exposed to the observer. The following criteria are used to assess this aspect of visual sensitivity. It completes this inventory of visual qualities by defining existing visual qualities and where they are most sensitive to change.

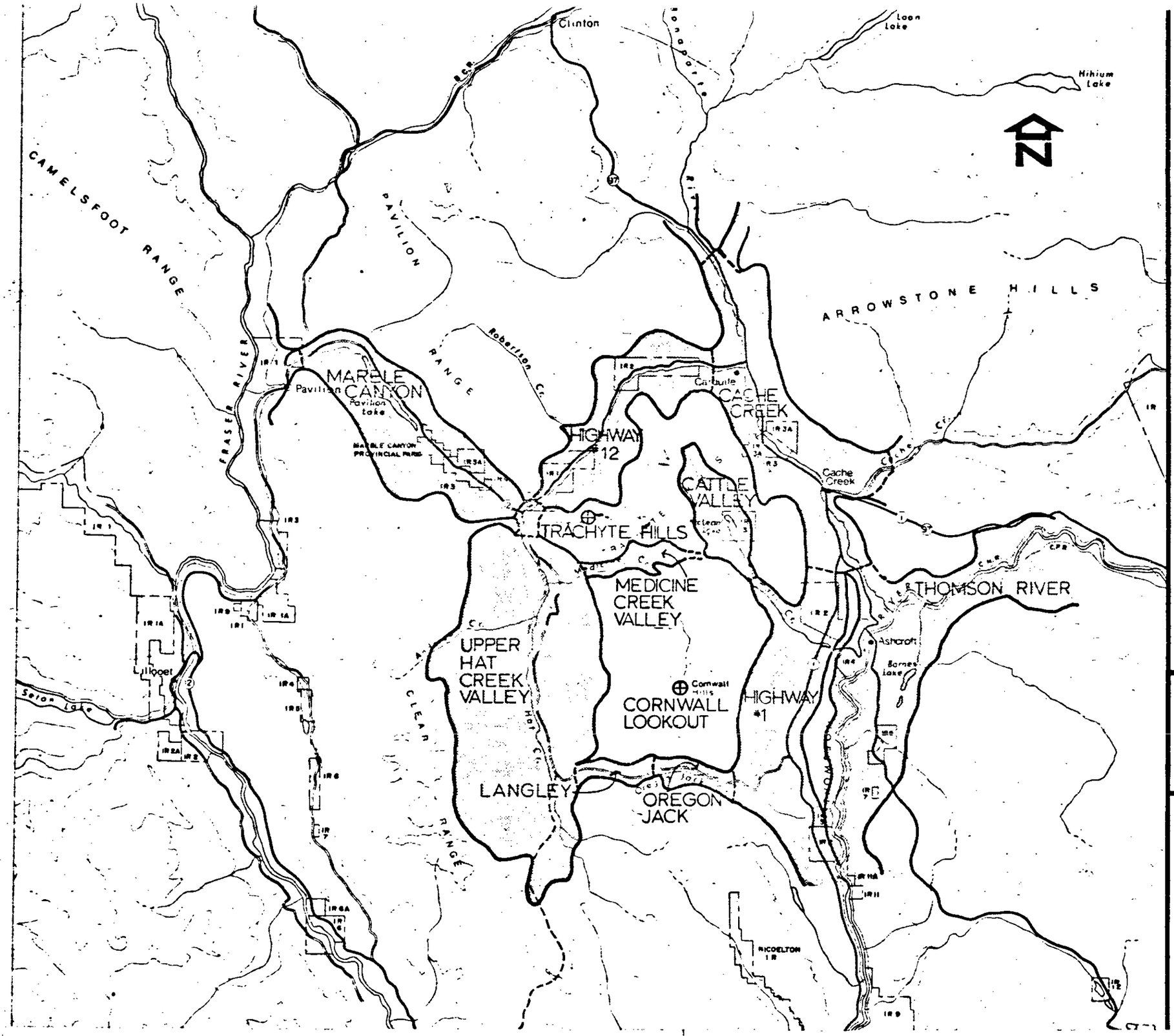
(a) Changes occurring on higher locations became more apparent to an observer than ones that occur along a valley floor.

(b) The greater the sideslope the greater the exposure of changes that occur on it.

(c) Ridgelines and skylines are sensitive to change because of the manner in which it is displayed.

(d) Changes that occur along shorelines and water courses are sensitive because of the exposure and contrast between man-made and natural elements.

(e) Vegetative type, texture, and pattern affect visual sensitivity. A heavily treed area provides a visual screen while the uniformity of the bunch grass ranges is highly sensitive to modifications that occur on it. A treed area is also sensitive to changes such as clear cut logging operations and transmission line corridors.



LEGEND

⊕ SPECIAL FEATURES

VISUAL UNITS

SCALE – 1:250,000

5 0 Kilometres 5 10 15

CONTOUR INTERVAL – 250 METRES

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
HAT CREEK PROJECT

DETAILED ENVIRONMENTAL STUDIES

FIG. 4.1 : VISUAL UNIT MAP

4.2 VISUAL UNIT ASSESSMENT

The visual units described in the following assessment are defined in Fig. 4-1. Each visual unit evaluation follows the criteria in Appendix A and is based on an analysis involving interpretation of aerial photos, examination of 1:50000 topographic maps, field reconnaissance at ground level and from a helicopter, review of site photographs, and a review of pertinent reports by project consultants.

The visual quality of each visual unit is independently evaluated according to the criteria in Appendix A-1 by three members of the study team. The visual units that were evaluated fall into four different categories of visual quality. At the highest level are those visual units having outstanding or unique visual qualities. Next are those units with high or above average visual qualities. The third group are those units with average visual qualities and finally, there are two visual units having fair to poor visual qualities. (See Appendix A1.2 for detailed analysis).

The ten visual units that are evaluated are shown on Figure 4-1. These visual units are determined from the topographic features which describe areas having a continuous sense of enclosure. A field observation of the study area verified the extent and location of the visual units. They include Marble Canyon, Upper Hat Creek Valley, Medicine Creek Valley, Cattle Valley, Highway #12, Cache Creek, Thompson River, Highway #1, Oregon Jack and Langley. In addition observations are also made of two special features: Cornwall Lookout and Trachyte Hills.

(a) Visual Units

(i) Marble Canyon - Visual Quality: Outstanding

In the Marble Canyon visual unit a number of landscape

components has been combined into a distinctive and highly unified visual experience. The well-defined and controlled entrance and gateway at the eastern end of Marble Canyon dramatizes the visual experience and enhances the uniqueness of the valley. The canyon with its narrow entrances, chain of lakes, and sheer canyon walls has received provincial recognition by being designated a provincial park.

Marble Canyon with its unique scenic qualities is also highly sensitive to man-made developments along its steep slopes, ridges, and the shoreline of its lakes. Development in such areas could disrupt the existing unity and harmony of the area. However, the area can also absorb man-made changes when well handled. For example, a cabin, screened by vegetation and built on the island in Pavillion Lake, adds variety and interest to the landscape without disrupting the existing visual harmony. The limestone quarry provides an example of how the existing visual quality was degraded and disrupted. At this site no attempt has been made to provide mitigation measures to preserve the integrity of the scenery.

(ii) Upper Hat Creek Valley - Visual Quality: Outstanding

In contrast to Marble Canyon, the Upper Hat Creek Valley is broader and has less vivid features and edge definition. On entering the valley from the north, the landscape consists of both man-made and natural landscape elements. The ranches, pastures, irrigated fields and fencing have greatly enhanced the visual quality by adding contrast, variety, and texture to the vegetative pattern of a typical valley in this region. Additionally these complementary man-made features

provide an easily identifiable scale along the broad valley floor. The outstanding visual quality of this valley is attributed to the integration of man-made and natural elements into a unified visual experience.

Within this broad valley form, major developments which do not respect the established scale along the valley floor will have a high impact on the visual vulnerability of the area. The rolling hills that define the edge of this visual unit are capable of absorbing changes which can be screened or integrated with the existing landforms and vegetative pattern.

(iii) Medicine Creek Valley - Visual Quality: High

The man-made and natural landscape components of this visual unit are similar to the Upper Hat Creek Valley visual unit. Differences occur in the scale and more definition of natural features of the Medicine Creek Valley. In its 5.5 km. length the visual experience includes a small mountain lake, open range land, a small ranch, and a narrow V-shaped valley with a small creek.

Both the heavily treed, steep north slope and the rolling, open south slopes of Medicine Creek are highly vulnerable to man-made developments. Any major development could dominate and obscure the existing visual amenities of the visual unit.

(iv) Cattle Valley - Visual Quality: High

Cattle Valley also provides a high quality visual experience. The visual significance is derived from the contrast between the entrances, which are steep, narrow, and heavily treed,

and the openness and pastoral quality of Cattle Valley visual unit. McLean Lake dominates the southern end of this valley which has many visual qualities similar to the Upper Hat Creek Valley.

The areas most vulnerable to development in this valley are along the steep side slopes, the open grazing land and the lake shoreline. Large cuts through the narrow entrances could also destroy the totality of the visual experience. Developments can occur in selected areas without disrupting the existing harmony, and in certain places may provide opportunities for new vistas and visual display.

(v) Highway # 12 - Visual Quality: Average

The Highway #12 corridor, from Highway #97 to Marble Canyon, follows the route of Hat Creek. Within this visual unit there are small ranches and farms, power lines, and a highway to contrast with the natural features of the valley. However, these man-made elements do not provide the variety and interest that are created in the Upper Hat Creek or Cattle Valleys. Instead they tend to disrupt the existing visual unity and harmony and lower the visual experience to an average quality level.

Developments along the narrow valley floor and steep side slopes of this visual unit would have a high visual impact on the existing environment. Development could occur in certain areas which are naturally screened from the existing highway and other viewpoints in the visual unit. The existing highway is an example of a man-made element that disregards existing landforms and vegetative pattern by making large cuts and fills with very little attempt at revegetation.

(vi) Cache Creek - Visual Quality: Poor

The Cache Creek visual unit follows the valley and the water course of the Bonaparte River. The unifying element of the area is the river and its associated vegetative pattern. In the northern part of this unit the presence of farms provides a visually interesting contrast to the barren hills. However, the visual experience is dominated by the commercial and residential developments in Cache Creek. These man-made changes have not responded to the natural amenities of the area. In their place a development has been created that lacks visual cohesion or interest.

The lack of vegetative cover on the hills surrounding this visual unit makes them highly vulnerable to any man-made changes. Although the existing pattern of development has tended to degrade the visual experience, any new developments could begin to improve the existing visual quality through careful siting and screening.

(vii) Thompson River - Visual Quality: High

This visual unit is dominated by the Thompson River which becomes its unifying element and its predominant feature. Along this corridor natural features such as the sandstone cliffs, Black Canyon, and the river add variety and interest. Certain man-made elements like the small farms complement the existing natural quality. However, the natural harmony of the valley has been disrupted by Ashcroft's new subdivisions which appear scattered and out of character with the terrain and the older areas of the community. In the overall perspective, the strength and simplicity of the river's visual experience dominates this visual unit.

In general, the exposure of developments within this unit creates a situation of high visual impact. The contrast between the barren hills and the new Ashcroft subdivisions demonstrates this vulnerability. Like Cache Creek, any new developments must be sensitive to the visual character of the area.

(viii) Highway # 1 - Visual Quality: Fair to Poor

The Highway #1 visual unit follows the Thompson River. The eastern edge of this unit is separated from the river by a series of small hills. The uniformity of the landscape and the vegetative patterns add very little to the visual interest created by the slopes of the small hills. The limited amount of cultivation is sporadic and fails to establish an overall pattern in the area.

Due to the simplicity and the domination of the smooth rolling character of the middle distance landscape, any development would have to be carefully sited to reduce its visual impact from the highway.

(ix) Oregon Jack - Visual Quality: Outstanding

This visual unit connects Langley to Highway #1. Oregon Jack's principal distinguishing feature is the natural amphitheatre created by a box canyon having several small ranches strung along the narrow winding valley floor. The uniqueness of this feature is enhanced by the heavily-treed side walls, high vertical rock outcrops, and the excitement and surprise created by the dramatic approach along a steep, narrow and winding road.

The small intimate scale of this valley cannot absorb any

major developments. These changes would destroy the existing visual unity and harmony. Minor modifications along the valley floor can be made without degrading existing vistas.

(x) Langley - Visual Quality: Outstanding

Langley connects the south end of the Upper Hat Creek Valley to Oregon Jack. It rates highly as a scenically distinctive visual unit due to the vivid contrast between the very narrow valley floor containing Langley Lake and some farm land and the very steep escarpments enclosing and unifying all the landscape components. In scale, Langley is not as overpowering as Marble Canyon, yet has many of the same features which provide such an outstanding visual experience.

Unlike Marble Canyon, Langley cannot absorb developments because of its relatively small scale. Any change along the steep slopes would be exposed to the other parts of the valley and would destroy the existing unity and harmony. Modifications to the valley floor would have to be modest to reduce the visual impact.

Figure 4.2
Marble Canyon
from Trachyte Hills

Figure 4.3
Looking West along
Highway No. 12

Figure 4.4
Upper Hat Creek Valle

Figure 4.5
Medicine Creek Valley

Figure 4.6
Trachyte Hills
at Plant Site

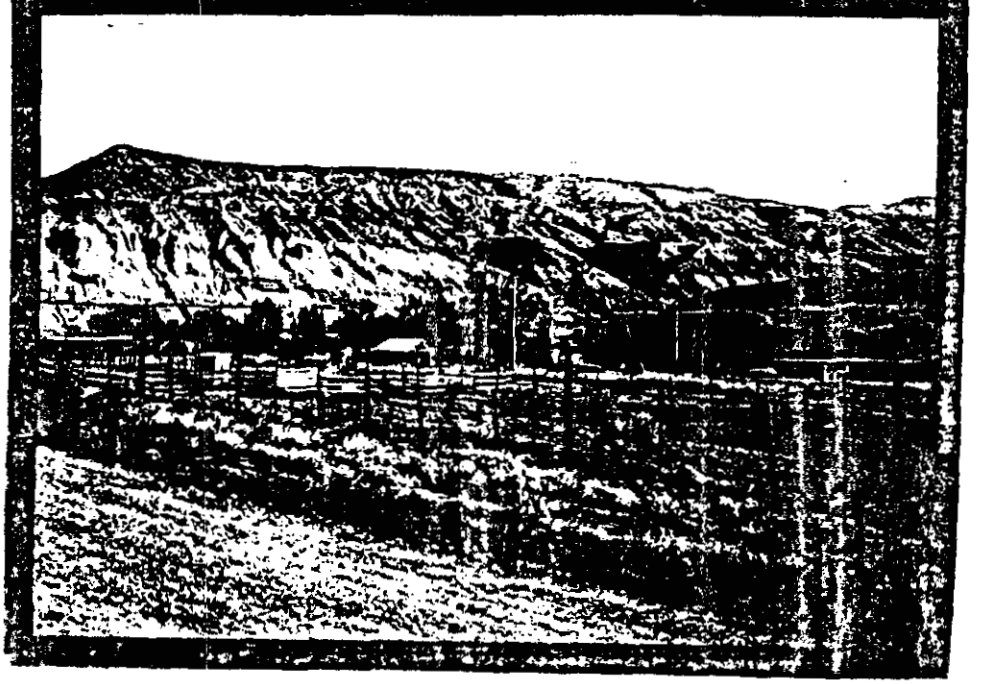


Figure 4.7
High Banks along
Thompson River
near Ashcroft

4.3 SPECIAL FEATURES

The nature of the landscape and the characteristics of the project development indicated the need to include features within the study area which were not within the defined visual units. The two special features described below are the Cornwall Lookout and the Trachyte Hills.

The visual quality assigned to the two special features is determined from a comparative analysis with the visual units. The qualitative description indicates the general visual quality of each special feature because criteria for landscape components are not applicable to either Cornwall Lookout or Trachyte Hills.

(a) Cornwall Lookout - Special Feature - Visual Quality: Outstanding

The Cornwall forestry lookout provides a special and unique visual experience to the study area. Located on the highest point within the study area, it produces a majestic panoramic view extending from the snow-capped Coast Range on the west and south-west to the Highland Valley and the Thompson Lake valley to the east and north-east. Below the lookout there is a unique vista of the Thompson River, Ashcroft, and the existing pattern of the valley floor. To the north, the Trachyte Hills dominate the vista from the lookout. However, it is the rugged features of the Coast Range and the ability to look down at the Thompson valley that provide the unsurpassed vistas from the lookout.

(b) Trachyte Hills - Special Feature - Visual Quality: High

This special feature was selected bacause of its significance to the development of this project. Although the Trachyte Hills extend along the Highway #12 corridor, this observation focused on that part

of the Trachyte Hills that has been proposed as the plant site. The area contains both treed and open areas. From various points around the proposed plantsite, vistas of Highway #12, Marble Canyon, Upper Hat Creek Valley, and Medicine Creek Valley can be seen. The predominant views are down to Upper Hat Creek, Marble Canyon, and Highway #12 junction.

4.4 ASSESSMENT CONCLUSIONS

The visual assessment of the study area provides the framework for the following evaluation of visual impact and recommendations regarding measures that could be taken to reduce or enhance this impact.

In general, the visual units and special features of the study area are unique to the region. They contain a variety of outstanding visual features that have been grouped and linked together to provide a unique visual experience to all observers whether they be residents, transients, or visitors. The following sections describe the measures by which this visual experience can be maintained or enhanced as a result of the development of the Hat Creek project.

5.0 IMPACT CAUSES AND THEIR RECEPTORS

5.1 IMPACT ASSESSMENT

The purpose of this section is to define the project elements that cause a visual impact and to determine the characteristics of this impact upon the receptors. The receptors referred to are the affected visual units and the special landscape features of the study area.

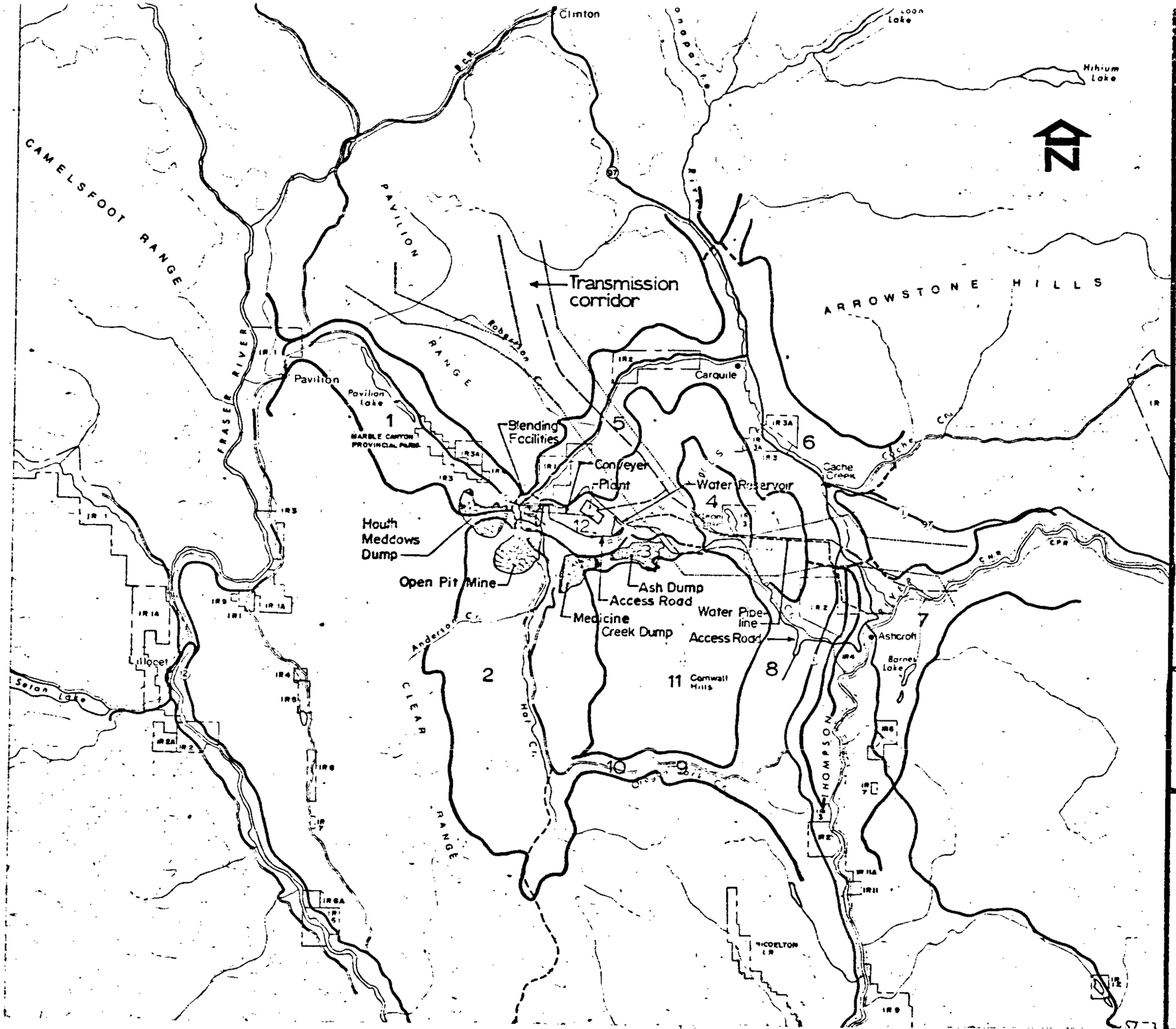
Each "project action" listed in the Detailed Environmental Studies Terms of Reference was reviewed to determine the physical elements required for implementation. The physical elements that were functionally related and that could be grouped into clusters are considered as single entities. This reduced the number of elements for assessment and provides an opportunity to assess the impact caused by a group of elements. There are exceptions to this grouping of elements, and they occur when the scale or form of a single element dominates the group. For these exceptions the group is assessed without the dominating element, and the visual impact of the latter is considered by itself.

The first step of the assessment process is the determination of areas from which a project element could be viewed. The areas are defined from a study of the location of project elements on topographic maps and aerial photographs, from the visual inventory taken on the site visits, and from the computer-based terrain analysis model that developed viewable area maps for specific project elements.

The form of a project element describes its physical qualities of shape, mass, and structure. In this study, form also refers to the linear elements such as the transportation and service corridors. The form described by a group of elements defines the spatial organization among individual elements.

The assessment of how the form of a project element visually affects the receptors is based on the evaluation of whether a prcject element either conforms to or disrupts the receptor's visual qualities. Appendix B1.1 describes the factors that were considered to determine whether the form contrasts or complements the setting in which it is lccated; dominates or is consistent with the existing visual qualities of the receptors; and degrades or enhances the existing setting.

The characteristics of the visual impact caused by a project element consist of all the other factors, with the exception of its form, that visually affect the perceived quality of the existing environment. In the evaluation, the nature of the effects of the impact causes was assessed and includes such factors as whether the characteristics of the visual change are either irreversible or reversible, whether it contrasts or complements the existing setting; and whether it degrades or enhances the surrounding visual quality. (See Appendix B1.1).



LEGEND

VISUAL UNITS

1 MARBLE CANYON
2 UPPER HAT CREEK VALLEY
3 MEDICINE CREEK VALLEY
4 CATTLE VALLEY
5 HIGHWAY # 12
6 CACHE CREEK
7 THOMPSON RIVER
8 HIGHWAY # 1
9 OREGON JACK
10 LANGLEY

SPECIAL FEATURES

11 CORNWALL LOOKOUT
12 TRACHYTE HILL

SCALE - 1:250,000

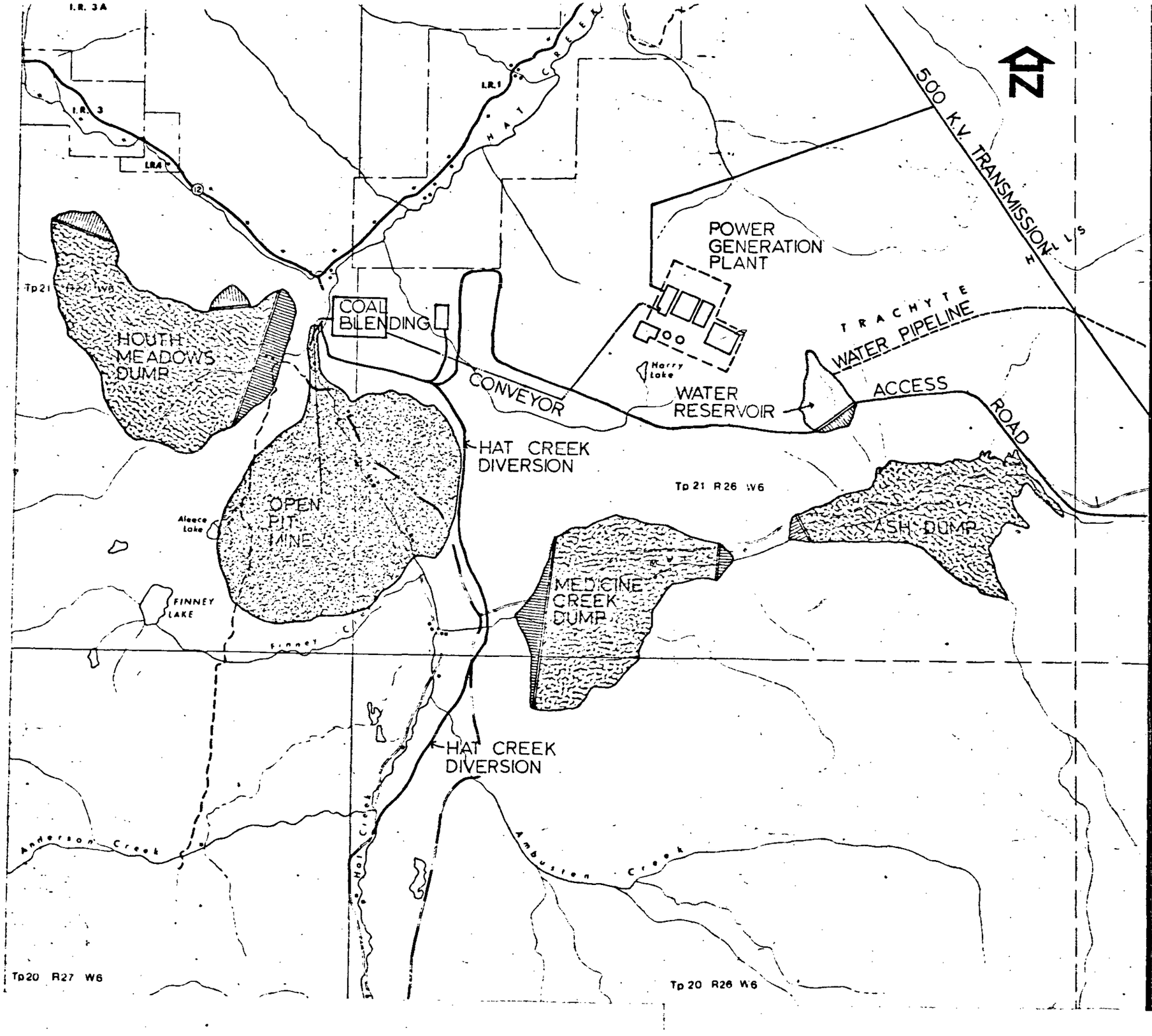
5 0 Kilometres 5 10 15

CONTOUR INTERVAL - 250 METRES

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
HAT CREEK PROJECT

DETAILED ENVIRONMENTAL STUDIES

FIGURE 5.1 VISUAL UNITS AND PROJECT ELEMENTS



BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
HAT CREEK PROJECT

DETAILED ENVIRONMENTAL STUDIES

FIG. 5.2: SITE PLAN OF HAT CREEK PROJECT

5.2 VISUAL IMPACTS AND ALTERNATIVE MEASURES

The impact cause matrix in Table 5.1 identifies the visually impacted areas and the project elements that cause the impact. The following analysis groups the project elements under five major categories. One group consists of the plant and related facilities, another the pit and related facilities, a third group is the linkages, a fourth the water intake facilities, and the last group is the construction facilities.

In general, the focus of the visual impact study is on the operation phase of the development. During the pre-construction and construction stages the visual impact would be too dynamic to propose meaningful mitigation or enhancement procedures. Therefore the visual impact issues are chiefly concerned with the quality of the built environment and not with the process by which it is created. During the decommission phase the concerns of the visual environment would be to reclaim, to the extent possible, the visual qualities existing before the initial phases of this project's development. In certain situations the reclamation may be in the form of compensation measures such as the development of a new lake or new access roads to the recreation areas.

For each individual or group of project elements a description of its physical characteristics, the visually impacted areas, and the mitigation, enhancement, or compensation measures are described before determining the recommendations which appear at the conclusion of this study. The views from the receptors are described as foregound (up to .8 km.), middleground (up to 5 km.), and background or distant views. Mitigation, enhancement, and compensation measures are also described in the same terms. Foreground views are those that occur in the immediate vicinity of the observer. Middleground views occur at distances where form, line, colour, and texture of the landscape and man-made elements are still observable. Background or distant views are those concerned with long vistas of the skyline or ridgeline of hills and mountains where the shape or silhouette of objects become the identifiable factor.

This grouping of views and measures provides the opportunity of developing mitigation, enhancement, or compensation actions that would apply to the appropriate views of the impacted area.

The impact cause matrix in Table 5.1 was developed from the data collected in the field, from topographic maps and aerial photos, and from the computer based viewable area maps. The computer was used to generate maps of project elements whose viewable areas were difficult to ascertain. These elements are the stack, the cooling towers, the generating plant structure, and the retaining embankment of the Houth Meadow Dump. Figures 5.3 to 5.7 represent the computer viewable area maps or areas from where the project element can be observed.

For example, the dotted areas on Figure 5.3 represent the locations from which the top of the 244 meter (800 ft.) stack can be seen. The areas not dotted on this topographic map are those locations from which the stack cannot be viewed. Based on this computer generated map, the 244 meter stack will not be seen from the lower areas of Marble Canyon and Highway #12, as well as Cache Creek, Highway #1 and the Thompson River. Similar interpretations have been made for Figures 5.4 to 5.7 and form part of this study's analysis of the visually impacted areas surrounding the site.

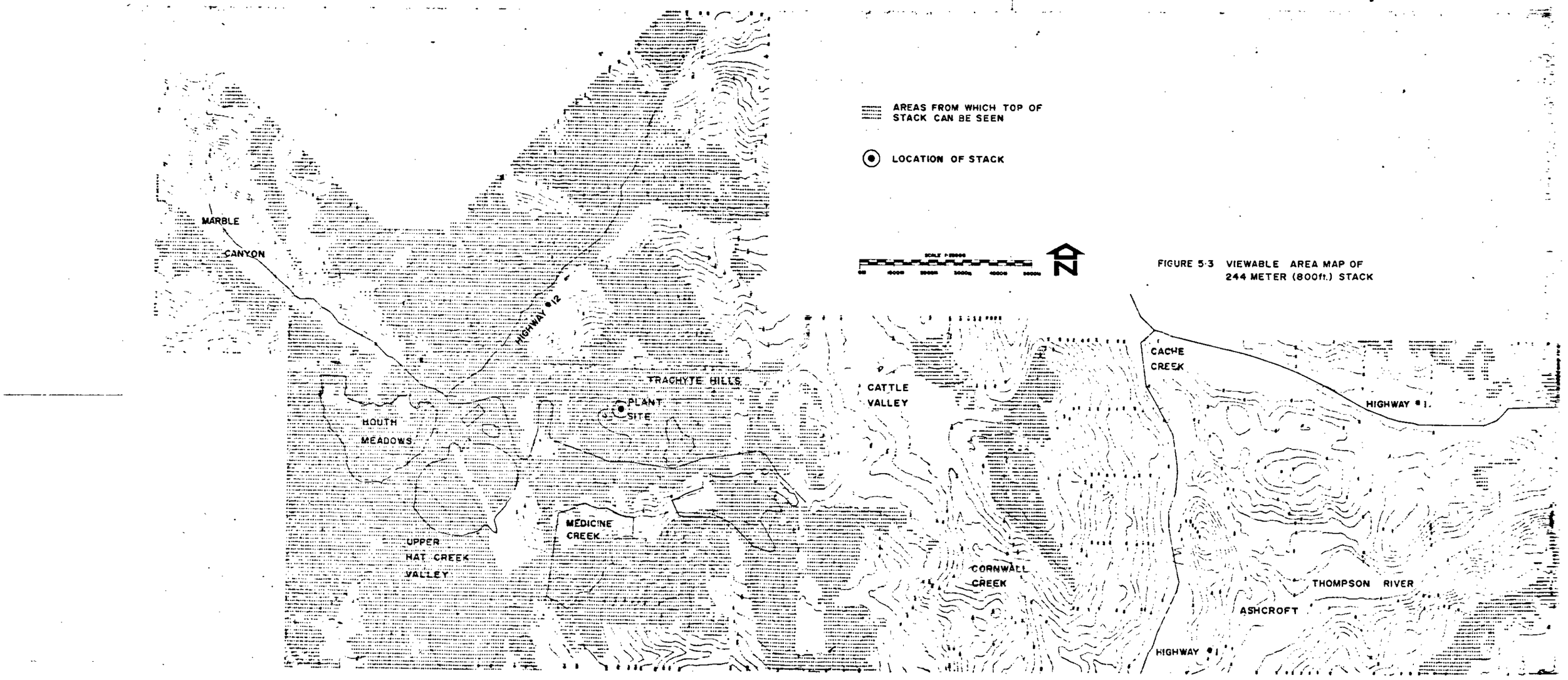


FIGURE 5-3 VIEWABLE AREA MAP OF 244 METER (800ft.) STACK

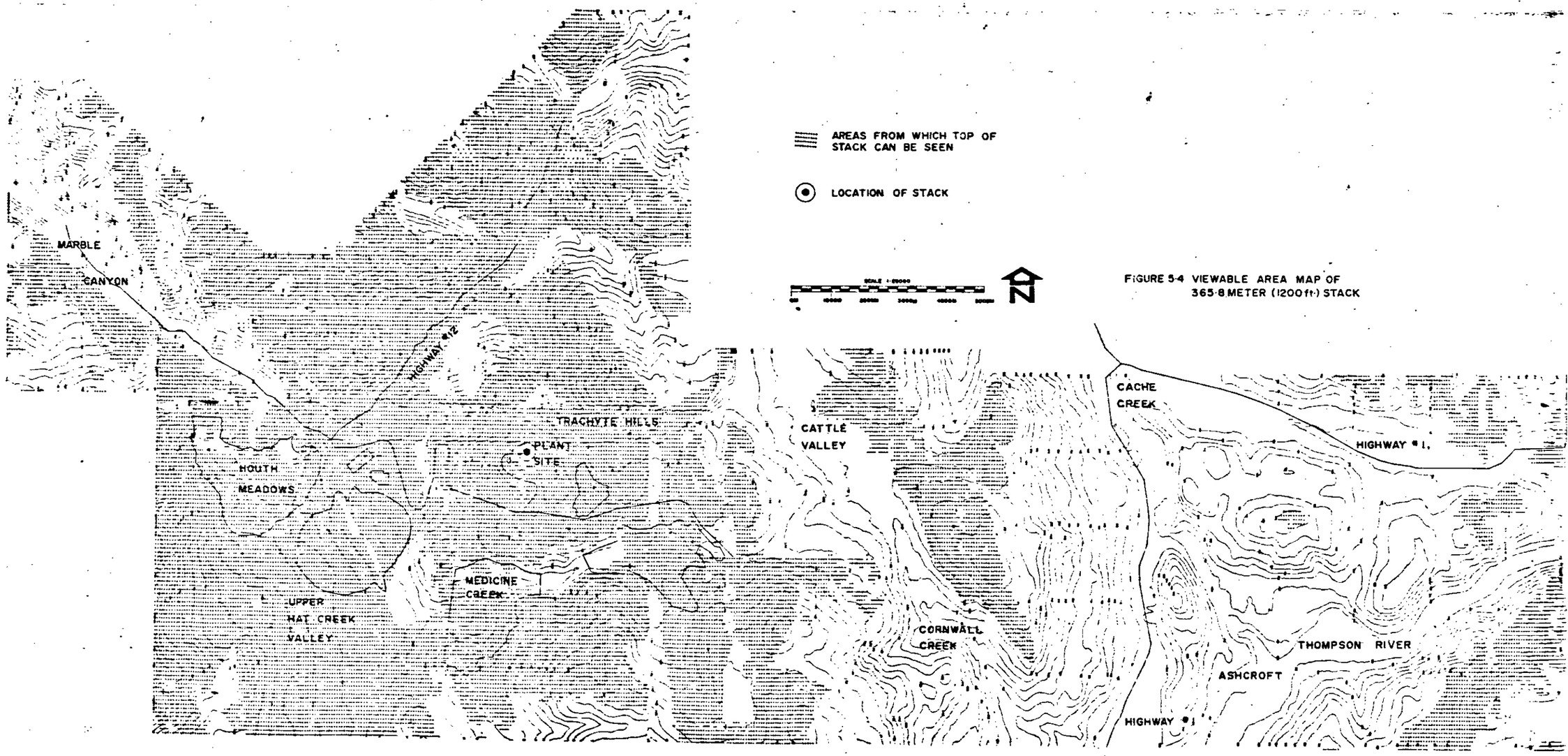


FIGURE 5-4 VIEWABLE AREA MAP OF 365·8 METER (1200 ft) STACK

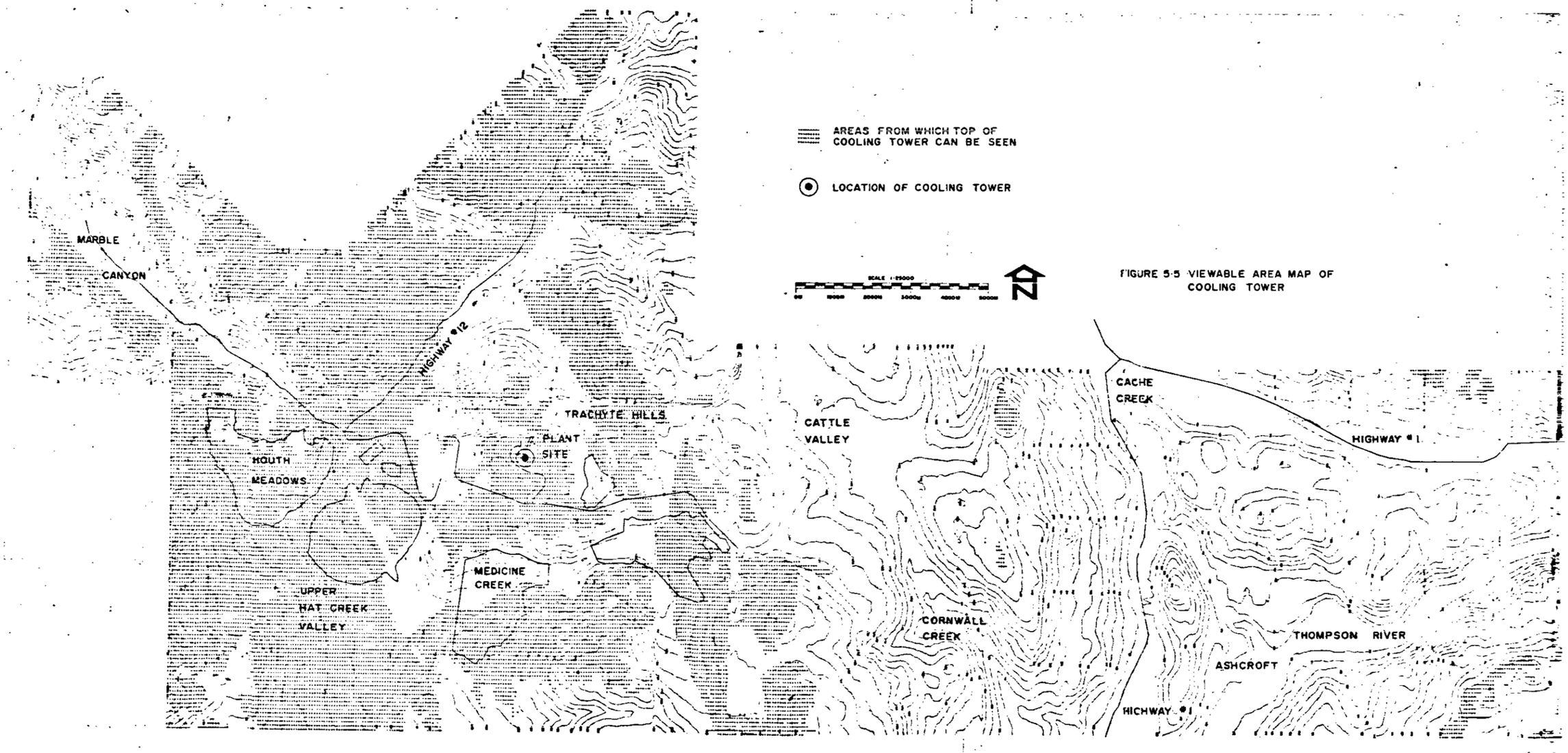


FIGURE 5-5 VIEWABLE AREA MAP OF COOLING TOWER

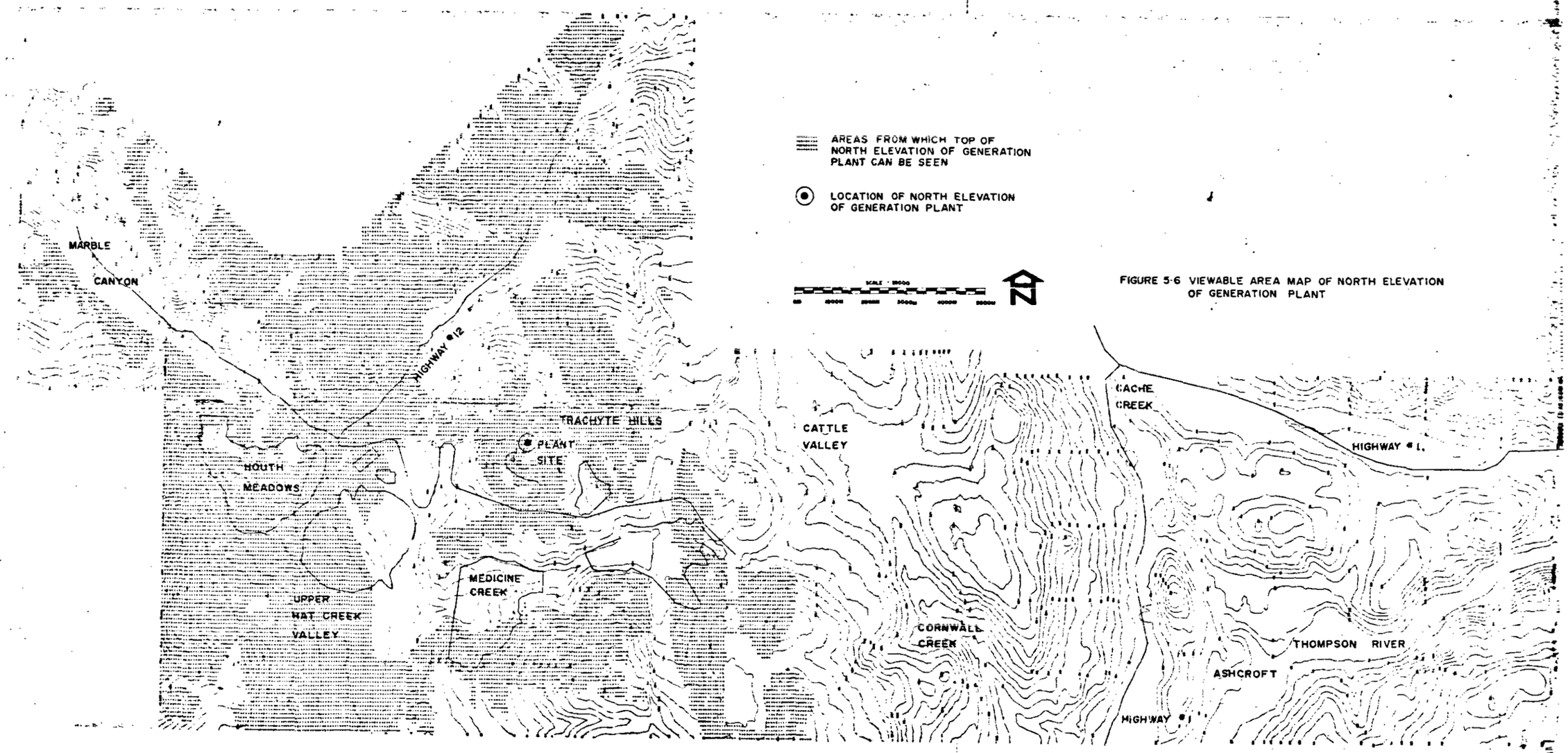


FIGURE 5-6 VIEWABLE AREA MAP OF NORTH ELEVATION OF GENERATION PLANT

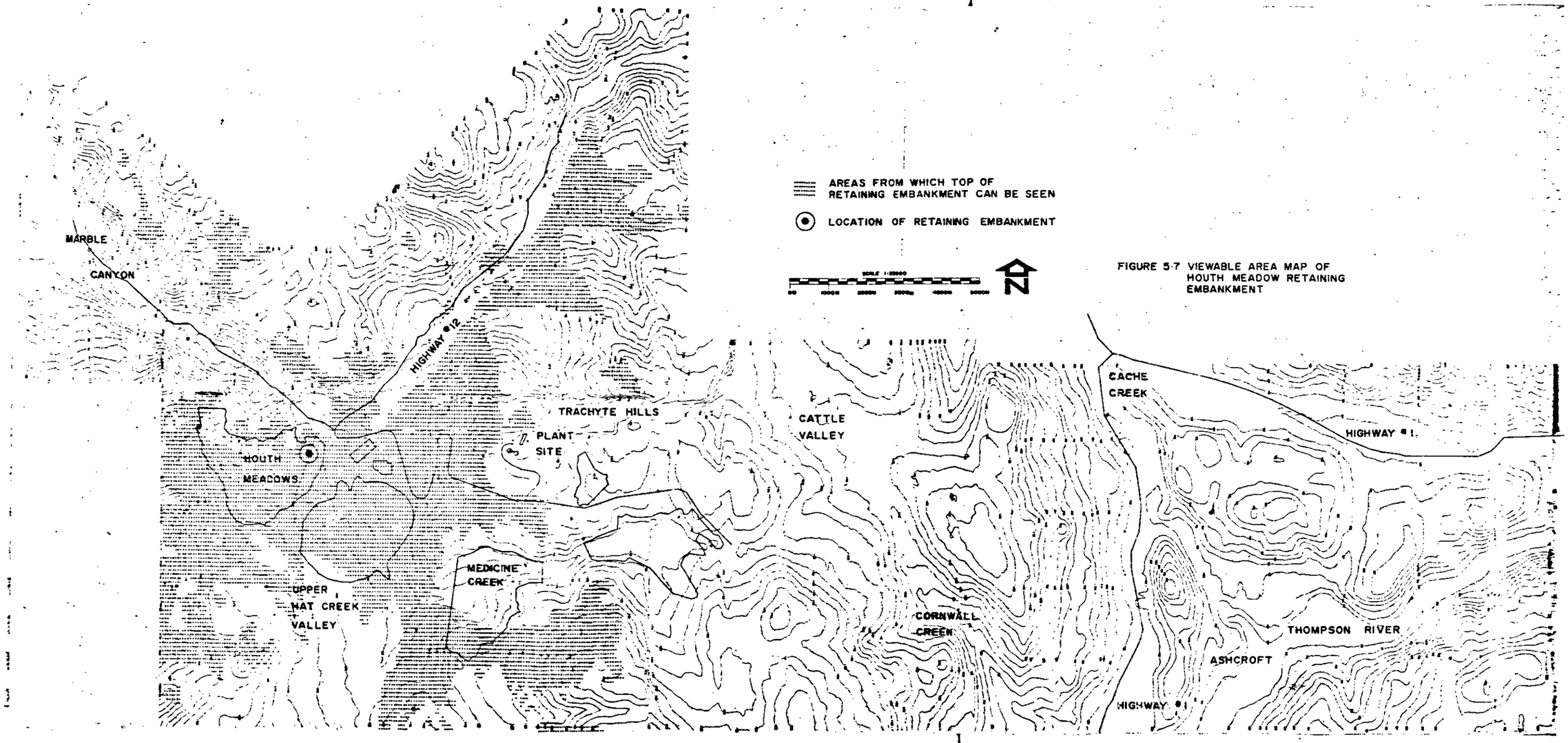


FIGURE 5-7 VIEWABLE AREA MAP OF HOUTH MEADOW RETAINING EMBANKMENT

		Visual Units										Special Features	
		Marble Canyon	Upper Hat Creek Valley	Medicine Creek Valley	Cattle Valley	Highway # 12	Cache Creek	Thompson River	Highway # 1	Oregon Jack	Langley	Cornwall Lookout	Trachyte Hills
Plant & Related Facilities	Thermal Generation Plant and Cooling Towers	*	*	*	*	*						*	*
	Stack	*	*	*	*	*			*			*	●
	Ash Dump			*								*	*
	Water Reservoir			*								*	*
Pit & Related Facilities	Open Pit Mine		*	*		*							*
	Blending Facilities and Stockpiles	*	*	*		*							*
	Houth Meadow Dump	*	*	*		*						*	●
	Medicine Creek Dump	*	*	*									*
	Hat Creek Diversion		*	*									●
Linkages	Conveyor	*	*	*		*							*
	Access Road	*	*	*	*	*			*			*	*
	500 kv. Transmission Corridor			*	*	*	*	*	*				●
	Water Pipeline Corridor			*	*				*			*	*
	Airport								*				
Water Intake & Related Facilities	Water Intake							*					
	Storage and Pumping Facilities							*					
Construction Facilities	Plant Construction Camp			*									*
	Mine Construction Camp	*	*										*

Table 5.1: Impact Cause Matrix

5.3 ALTERNATIVE MEASURES FOR PLANT AND RELATED FACILITIES

(a) THERMAL GENERATION PLANT AND COOLING TOWERS

(i) Physical Characteristics of the Thermal Generation Plant and Cooling Towers

Included in this group of project elements are the switchyard, the towers, and the cables required to tie into the 500 kv. corridor; the power plant consisting of the turbine hall, the boiler plant, and the precipitators; the buildings for administration, service, and warehouse; the facilities for ash water and fly ash; the fuel oil and water tanks; the coal storage area and conveyor system; the ash slurry pipes; the cooling towers; and the approach from the access road. The group is dominated by a plant structure approximately 280 meters long, 92 meters wide, and 94 meters high, and by two hyperbolic shaped cooling towers, each measuring about 100 meters in diameter and 138 meters in height. The major building materials used on the exterior include concrete, metal cladding, steel structures, and glass.

(ii) Impacted Areas for the Thermal Generation Plant and Cooling Towers

Marble Canyon

Distant view from southern entrance of Marble Canyon. Views looking up at ridgeline of Trachyte Hills and of the forms of the larger plant elements.

Upper Hat Creek Valley

Distant views from northern half of the Upper Hat Creek Valley. Views looking up at Trachyte Hills and major plant elements.

Medicine Creek Valley

Distant view from western end of this valley and middle-ground views from eastern half. Both views look up at southern elevations of plant elements.

Highway # 12

Distant view from western half of this visual unit. Views looking at top of Trachyte Hills and elements located on north and east sides of plant site.

Cornwall Lookout

Distant view of plant elements partially screened by other hills between the lookout and the plant site.

Trachyte Hills

Foreground and middleground views of all plant elements.

(iii) Mitigation Measures for the Thermal Generation Plant and Cooling Towers

Foreground Views:

Develop system of structures and form that provide architectural design continuity to all the plant elements.

Develop landscaped terraces for various plant elements to relate to landform and to add interest, variety, and scale to the site.

Minimize volume of coal storage piles to limit extent of this potentially black dusty area.

Develop landscaping around plant site and group smaller, functionally related buildings to provide a scale to which users and visitors can relate.

Establish well defined circulation patterns for clear visual definition and for orientation within this high technology environment.

Middleground Views:

Develop strong architectural forms for the conveyor, the transmission take-off, and the ash transport system in order to complement the scale of the plant elements. Locate approach road to provide sequential views of plant elements.

Background Views:

The distant views of the plant elements should be a strong unified unit if foreground mitigation measures are implemented. Form, colour, and texture should indicate the presence of a high technology environment.

(b) THE STACK

(i) Physical Characteristics of the Stack

Although an integral part of the thermal generation plant, the stack was considered as a separate entity because it was the most visible element from the surrounding area. The proposed stack is 244 or 366 meters high and has a top diameter of about 22 meters.

(ii) Impacted Areas for the Stack

Marble Canyon

Distant view from southern end of canyon of the stack partially hidden by intervening hills.

Upper Hat Creek Valley

Distant view from the valley looking at the stack silhouetted against the skyline.

Medicine Creek Valley

Middleground view looking up at the great vertical height of the stack.

Cattle Valley

Distant view of stack partially screened by intervening hills.

Highway # 12

Distant view looking up at a stack whose vertical height is augmented by its location on top of a small mountain.

Highway # 1

Distant view of stack from Highway #1 in the Semlin Valley which is not in the Highway #1 visual unit but would be associated with Highway #1.

Cornwall Lookout

Very distant view looking down on stack.

Trachyte Hills

Foreground views of base of stack looking up vertically at its full height.

(iii) Mitigation Measures for the Stack

Foreground, Middleground, and Background

Integrate design of stack with other plant elements by using alternative shapes, texture, and colour, to create a functional but aesthetically attractive composition of man-made elements.

(c) ASH DUMP

(i) Physical Characteristics of the Ash Dump

Located about three kilometers southeast of the plant, the ash dump when filled to capacity would cover approximately 370 hectares. At its western end a retaining embankment about 90 meters high and 550 meters long along the top would be required to contain the ash slurry that would be dumped here. Both the fly ash and bottcm ash would be piped from the plant in a grey slurry. Some of the water will be recovered from the dump for use at the plant.

(ii) Impacted Areas for the Ash Dump

Medicine Creek Valley

Foreground views of retaining embankment face and of the surface and edges of the ash dump area. Middleground views of earth dam and of the ash dump slurry surface.

Cornwall Hills Lookout

Very distant views of the ash dump surface which would be partially screened by intervening vegetation and hills.

Trachyte Hills

Middleground views looking down on ash dump surface from south-eastern edge of Trachyte Hills.

(iii) Mitigatien Measures for the Ash Dump

Foreground

Develop phasing program to progressively clear area for the ash dump in order to minimize extent of visual impact area.

Contour and landscape the embankment face and top to fit into

the existing terrain pattern.
Design berms and utilize natural elements to screen views of ash dump.

Middleground

Develop system for sequential reclamation of ash dump and/or recycling of ash material for other uses to reduce viewable area of the ash slurry.
Establish a landscape program that will compensate for growth of ash dump area and provide screening from future viewable areas.
Examine potential of developing several smaller ash dumps around the plant in order to reduce visual impact of one massive dump area.
Examine alternative access road locations to minimize number of views of ash dump from this road.
Examine potential of using other sites for ash dump to minimize viewer access.

Background

Retain existing vegetation for screening and minimize amount of clearing during construction.

(iv) Compensation Measures for the Ash Dump

Foreground, Middleground, Background

Provide a visually attractive water reservoir to compensate for the negative visual qualities of the ash dump.

(d) WATER RESERVOIR

(i) Physical Characteristics of the Water Reservoir

A water reservoir is located about 1.5 kilometers east of the plant. When filled it will cover about 60 hectares and

will be contained by an earth dam 45 meters high by 790 meters long.

(ii) Impacted Areas for the Water Reservoir

Medicine Creek

Foreground view of earth dam face and shoreline of reservoir. Middleground view looking up at earth dam face.

Cornwall Lookout

Very distant view partially screened by intervening vegetation of the earth dam and reservoir.

Trachyte Hills

Middleground view looking down on the dam and reservoir from eastern end of the plant site.

(iii) Mitigation Measures for the Water Reservoir

Foreground

Contour and landscape face of earth dam to fit into existing terrain pattern. Clear flooded area of stumps and debris to make reservoir visually attractive.

Middleground

Develop landscaping for shoreline to accommodate fluctuations in elevations.

(iv) Enhancement Measures for the Water Reservoir

Foreground

Develop landscaping around shoreline to provide a visually attractive parklike setting.

Middleground

Develop shape and form of reservoir and dam that complement the existing vegetation and terrain.

Treat reservoir as a natural lake form by contouring its edges or developing more than one body of water.

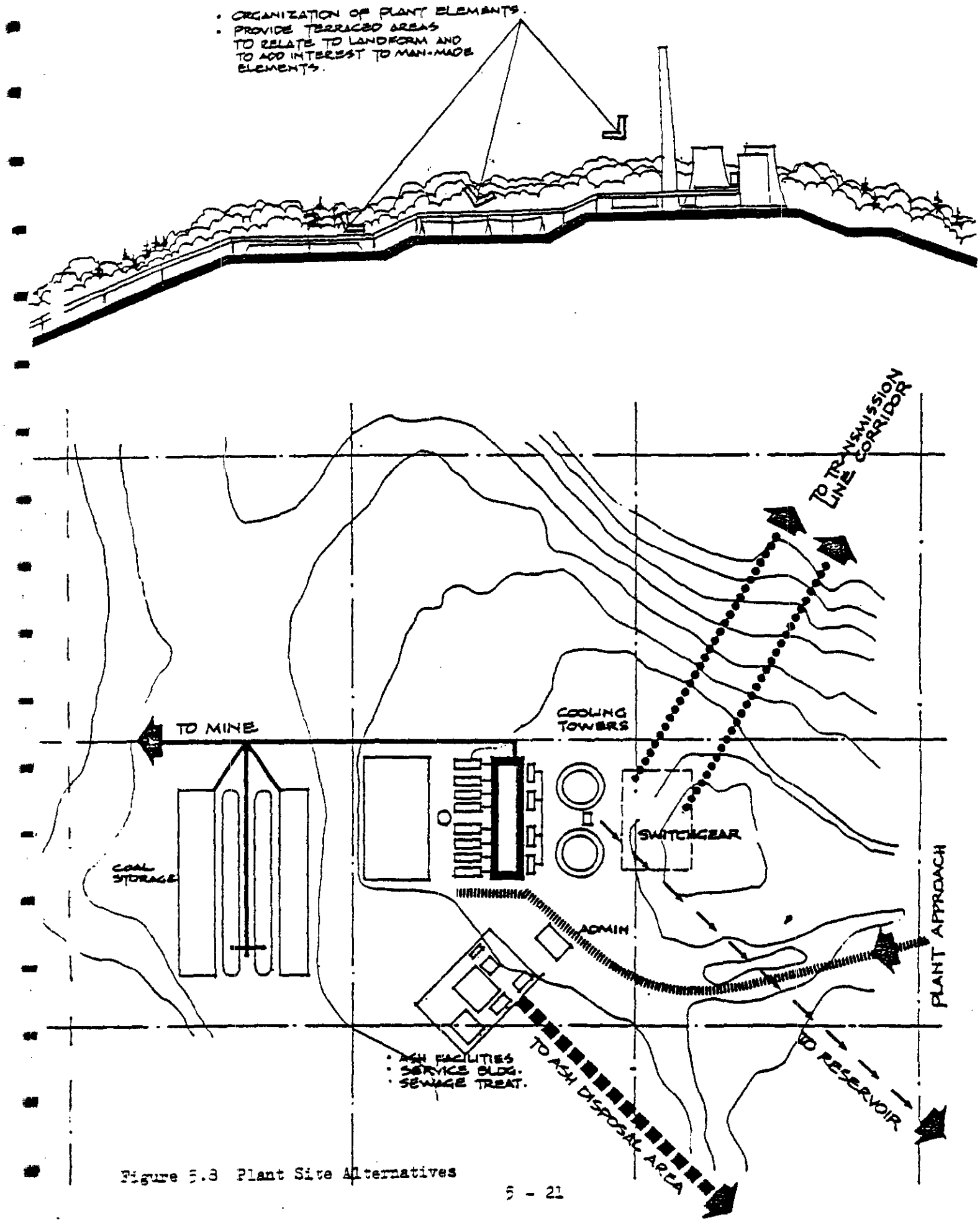


Figure 5.3 Plant Site Alternatives

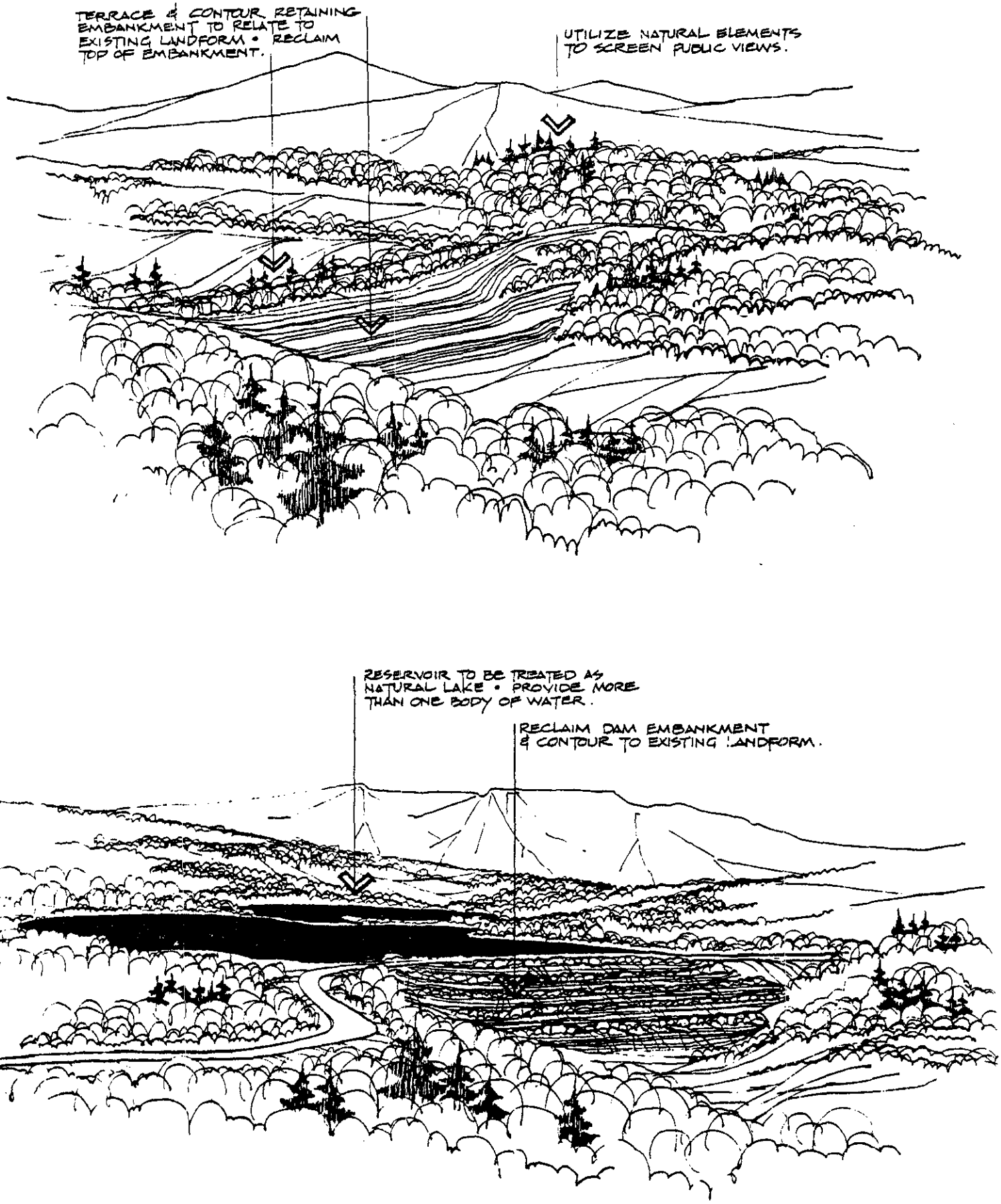


Figure 5.9 Retaining Embankment and Reservoir Alternatives

5.4 ALTERNATIVE MEASURES FOR PIT AND RELATED FACILITIES

(a) OPEN PIT MINE

(i) Physical Characteristics of the Open Pit Mine

The open pit mine will encompass an area of 470 hectares by the year 1994 and over 750 hectares by 2021. The pit will be excavated in the form of benches about 15 meters high which will accommodate shovels, large dump trucks, and possibly a bucket-wheel excavator machine. By the year 2021 the pit will be about 187 meters in depth. Three conveyors requiring approximately 62 meters for a right-of-way will be used to transport material out of the pit.

(ii) Impacted Areas for the Open Pit Mine

Upper Hat Creek Valley

Foreground views at the north end of this valley of the excavation.

Middleground views from edge of excavation and into the open pit mining operation.

Medicine Creek Valley

Middleground and distant views from western edge of this valley into and across the open pit.

Highway # 12

Distant oblique view of the hole created by the open pit mine.

Trachyte Hills

Distant view of the whole open pit operation from western edge of the Trachyte Hills.

(iii) Mitigation Measures for the Open Pit Mine

Foreground

Develop strong edge definition using drainage ditches and perimeter road where required.

Middleground and Background

Depending on mining technique, define the ultimate perimeter at each stage to provide a strong identifiable edge to the open pit.

Control public access to pit area by developing controlled viewpoints that provide opportunities to display an orderly appearance of the mining operation.

Minimize haphazard erection of maintenance and storage facilities in the open pit mine.

(iv) Enhancement Measures for the Open Pit Mine

Foreground and Middleground

Examine feasibility of using surface material to create high berms along south rim of pit to provide a landscaped termination for the southern part of the Upper Hat Creek Valley visual unit.

(b) BLENDING FACILITIES AND STOCKPILES

(i) Physical Characteristics of the Blending Facilities and Stockpiles

The blending facilities and the stockpiles of coal are located next to the entrances to Marble Canyon, Highway #12, and Upper Hat Creek Valley visual units. Sited here are the primary and secondary crushers, coal preparation area,

blenders, and spreaders for stockpiling. Four large stockpiles of coal 780 meters long by 62 meters wide and 15 meters high along with the 50 hectare surface material dump are part of the blending facilities area. The access road to the plant from Highway #12 passes through the blending area.

(ii) Impacted Areas for the Blending Facilities and Stockpiles

Merble Canyon

Foreground view of the facilities and stockpiles next to southern entrance to Marble Canyon.

Upper Hat Creek Valley

Foreground view at entrance to north end of Upper Hat Creek Valley.

Middleground view across open pit mine of blending area facilities.

Medicine Creek Valley

Distant oblique view from western end of this valley.

Highway # 12

Middleground view of stockpiles and blending facilities from highway.

Foreground view from western entrance to Highway #12 visual unit entrance.

Trachyte Hills

Distant view looking down at this area from western edge of Trachyte Hills.

(iii) Mitigation Measures for the Blending Facilities and Stockpiles

Foreground

Alternate access around pit facilities should be developed to

eliminate conflicts between public and operation of facilities and to minimize foreground views through this area.
Develop site plans and organize elements to maximize the separation from the entrance to Marble Canyon and Highway #12.

Middleground

Examine use of man-made landscape elements such as extensions to Houth Meadow spoil dam and a lake to separate pit facilities from entrance to Marble Canyon.

Background

Organize elements into an orderly design by grouping related facilities and keeping stockpiles confined in a well defined area.

(c) HOUTH MEADOWS DUMP

(i) Physical Characteristics of the Houth Meadow Dump

This spoil dump located at the north end of Upper Hat Creek Valley will be created by the construction of a retaining embankment 155 meters high and 1932 meters long. Two retaining embankments would also be required to prevent slippage into Marble Canyon. In 1994 the dump would cover 410 hectares; by the year 2021, 618 hectars. The spoil material would be sloped at 1 to 20 or 1 to 10 depending on the composition of the spoil. If the 1 to 10 slope is used, the Medicine Creek dump would not be required.

(ii) Impacted Areas for the Houth Meadow Dump

Marble Canyon

Middleground views looking up at face of retaining embankments from southern end of the canyon.

Upper Hat Creek Valley

Foreground view of face of retaining embankment from northern entrance to the valley. Oblique middleground views of embankment and surface of spoil dump from northern sections of the Upper Hat Creek Valley.

Medicine Creek Valley

Distant view looking down on the retaining embankment and the spoil dump from western edge of this valley.

Highway # 12

Middleground views of the face of the retaining embankment from western entrance to this visual unit.
Distant views of embankment and spoil area from sections of the highway.

Cornwall Lookout

Very distant view partially screened by intervening hills of the surface of the spoil area.

Trachyte Hills

Distant view looking down on the full extent of the retaining embankment and the spoil area.

(iii) Mitigation Measures for the Houth Meadow Dump

Foreground

Develop landscape program for sequential reclamation of

retaining embankment to complement existing vegetation and terrain pattern.
Design shoreline of settling lagoons to look natural and be part of landscape.

Middleground
Design retaining embankments to blend into existing terrain and be compatible with existing landscape form.
Extend main retaining embankment and shape to define edge of pit facilities area.

Background
Develop methods for progressive shaping and revegetation of spoil area.
Contour and vegetate edges of spoil dump to fit into existing landscape.

(iv) Enhancement Measures for the Houth Meadow Dump

Middleground and Background
Extend and contour main retaining embankment to terminate the open pit operation and to enhance the existing entrance to Marble Canyon.

(d) MEDICINE CREEK DUMP

(i) Physical Characteristics of the Medicine Creek Dump

The Medicine Creek dump is located at the western edge of this valley near the north end of the Upper Hat Creek Valley. A retaining embankment about 187 meters high and 2490 meters long would be constructed to create the spoil area for the stable material from the mine. In 1994 it would cover 236 hectares and 490 hectares by 2021.

(ii) Impacted Areas for the Medicine Creek Dump

Marble Canyon

Distant oblique view of face of embankment from southern entrance to Marble Canyon.

Upper Hat Creek Valley

Foreground view looking up at the face of the retaining embankment.

Middleground and distant views of the embankment and the spoil dump from various parts of the northern half of Upper Hat Creek Valley.

Medicine Creek Valley

Foreground view looking down on the surface of the spoil dump.

Trachyte Hills

Middleground views looking down on the spoil dump from the southern edge of the Trachyte Hills area.

(iii) Mitigation Measures for the Medicine Creek Dump

Foreground

Contour and landscape face, crest, and toe of retaining embankment into existing terrain.

Develop sequential dumping and reclamation methods for re-vegetation and minimal visual impact of spoil area.

Middleground and Background

Develop progressive clearing programs to minimize need to clear full extent of spoil area.

Contour and revegetate spoil area to fit into existing landscape.

Relocate, if possible, to Houth Meadow and maintain existing landscape.

(e) HAT CREEK DIVERSION

(i) Physical Characteristics of the Hat Creek Diversion

Included in the Hat Creek diversion are the 7.0 km. canal, a 2.2 km. discharge conduit, water reservoirs from 7.3 hectares to over 80 hectares (alternative), a canal service road and the access road to the Upper Hat Creek Valley. The main canal and road right-of-way vary in width from 37 to 62 meters and require 30 hectares of land.

(ii) Impacted Areas for the Hat Creek Diversion

Upper Hat Creek Valley

Foreground views along the northern sections of this valley of the canal and its roads.

Middleground and distant views from across the valley.

Medicine Creek Valley

Middleground and distant views looking down at the canal, the roads, and the reservoirs.

Trachyte Hills

Distant views of looking down from the western edge of this site on the Hat Creek diversion system.

(iii) Mitigation Measures for the Hat Creek Diversion

Foreground

Design system with a road that meets access and service requirements to minimize the right-of-way required.

Develop landscaping to blend in with existing pattern of

vegetation.
Develop opportunities to create natural reservoirs wherever canal intersects the creeks flowing into the Upper Hat Creek Valley.

Middleground
Develop shoreline of reservoirs to reflect existing lakes in the valley.
Blend cuts and fills into terrain and revegetate to minimize their visual impact.

Background
Develop edge of canal to soften visual impact by blending into the existing landscape.

(iv) Enhancement Measures for the Hat Creek Diversion

Foreground, Middleground, Background
Relocate existing access road away from open pit mine and pit facilities by linking to plant access road.
Develop alternative to Hat Creek diversion by creating the larger reservoir (80 hectares) with underground piping.

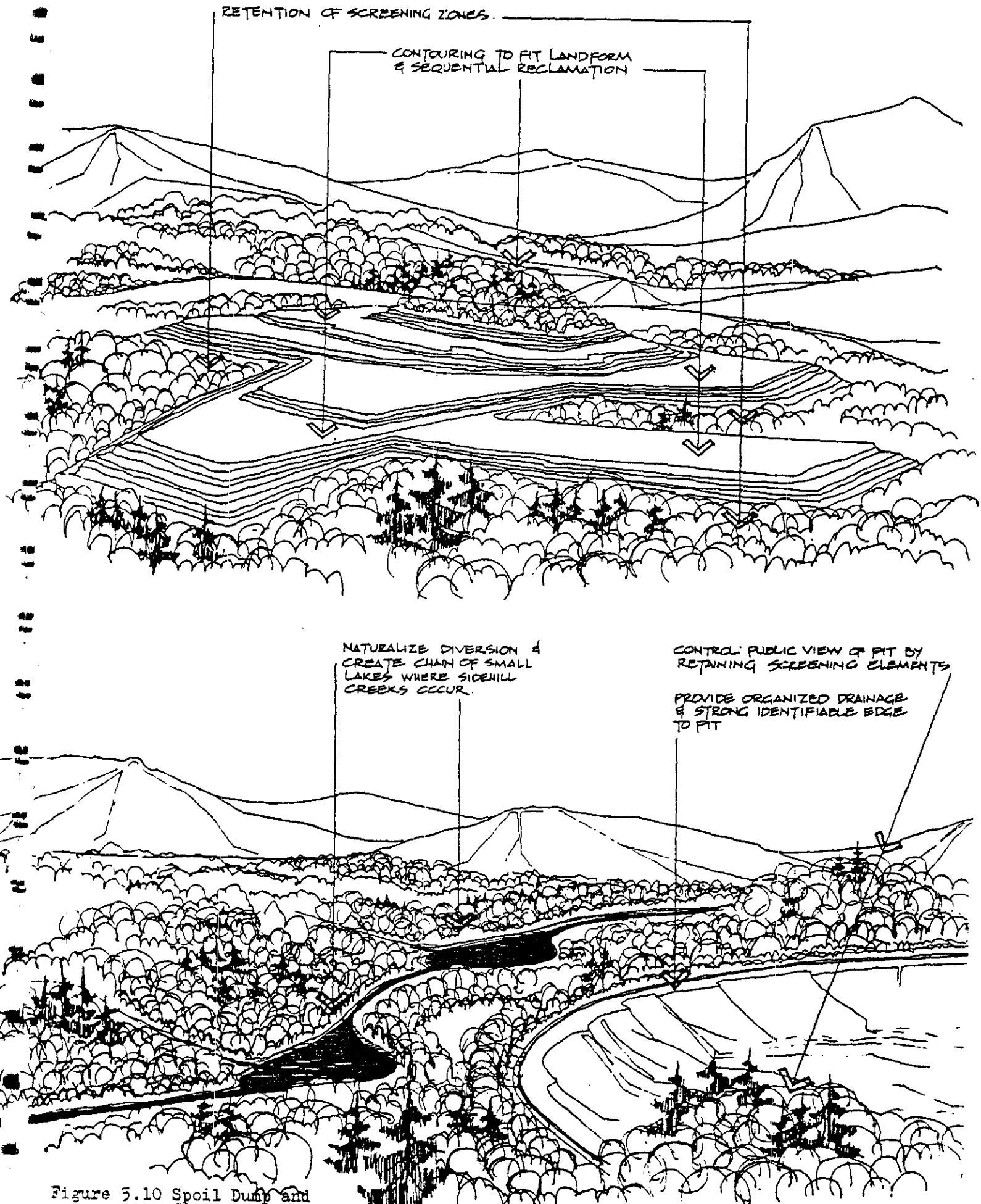


Figure 5.10 Spoil Dump and Canal Alternatives

5.5 ALTERNATIVE MEASURES FOR LINKAGES

(a) CONVEYOR

(i) Physical Characteristics of the Conveyor

The main conveyor is required to transport the coal from the blending stockpiles to the storage area at the plant site on top of the Trachyte Hills. This conveyor would be approximately 2500 meters long, would be covered, and would be above grade. The present line proceeds in a southeasterly direction to a point halfway up the hill. It then continues in a northeasterly direction to the plant site.

(ii) Impacted Areas for the Conveyor

Marble Canyon

Distant view looking up at the conveyor from the entrance to Marble Canyon.

Upper Hat Creek Valley

Middleground and distant views looking up at the conveyor from various sections in the northern part of this valley.

Medicine Creek Valley

Middleground view of parts of the conveyor system from the western end of Medicine Creek Valley.

Highway # 12

Distant oblique view looking up at sections of the conveyor as it leaves the blending stockpile area.

Trachyte Hills

Foreground and Middleground views of sections of the conveyor system.

(iii) Mitigation Measures for the Conveyor

Foreground

Design conveyor system as a strong architectural design element that emphasizes the link between the blending facilities and the plant. Design structural elements to reflect and complement the other plant structures.

Middleground and Background

Alignment of conveyor should be as direct as possible between plant and blending area to visually strengthen the linkage between the two.

Design of conveyor should express the high technology requirements of the project to provide a contrast to the existing landscape.

(b) ACCESS ROAD

(i) Physical Characteristics of the Access Road

A highway is located to provide access from Highway #1 to the plant site and the pit facilities. It follows an existing trail from the highway up Cornwall Creek, past Cattle and Medicine Creek valleys to the plant site. From the plant site it goes in a westerly direction down through the blending facilities area to Highway #12. The total length of this road would be 31 kilometers. Maximum grade 8% and designed to 80 kmh. standards. Right-of-way for this road would be up to 100 meters wide and cover about 100 to 122 hectares of land.

(ii) Impacted Areas for the Access Road

Marble Canyon

Distant view of road as it comes down the Trachyte Hills.

Upper Hat Creek Valley

Foreground view of road as it winds through the area around the blending facilities.

Middleground and distant views of the road as it comes down the Trachyte Hills.

Medicine Creek Valley

Foreground and middleground views of road as it approaches and leaves the plant site.

Cattle Valley

Foreground and middleground views of road as it passes through Cattle Valley.

Highway # 12

Distant oblique view of small sections of road as it comes down the Trachyte Hills.

Highway # 1

Foreground, middleground, and distant views of road as it climbs up towards Cattle Valley from Highway #1.

Cornwall Lookout

Very distant views of partially screened road right-of-way as it crosses eastern end of Medicine Creek Valley.

Trachyte Hills

Foreground and middleground views of road as it approaches plant from the east and the west.

(iii) Mitigation Measures for the Access Road

Foreground

Examine relocation of road near ash dump to maximize natural

screening and to minimize this dump's visual impact.
Examine relocation of road to an alignment east of the plant.
Avoid public access through blending area.
Develop main access road as a bypass from Highway #1 to Marble Canyon with separate service and visitor access roads to plant, the open pit and Upper Hat Creek Valley.

Foreground, Middleground, and Background

Design road to conform and respect immediate landform by not cutting through it.
Reclamation of cut and fill areas should begin immediately and should conform to existing terrain and vegetation pattern.
Locate access road to take advantage of screening zones where views are undesirable.
Retain groups of screening trees to soften views of cuts or fills.

(iv) Enhancement Measures for the Access Road

Foreground, Middleground, and Background

Design road alignment to take advantage of opening new vistas of the natural and man-made elements.

(c) 500 KV. TRANSMISSION CORRIDOR

(i) Physical Characteristics of the 500 KV Transmission Corridor

Two 500 kv. transmission circuits are located in the transmission corridor that links Kelly Lake to the Nicola substation. The existing right-of-way passes near Cattle Valley. A link from this corridor would be made to the Hat Creek power plant.

(ii) Impacted Areas for the 500 KV Transmission Corridor

Medicine Creek Valley

Distant view of small section of the transmission towers.

Cattle Valley

Foreground and middleground views of the transmission lines and towers as they pass through this valley.

Highway # 12

Foreground view of corridor as it crosses Highway #12.
Middleground and distant view of corridor and towers from various sections of Highway #12.

Cache Creek

Distant view of towers as they cross Highway #1.

Thompson River

Foreground, middleground, and distant views of transmission line and towers as they cross this visual unit.

Highway # 1

Foreground view of towers and corridor as they cross Highway #1.
Middleground and distant views as it descends from Cattle Valley and goes through the Thompson River visual unit.

Cornwall Lookout

Very distant views of corridor as it cuts across the Marble Range.

Trachyte Hills

Distant views of transmission line, towers and the corridor as it crosses Highway #12 and Cattle Valley.

(iii) Mitigation Measures for the 500 KV Transmission Corridor

Foreground, Middleground, and Background

Develop corridor clearing plan that modulates edges to integrate

crosses over the highway from the Thompson and goes up towards Cattle Valley.

Trachyte Hills

Distant view of corridor as it cuts across Medicine Creek Valley.

(iii) Mitigation Measures for the Water Pipeline Corridor

Foreground, Middleground, and Background

Modulate clearing through heavily treed areas to resemble existing pattern of vegetation.

Integrate into grassland where corridor cuts through open range areas.

Examine use of access roads at various points to minimize visual impact of a continuous service road which emphasizes linearity of corridor.

Design surge tanks, booster pumping stations, and clearwell to complement colour, texture, and form of the natural landscape.

(e) AIRPORT

(i) Physical Characteristics of the Airport

a 1500 meter runway is located about 1.5 kilometers west of Highway #1 and 1.0 kilometers south of the new access road to plant site. This paved runway would be suitable for executive type jet aircraft as well as other small aircraft.

(ii) Impacted Areas for the Airport

Highway # 1

Distant view of edge of runway embankment from Highway #1.

(iii) Mitigation Measures for the Airport

Foreground, Middleground, and Background

Contour and landscape cut and fills for runway to fit existing terrain pattern.

Figure 5.11 Transmission Corridor and Access Road Alternatives

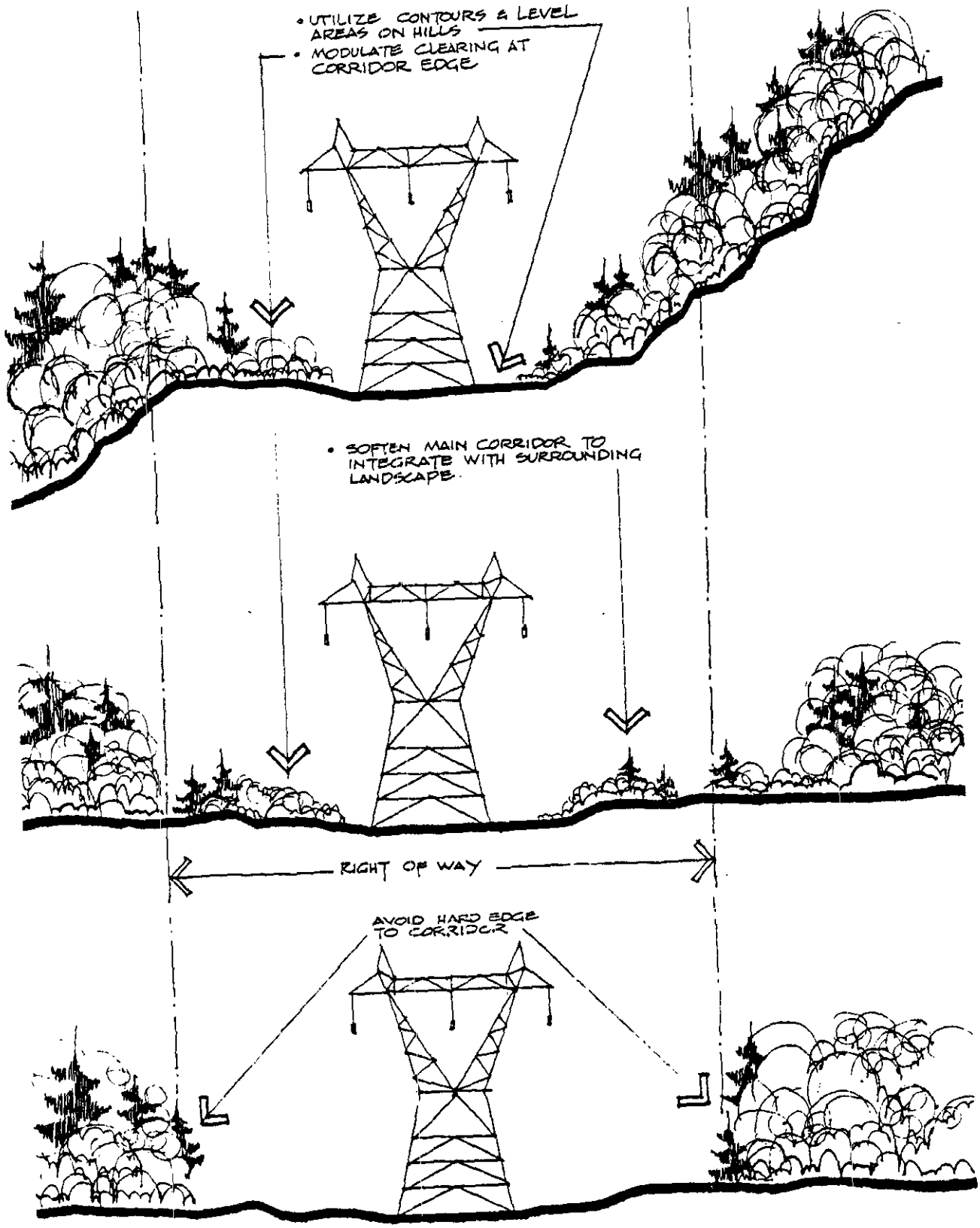
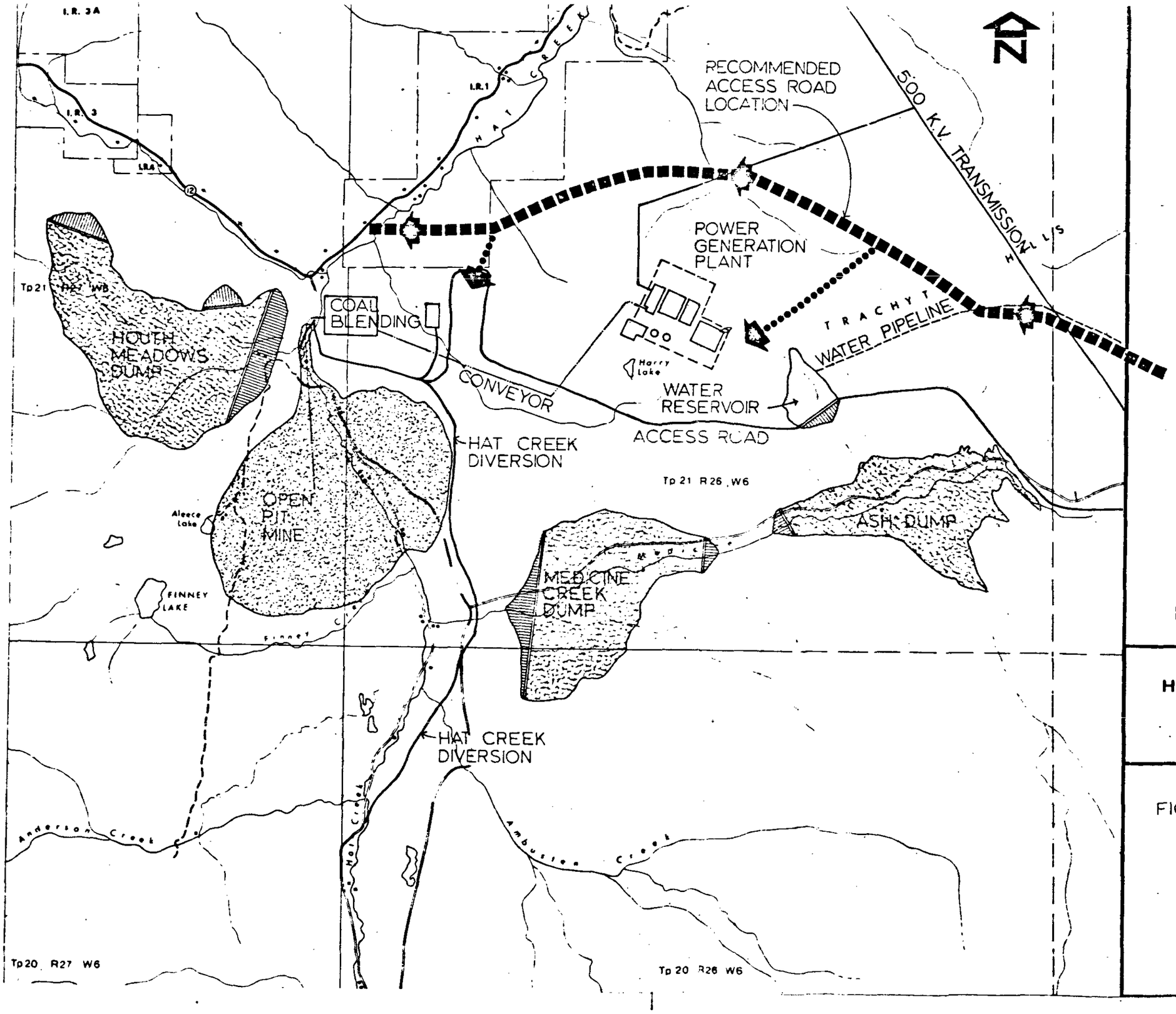


Figure 5.12 Transmission Corridor Alternatives



RECOMMENDED ACCESS ROAD LOCATION

PLANT APPROACH AND LINK TO UPPER HAT CREEK

SCALE - 1:50,000

0 Kilometres 1 2 3

CONTOUR INTERVAL - 100 METRES

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
HAT CREEK PROJECT

DETAILED ENVIRONMENTAL STUDIES

FIGURE 5.13 PLANT ACCESS ROAD ALTERNATIVE

5.6 ALTERNATIVE MEASURES FOR WATER INTAKE AND RELATED FACILITIES

(a) WATER INTAKE

(i) Physical Characteristics

A water intake structure is located in the Thompson River just above the mouth of the Bonaparte River. This structure is about 34 meters long, 9 meters wide and 9 meters above high water.

(ii) Impacted Areas

Thompson River

Foreground, middleground and distant views of the intake structure from various parts of this visual unit.

(iii) Enhancement Measures

Foreground, Middleground, and Background

Develop intake structure as architectural element that relates to the form, colour, texture, and line of existing landscape components.

(b) STORAGE AND PUMPING FACILITIES

(i) Physical Characteristics

Water from the intake would be pumped to a 30-meter diameter clarifier, then into a 6-meter diameter clearwell before entering the high pressure pumping station. This station would be about 60 meters long, 13 meters wide, and 13 meters high. All three structures are located just south of the mouth of the Bonaparte River.

(ii) Impacted Areas

Thompson River

Foreground and middleground views of this area next to the mouth of the Bonaparte River.

(iii) Mitigation Measures

Foreground, Middleground, and Background

Develop structures as architectural elements to contrast and complement form, colour, and texture of surrounding landscape.

Develop landscaping to provide transition between structures and existing landscape and to minimize visual impact of structures.

5.7 ALTERNATIVE MEASURES FOR CONSTRUCTION FACILITIES

(a) PLANT CONSTRUCTION CAMP

(i) Physical Characteristics

An area of 12 hectares near the plant site would be cleared to accommodate the construction camp for maximum of 1000 men. Total life of the camp would be approximately eight years.

(ii) Impacted Areas

Medicine Creek Valley

Distant view looking up at edge of construction camp facilities.

Trachyte Hills

Foreground and middleground views of construction camp from various areas around plant site.

(iii) Mitigation Measures

Foreground, Middleground, and Background

Utilize natural contours and vegetation to soften close-up view of camp structures and to screen middleground and distant views.

Minimize disruption to natural contours and vegetation to facilitate reclamation after camp structures are removed.

(b) MINING CONSTRUCTION CAMP

(i) Physical Characteristics

The camp is located just above and east of the coal blending area. It covers a cleared area of 6 hectares and would accommodate up to 440 men. This camp would also have a life cycle

of approximately eight years.

(ii) Impacted Areas

Marble Canyon

Distant view, partially screened by intervening vegetation, from the entrance to Marble Canyon.

Upper Hat Creek Valley

Foreground and middleground views from various parts of the entrance to Upper Hat Creek Valley.

Trachyte Hills

Distant view looking down on camp from western edge of the Trachyte Hills.

(iii) Mitigation Measures

Foreground, Middleground, and Background

Utilize natural contours and vegetation to soften close-up view of camp structures and to screen middleground and distant views.

Minimize disruption to natural contours and vegetation to facilitate reclamation after camp structures are removed.

5.8 NEXT STEPS

The general measures for mitigation, enhancement or compensation that have been proposed will require detailed development during the next phase of this project's development.

The intent was to identify the impact cause and to develop a course of action that could then be implemented in order to reduce the sensitivity of an impact. During the next steps of design development specific measures will be outlined for each project element, based on the general statements in the above sections. The following chapter establishes the priorities for the mitigation, enhancement, or compensation measures.

5.9 EXISTING AND AFTER CONSTRUCTION VIEWS

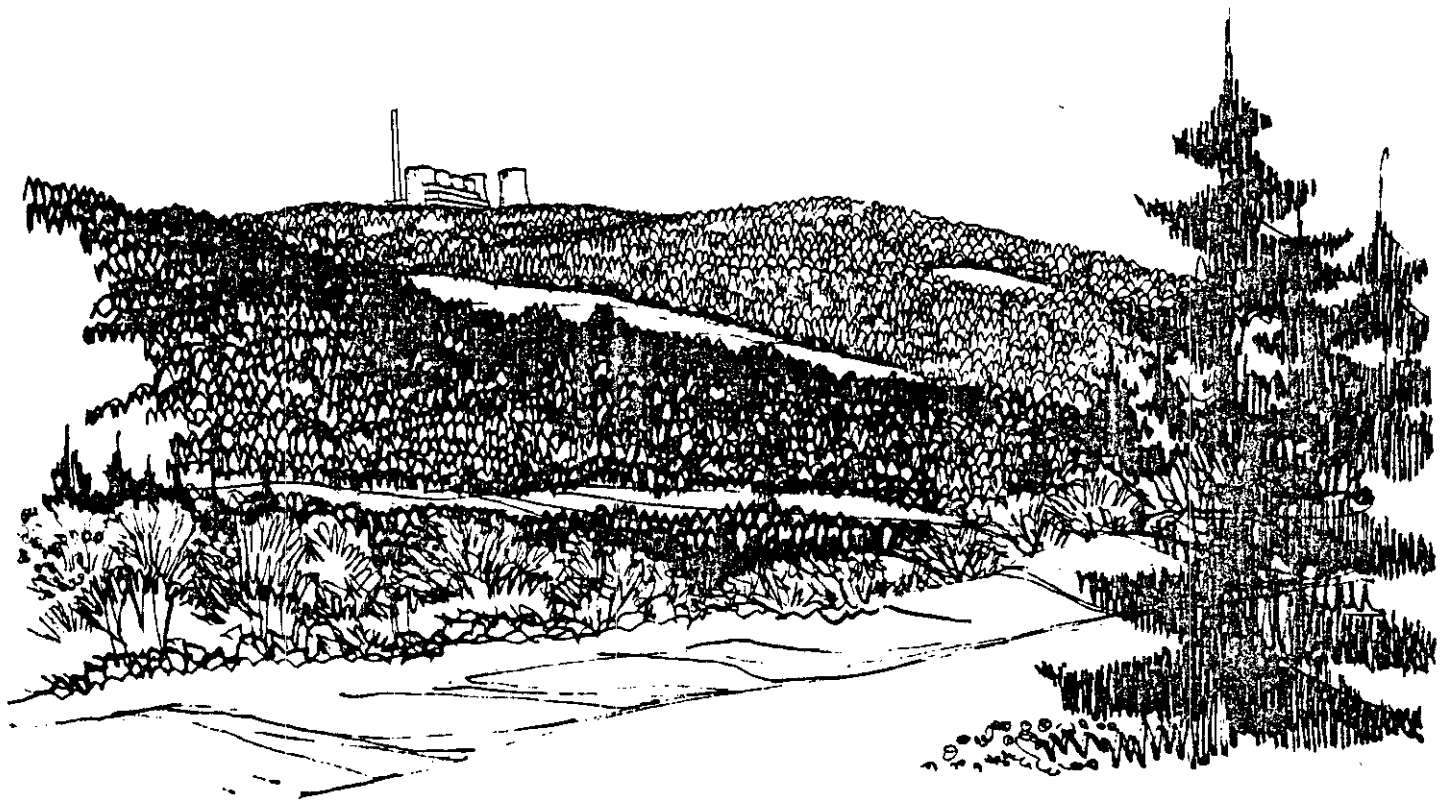
The following sketches, along with the preceeding ones in this chapter, illustrate the visual impact of the various project elements on different parts of the site. The intent of Figures 5.14, 5.15 and 5.16 is to demonstrate graphically how the existing views along Highway # 12 are affected by the project elements. These sketches are all taken from Highway # 12 because of the significant number of potential travellers along this route as opposed to others in the study area.

Figure 5.14 illustrates the initial view of the generation plant and stack that will be seen by people as they drive westward along Highway # 12 towards Marble Canyon. Figure 5.15 is a before and after view along the same route but closer to Marble Canyon. Figure 5.16 illustrates the view to the southeast that people will see from the eastern entrance to Marble Canyon.

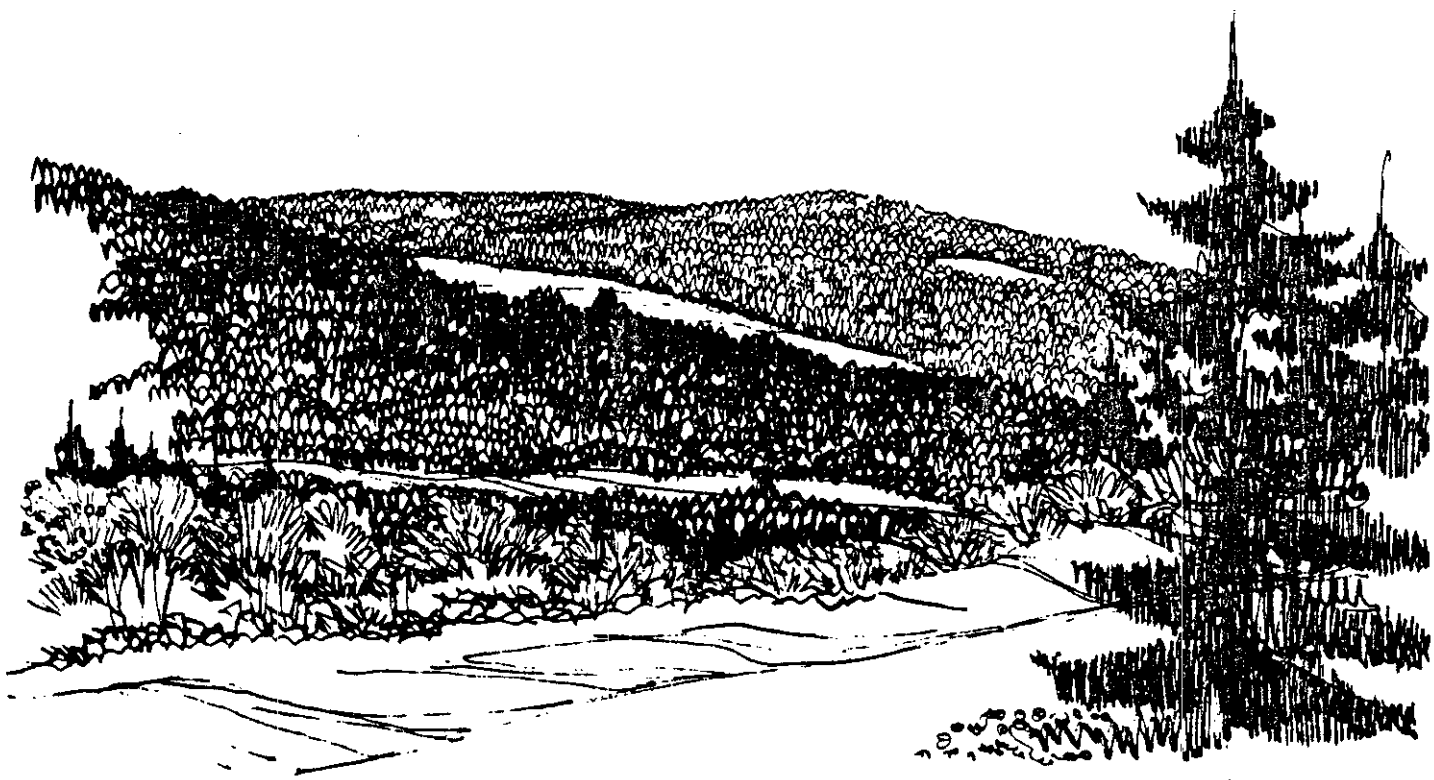
After Construction

Existing View

Figure 5.14 Initial View from Highway # 12 of Generation Plant and Stack

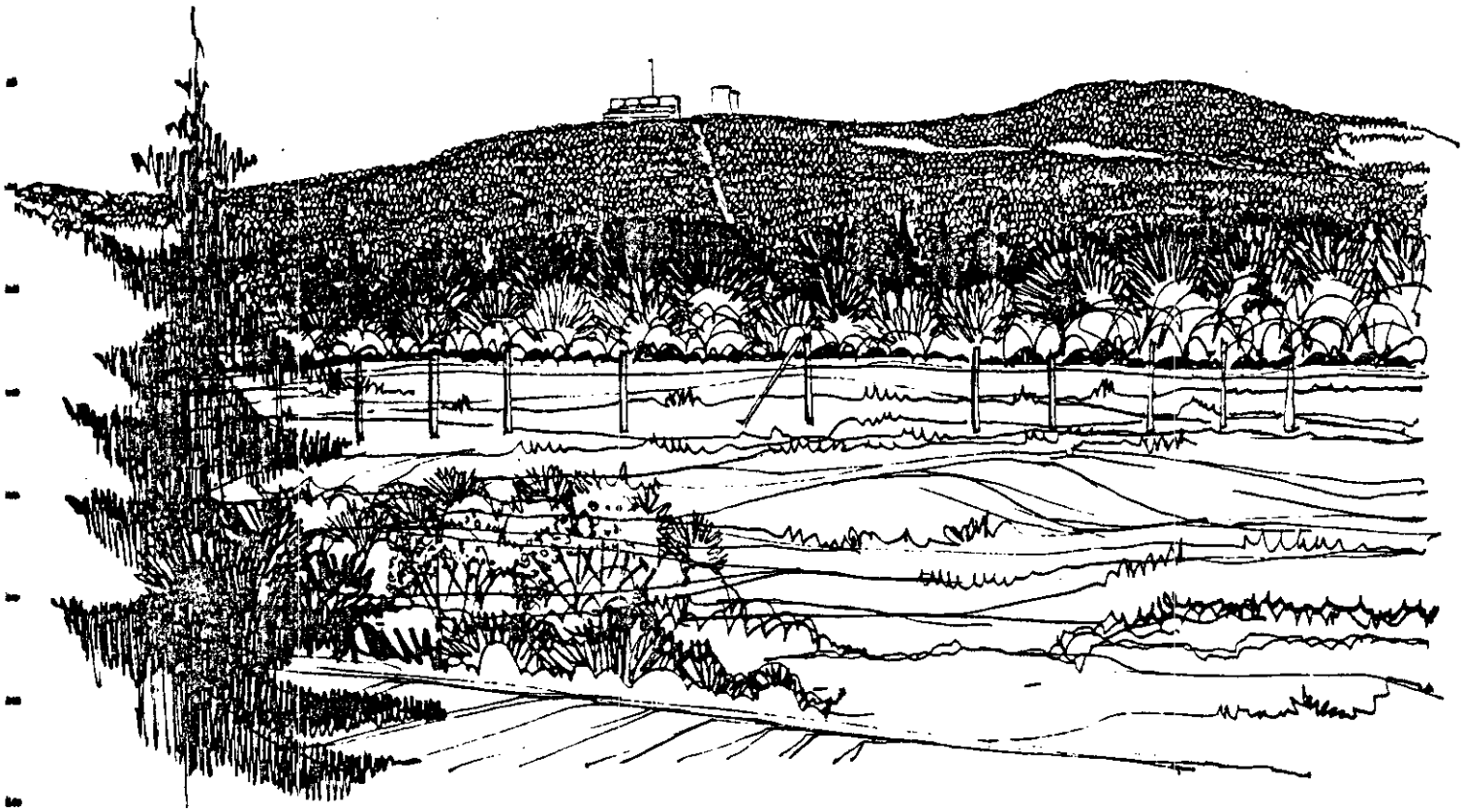


After Construction

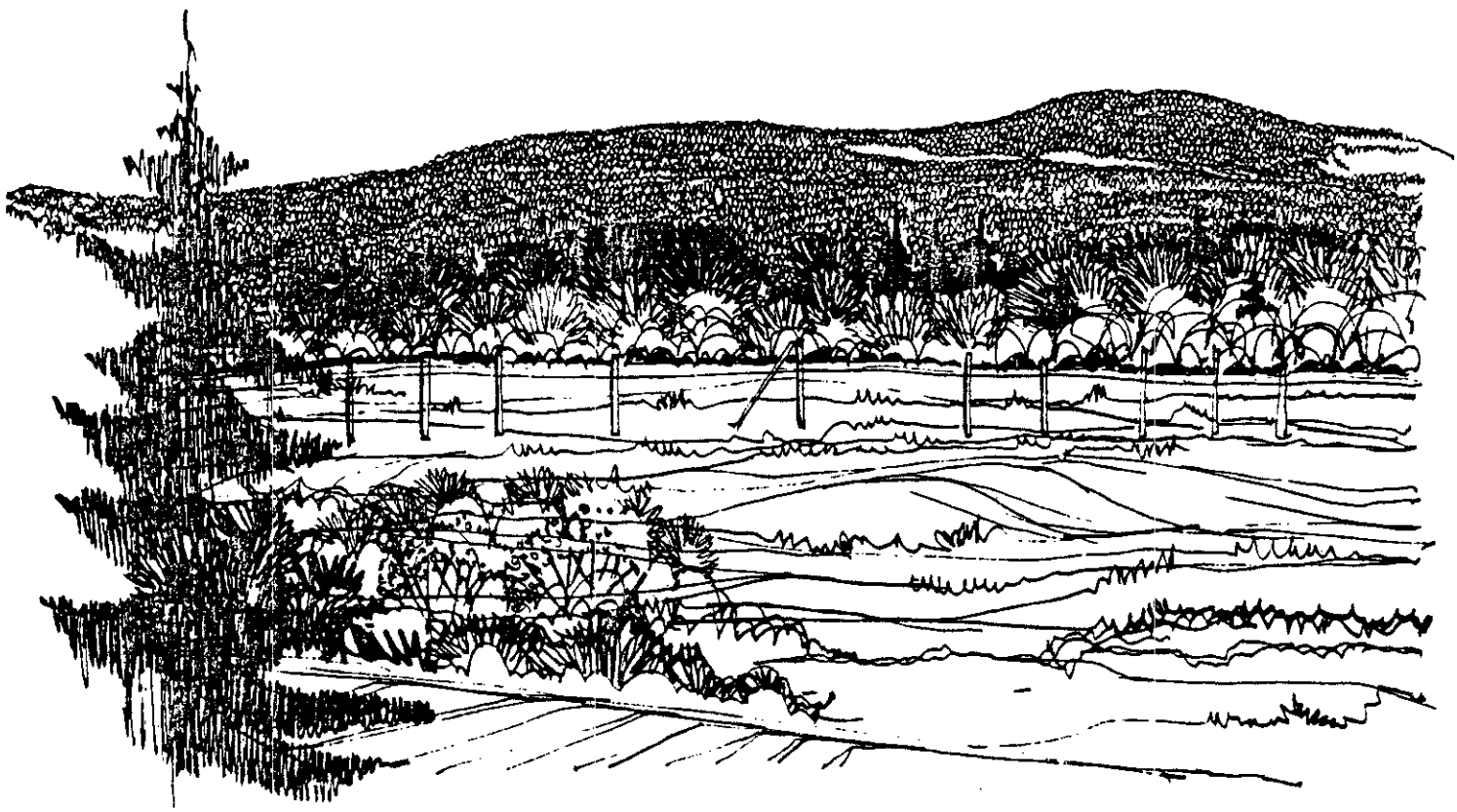


Existing View

Figure 5.15 View from Highway # 12 of Generation Plant and Stack



After Construction



Existing View

Figure 5.16 View from Eastern Entrance to Marble Canyon of Generation Plant, Cooling Towers, and Conveyor.

6.0 PRIORITIES AND RECOMMENDATIONS

6.1 PRIORITY DETERMINANTS

In this section, guidelines are established for determining the priorities for alternative measures to minimize visual impact of project elements. They are based primarily on the existing visual quality, upon the quality of the impact caused by the project element, and on the viewing distance between the observer and the project element.

Table 6.1 summarizes the existing quality of the visual units and the visual quality of the impact caused by a specific project element. Each visual unit was listed according to its level of visual quality and each project element according to its impact significance and appropriate viewing distance. Two visual units, Langley and Oregon Jack, have been omitted since they were not visually affected by any of the project elements.

The highest priority was given to foreground and middleground mitigation measures for project elements with extreme and high visual impacts that affected visual units having outstanding or high visual quality. Foreground and middleground views were important factors since they indicate points at which project elements begin to dominate and disrupt the existing visual quality. Distant or background views were given lower priorities since they would benefit from the mitigation measures affecting middleground and foreground views. Table B1.3 lists the order for establishing mitigation priorities based on a project element's visual impact and a visual unit's visual quality.

Viewer characteristics such as the number of visual contacts by residents and transients with project elements, the context within which visual contact was made, and the aesthetic impact each visual contact had on the observer were also taken into consideration. However, the degree of influence these factors

had on establishing priorities was limited due to the difficulty in obtaining data on the number and type of potential viewers and to the lack of conclusive methods for determining a factor which indicated the difference in the intensity of a visual contact between the resident population and the transient one. This issue was resolved when it became apparent that the location of the maximum number of visual contacts and the critical viewsheds coincided with the areas most sensitive to the other priority determinants.

Table 6.1 Summary of Visual Quality and Visual Impact Causes

	FOREGROUND			MIDDLEGROUND			BACKGROUND		
Visual Unit	Extreme High	Moderate	Low Insignificant	Extreme High	Moderate	Low Insignificant	Extreme High	Moderate	Low Insignificant
Marble Canyon (Outstanding)	Blending Fac., etc.			Mouth Dump			Medicine Dump Stack Conveyor Gen. Plant etc.	Access Rd. Mine Camp	
Upper Hat Creek Valley (Outstanding)	Open Pit Mine Blending Fac. etc. Medicine Dump Mouth Dump	Access Rd. Hat Creek Diver. Mine Camp		Open Pit Mine Medicine Dump Hough Dump Conveyor	Access Road Mine Camp Hat Creek Dump		Gen. Plant etc. Stack Conveyor		
Cornwall Lookout (Outstanding)							Ash Dump Transmission Mouth Dump Stack Gen. Plant etc.	Access Rd.	
Cattle Valley (High)	Transmission	Access Road	Water Pipeline	Transmission	Access Road	Water Pipeline			
Medicine Creek Valley (High)	Ash Dump Medicine Creek Dump	Access Road		Open Pit Mine Mouth Dump Conveyor Medicine Creek Dump	Access Road	Water Pipeline Water Reservoir	Open Pit Mine Mouth Dump Stack Blending Fac. etc. Gen. Plant etc. Transmission	Hat Creek Diver. Plant Camp	
Thompson River (High)	Transmission	Water Intake Storage & Pump		Transmission	Water Pipeline Water Intake Storage & Pump		Transmission	Water Pipeline Water Intake	
Trachyte Hills (High)	Transmission Conveyor Stack Gen. Plant etc.	Access Road Plant Camp		Ash Dump Transmission Medicine Dump Conveyor Stack Gen. Plant etc.	Access Road Plant Camp	Water Reservoir	Transmission Open Pit Mine Blending Fac. etc.	Hat Creek Diver. Mine Camp	Water Pipeline
Highway # 12 (Average)	Transmission Blending Fac. etc.			Transmission Mouth Dump Blending Fac. etc.			Transmission Open Pit Mine Mouth Dump Conveyor Stack Gen. Plant etc.	Access Road	
Cache Creek (Fair to Poor)							Transmission		
Highway # 1 (Fair to Poor)	Transmission	Access Road	Water Pipeline	Transmission	Access Road	Water Pipeline	Stack (from Semlin Valley) Transmission	Access Road Airport	Water Pipeline

Priority	Foreground	Middleground	Background
1. Ash Dump	*	●	
2. Blending Facilities and Stockpile	*	*	
3. Medicine Creek Dump	*	●	
4. Open Pit Mine	*	*	
5. Houth Meadow Dump	●	*	
6. Conveyor		●	
7. Generation Plant and Cooling Tower	*	*	
8. 500 kv. Transmission Corridor	*	●	
9. Stack	●	●	
10. Ash Dump			*
11. Access Road	*	*	
12. Hat Creek Diversion	*	*	
13. Mine Construction Camp	●	*	
14. Plant Construction Camp	●	*	
15. Items 1 to 9			*
16. Water Intake	*	*	
17. Storage and Pumping		*	
18. Water Pipeline Corridor	*	*	
19. Items 11 to 14			●
20. Items 16 to 18			*

Table 6.2 Project Element Priority List

6.2 PRIORITIES

Table B1.1 and B1.2 listed the project elements and their impact significance. In Table B1.1 the individual scores of the four assessors were recorded under the form and character of each project element's visual impact on a visual unit. The average scores of the impacted visual units were used to determine the relative rank of the impact.

The ash dump near the generation plant caused the most significant visual impact. The next significant impacts were caused by elements associated with the blending facilities, the generation plant, and the two linkages, the 500 kv. transmission line and the main coal conveyor.

Both the number of significant impacts caused by the group of blending facilities and the open pit mine elements and the quality of the Marble Canyon, Upper Hat Creek and Highway # 12 visual units made this area the highest priority for the implementation of mitigation measures. The other highly visible and significant impact was caused by the group of elements surrounding the generation plant and its related facilities. Its impact was limited to the Medicine Creek Valley visual unit which was also ranked with a high visual quality.

Significant visual impacts were caused by the linkage elements such as the conveyor, the transmission corridor, and the access road. The linear quality of these elements gave them high visibility and priorities for implementing mitigation measures.

Thus the priorities for implementing mitigation measures are:

(a) for the pit and related facilities

(b) for the plant and related facilities

(c) for the linkages: transmission corridor, the conveyor, and the access road.

6.3 RECOMMENDATIONS

The following recommendations were based on the priorities established above and upon the alternative measures proposed in Chapter 5.3. Although accurate costs of the proposed measures are not available, the recommendations do represent the measures that could be technically developed within a given budget.

(a) Pit and Related Facilities

The physical characteristics of the open pit mine, blending facilities, stockpiles, and dump, and their location in a visually sensitive area create the need to visually screen the project elements from foreground and middleground views; to minimize or eliminate public access to this area; and to minimize the visual impact of man-made landforms. The following recommendations are for the pit and related facilities:

(i) Develop and organize the plan of the blending area to maximize physical and visual separation between it and the entrances to Marble Canyon and Highway #12.

(ii) Design berms and retaining embankments to complement the existing landscape through sequential revegetation and shaping of the man-made forms.

(iii) Relocate the access road that goes through the blending area to eliminate conflict between public and service vehicles.

(iv) Use embankments or berms to terminate the north and south ends of the open pit mine and related facilities and to enhance the entrance to Marble Canyon.

(v) Develop a strong identifiable edge to the open pit mine with a drainage ditch and/or perimeter road.

(vi) Integrate the Hat Creek diversion canal into the landscape by creating reservoirs for creeks flowing into the canal.

(b) Plant and Related Facilities

The areas in and around the generation plant, the stack, and the cooling towers represent a concentration of man-made structures and forms that provides the opportunity to develop a highly technical environment which reflects the function of the components and contrasts with the natural environment. The related facilities such as the water reservoir and ash dump are separated from the plant and are treated as elements that blend into the existing landscape. The following are the recommendations that would accomplish these two objectives:

(i) Develop visual screens with existing vegetation and man-made berms to control view of the ash dump.

(ii) Develop a system for progressively revegetating the ash dump and reducing size by creating other dumping areas in order to reduce the visual impact of one large dump.

(iii) Relocate the access road to a new alignment to reduce the visual contact with the ash dump.

(iv) Use all generation plant elements to create a highly technical environment that provides contrast and variety to the natural landscape.

(v) Develop a circulation pattern, massing of structures, and landscaping to orient users and visitors in this high technology environment.

(vi) Develop the water reservoir into a visually attractive amenity around the plant site.

(vii) Emphasize the forms of conveyor, transmission take-off, stack, and ash transport system to complement the scale of the plant elements.

(c) Linkages

The three major linkage elements that cause the greatest visual impact are the transmission corridor, the main coal conveyor, and the access road. The physical characteristic of the coal conveyor is used to emphasize the man-made link between the mine and the plant. The measures for the transmission corridor and the access road are directed towards the need to achieve a closer harmony between these two linear forms and the natural landscape.

(i) Emphasize form of conveyor to create a strong visual link between mine and the plant and to contrast with natural landforms.

(ii) Modulate edges of transmission corridor to integrate with existing pattern of open and treed areas.

(iii) Select alignments for transmission corridor and the access road that utilize natural topography to minimize linearity and exposure.

(iv) Examine relocation of access road to an area east of plant facilities in order to minimize public traffic through blending facilities area.

(v) Design road alignment to minimize cut and fill and to take advantage of new vistas of natural and man-made elements.

6.4 CONCLUSIONS

Many mitigation measures were proposed in Chapter 5.3. They represent ideas and concepts which may or may not be achievable within the technical and economic constraints of this project. These measures should, however, be taken into consideration during each stage of this project's development in order to minimize wherever possible its potential visual impact. Each corrective measure that is taken will ultimately contribute to the total mitigation process.

There is a justifiable need to implement the recommendations of this study because of the many outstanding visual qualities in the study area. Although individually each visual unit has its own visual character it is the total impact of all the visual units that gives the study area its visual quality and emphasizes the need to minimize the impact of a project of this magnitude. The measures that have been recommended will require further development and should be co-ordinated with other mitigation measures during the next phase of the project's development.

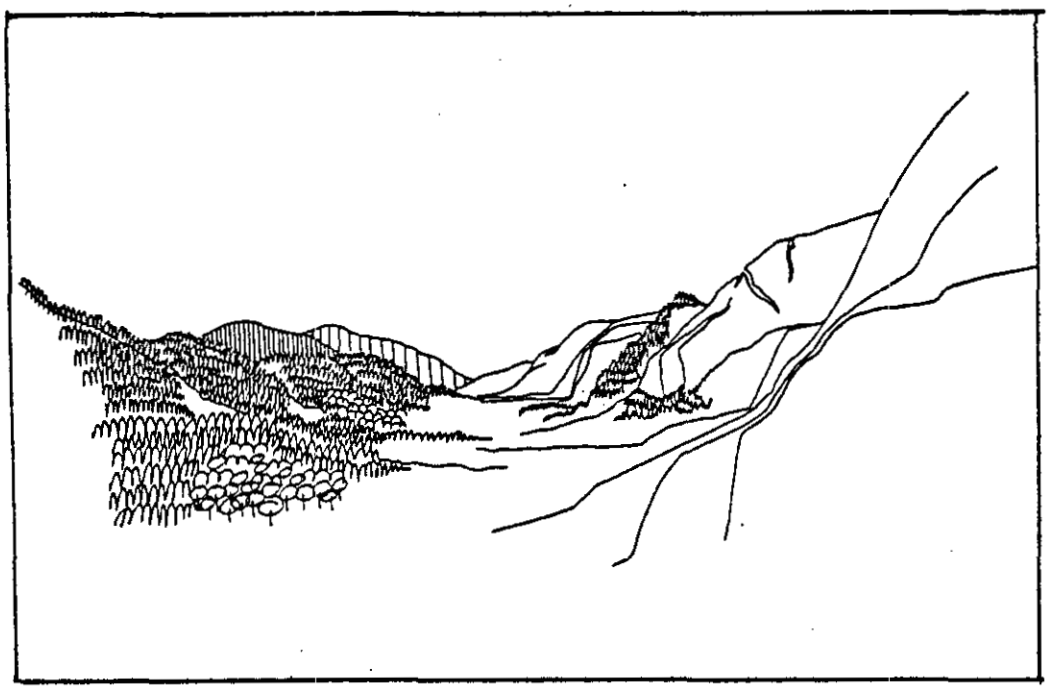
APPENDICES

APPENDIX A

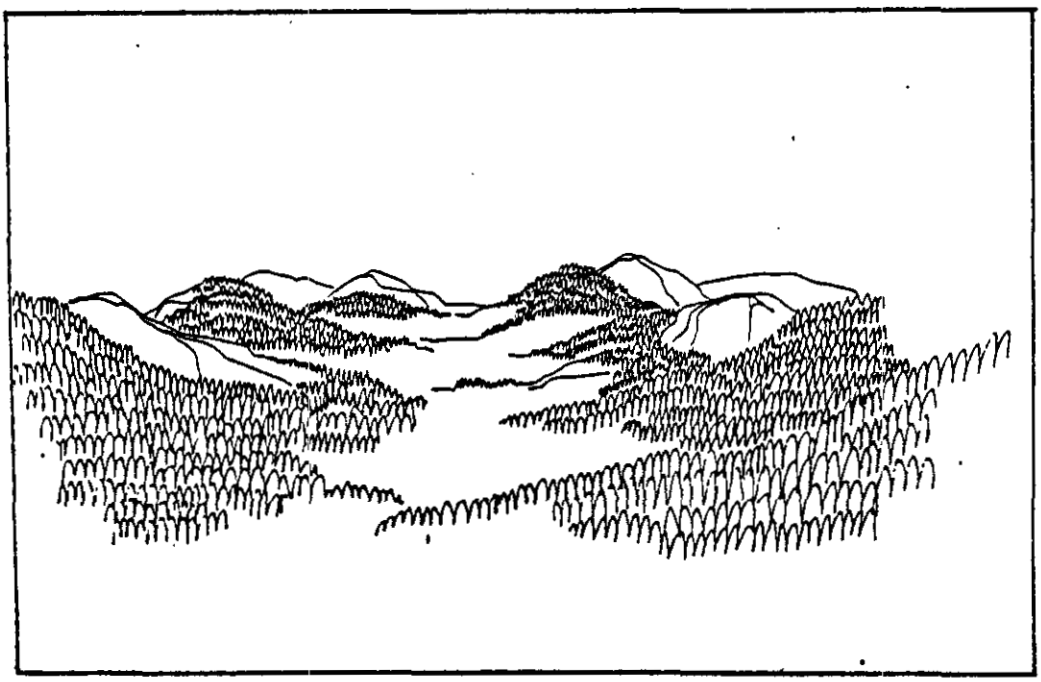
A1.0 VISUAL UNIT EVALUATION

A1.1 Comparative Visual Qualities of Landscape Components

Aesthetic Criteria	Criteria for High Quality	Criteria for Lower Quality
	1. BOUNDARY DEFINITION	
	Boundary definition deals with those characteristics which visually establish the perimeter of the unit within the general area. Edges are created by the interface between skyline and ridge, horizon and plane, or other boundary conditions that provide a visual edge to a unit.	
Unity	Strong apparent edge surrounds the regional Unit. Consistent break contrast with surrounding visual units.	Vague definition of edge or sections of boundary where edge not apparent. Boundary is not usually apparent as one is entering or leaving the visual unit.
Variety	Variation in edge definition on visual unit sides are an orienting force to observer. Apparent which side of unit one is passing through - as grassland to mountain unit to open desert.	Variation in edge definition without consistency to a side or sides of the landscape. Variation both tends to confuse orientation within the unit and blur the edges with external units.
Vividness	Contrast between adjacent visual units produces striking edge definition.	Contrast formed by juxtaposition of undisturbed natural and disturbed unnatural conditions.

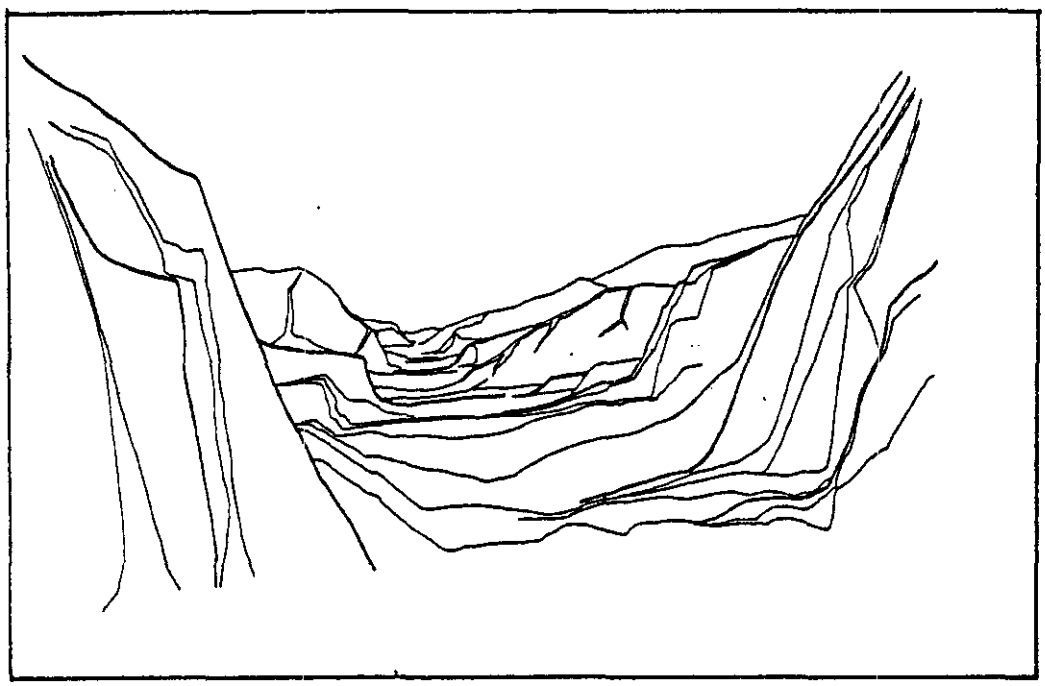


Boundary Definition - Higher Quality

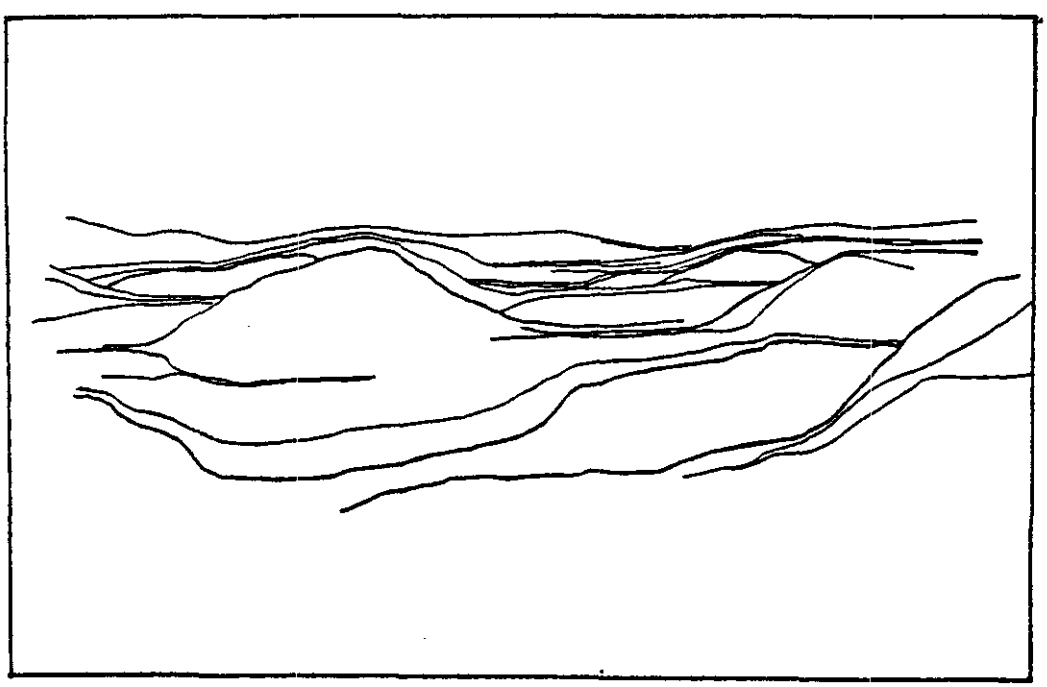


Boundary Definition - Lower Quality

Aesthetic Criteria	Criteria for Higher Quality	Criteria for Lower Quality
	2. GENERAL FORM General form relates primarily to the expression of the landform such as mountains, plains, and depressed or bowl-like containments such as valleys and basins.	
Unity	Strongly apparent internal consistency developed by repetition of forms. The internal consistency of forms contrasts with evidently different forms outside the unit. Forms exist within unit and do not repeat outside unit. Undulating cluster of hills surrounded by a vast flat prairie.	Land forms do not consistently exist within visual unit and are characteristic of surrounding visual units. Land forms transcend the boundaries of the visual unit. No consistent pattern developed from land forms that would strongly characterize unit.
Variety	Combination of adjoining and/or opposing land forms develops dramatic patterns and contrasts. Razor-back ridges alternating with flood plain valleys.	Landform so repeated and common to region that it tends to monotony.
Vividness	Presence of single landform or combination of landforms unique in comparison to all surrounding visual units and the region.	No sharp or abrupt breaks to contours, all transitions between landforms gentle and gradual. Sharp contrast formed by juxtaposition of undisturbed and disturbed landforms.

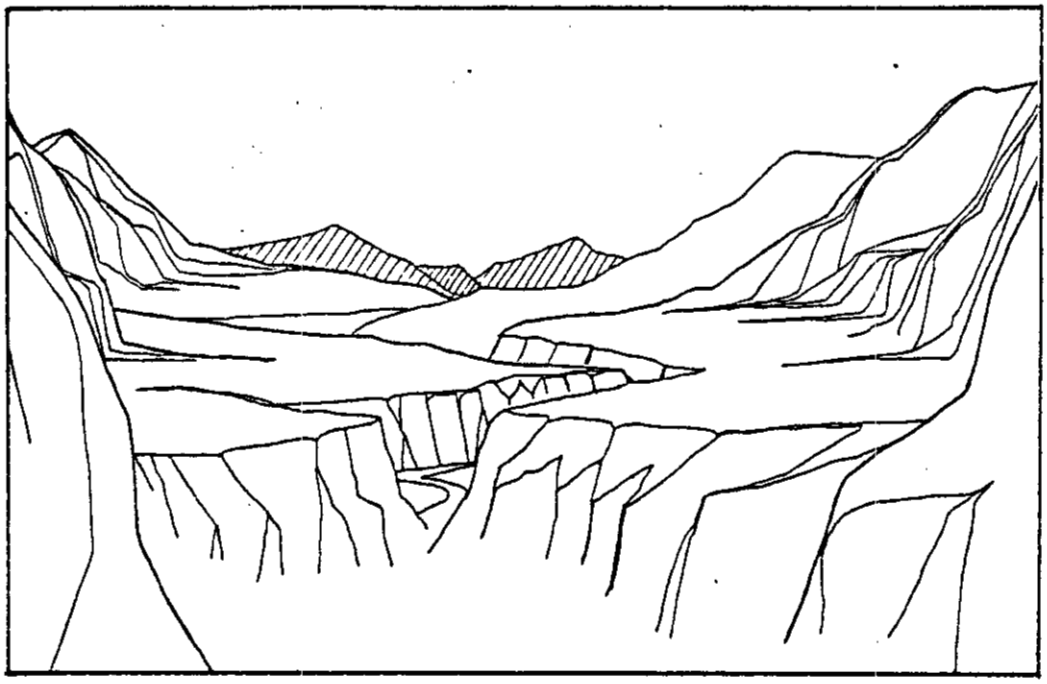


General Form - Higher Quality

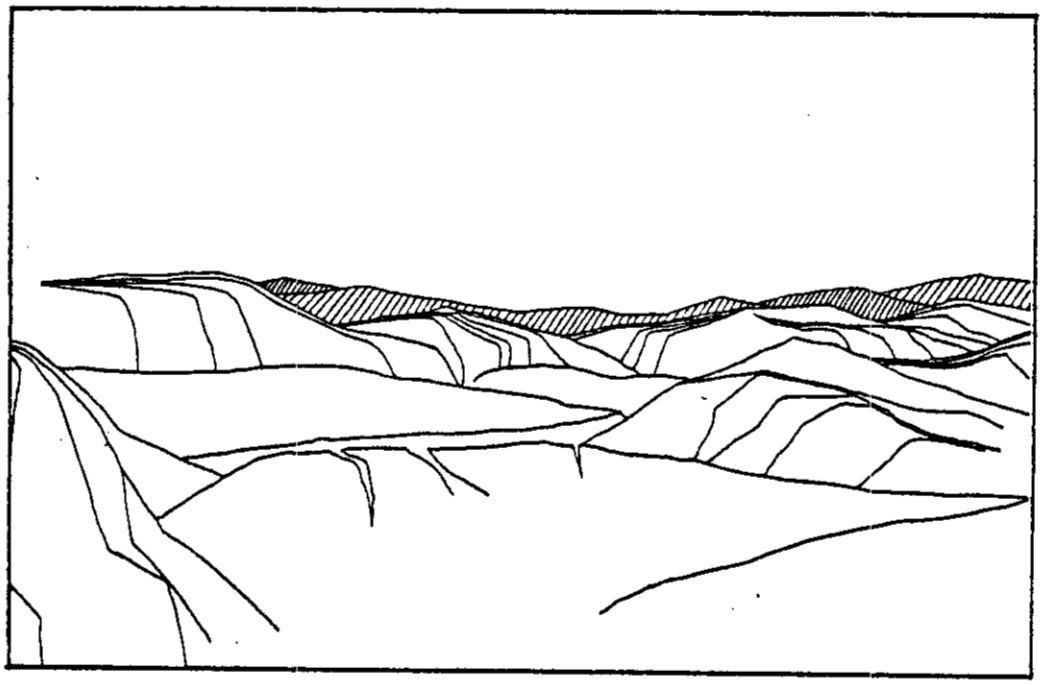


General Form - Lower Quality

Aesthetic Criteria	Criteria for Higher Quality	Criteria for Lower Quality
3. TERRAIN PATTERN		
	Terrain pattern emerges through repetition of form-shape-colour-texture variations. It can vary from soft undulating hills to mountainous terrain.	
Unity	Particular terrain pattern strongly characterizes the visual unit and distinguishes it from surrounding visual unit.	No single terrain pattern dominates or characterizes the visual unit. Terrain pattern extends beyond unit, common to larger region.
	Terrain pattern consistently associated with presence of a water pattern.	The appearance of water is evidently incidental to the combination of land forms. Reservoirs in desert conditions.
Variety	Pattern developed by terrain in visual unit contrasts with the larger region. Unique to wider geographic area. Landforms composing pattern in high relief, composed of highly dissected topography. Vivid landforms such as buttes, pinnacles, canyons, steep slopes -- compose the terrain patterns.	Pattern developed by terrain vaguely apparent or not at all evident. Visual unit appears to consist of randomly associated landforms -- no consistent repetitions or overall compositional relationship among landforms. Low, inconspicuous landforms compose terrain pattern.
Vividness	Strong contrast developed by dominant and sub-dominant cover. Water presence defined by vegetational contrasts. Vegetation type evidently associated with particular land form and mutually reinforce each other's presence.	Vivid contrasts developed by undisturbed natural conditions adjacent to disturbed conditions. Water presence obscured by vegetation -- no riparian contrast. Vegetational pattern not strongly related to land form types. Sage cover on slopes and valley floor.

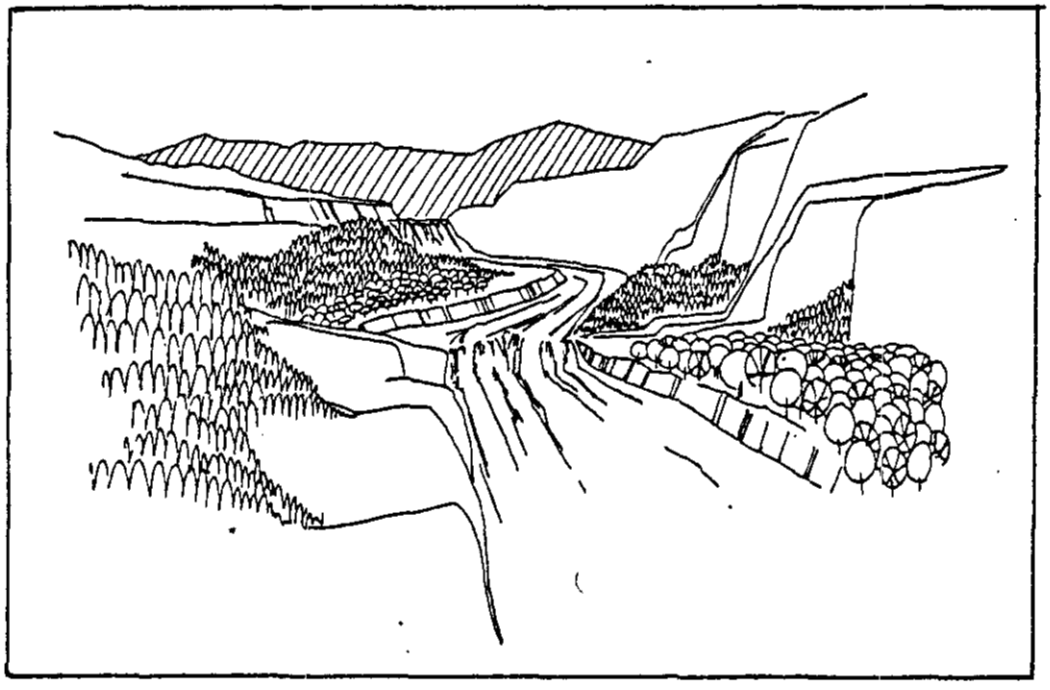


Terrain Pattern - Higher Quality

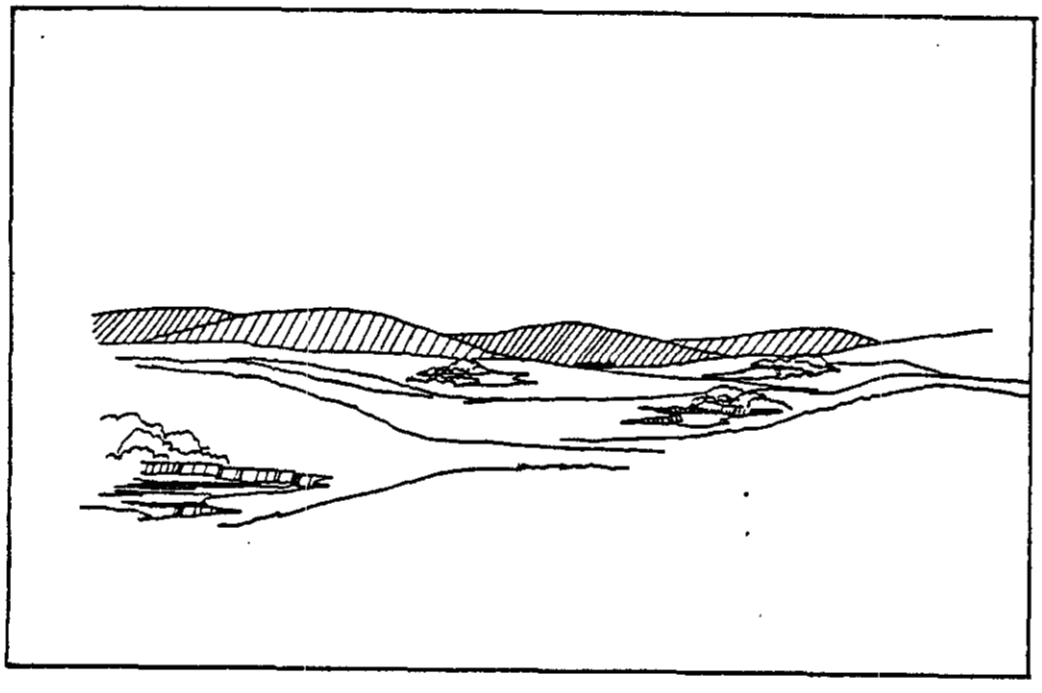


Terrain Pattern - Lower Quality

Aesthetic Criteria	Criteria for Higher Quality	Criteria for Lower Quality
	4. WATER PRESENCE Water presence within the visual unit provides another distinguishing feature that generally enhances the observer's aesthetic experience.	
Unity	Water evidently continuous throughout unit -- of a size or uniformity of expression to link surrounding land area into a regional unity. Type of water expression unique or characteristic to unit and does not extend to surrounding units.	Water inconspicuous in unit due to climate or vegetational obscuration. Water appears as isolated bodies throughout unit -- no evident drainage connection. Apparently random scattering of small water bodies throughout unit. Type of water expression not characteristic of unit and extends outside boundaries.
Variety	Water presents a rich combination of flow, size, and appearance differences. Unit contains wild raging rivers, placid streams, large lakes, and small ponds.	Water presence all of a uniform expression without any apparent contrasts from variation. All streams impounded into reservoirs.
Vividness	Water rare for region, and only exists within particular visual unit. Water has unique characteristics in comparison to the larger region.	Relatively common and not striking. So ubiquitous in region as to be more apparent than land.

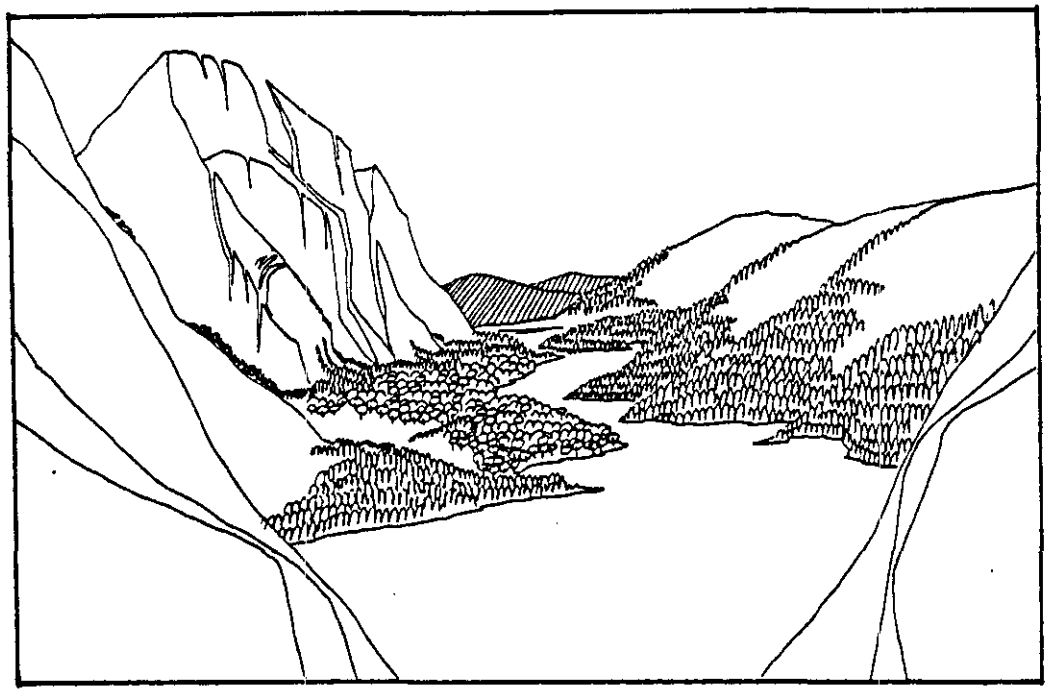


Water Presence - Higher Quality

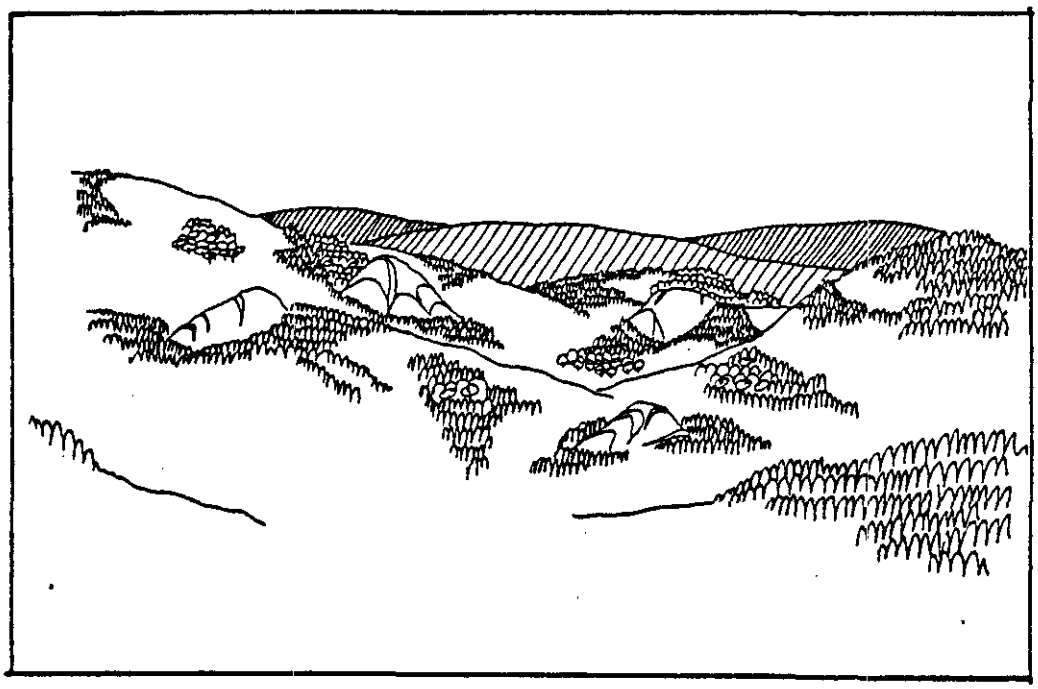


Water Presence - Lower Quality

Aesthetic Criteria	Criteria for Higher Quality	Criteria for Lower Quality
5. VISUAL FEATURES		
	Visual features are those elements within the visual unit that stand out through dominant scale, isolation, distinctive shape, or other special characteristics such as surface contrast and variation.	
Unity	Features have evident inter-relationships, same material, form, colour, texture. Arranged in compositional groups to form pattern. A chain of lakes, a ridge defined by a row of outcroppings.	Interrelationships not evident among features. Features appear to be randomly scattered about the visual unit.
Variety	Presence of many distinctly different features within landscape unit. Exceptional richness of feature content. Contrasting of two features by juxtaposition - cliff into pond, pinnacle rising from meadow.	Decreasing conspicuousness of feature by consistent repetition of single feature throughout visual unit.
Vividness	Presence of exceptionally large features - highest waterfall, pinnacle, or peak in region. Features of such unique distinction that it identifies visual unit.	Features are small in scale and common throughout region or the features are not specific to visual unit.

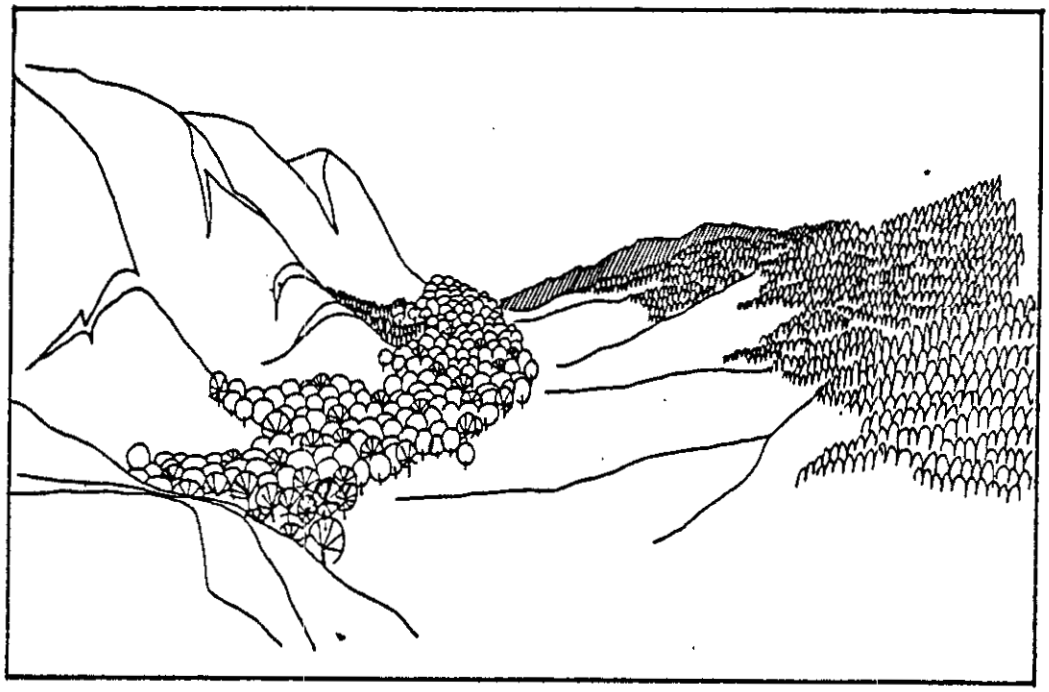


Visual Features - Higher Quality

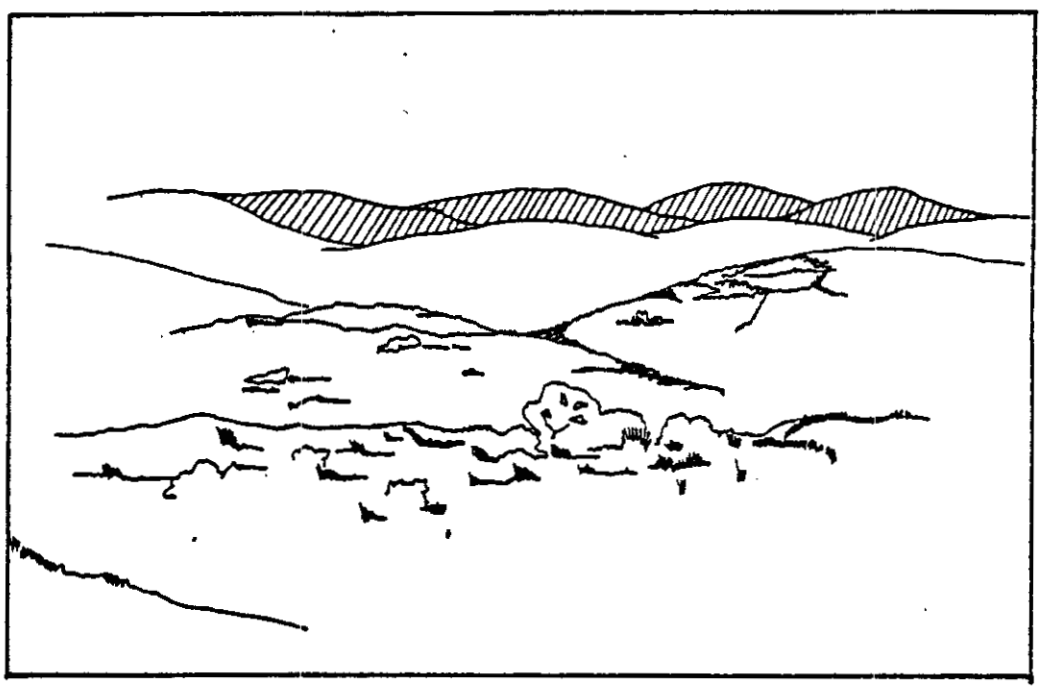


Visual Features - Lower Quality

Aesthetic Criteria	Criteria for High Quality	Criteria for Low Quality
	6. VEGETATIONAL PATTERNS Vegetation patterns assist in determining landscape character by defining particular kinds or composition of vegetation cover having distinctive colour, texture, and density.	
Unity	Entire visual unit covered by one consistent vegetational pattern that is distinctive to the unit and does not extend beyond the unit.	Non consistent vegetational pattern characterizes the visual unit. Mixture of several vegetational patterns that extend outside of the unit. Chaotic mixture of many vegetational communities do not combine to form a comprehensible pattern.
Variety	Many separately identifiable vegetation types form a rich pattern composition. Consistently expressed contrasts among a variety of adjoining-opposing vegetational zones. Bald grassy ridges, conifer slopes, riparian drainage courses.	Uniform cover with no break in expression. All one vegetation type or appearance - as all spruce or fir, all tundra, over entire region.
Vividness	Sharply defined edges. Bald edge of forested slopes, rock outcrops to grassland.	Vague edges that blend into landscape.

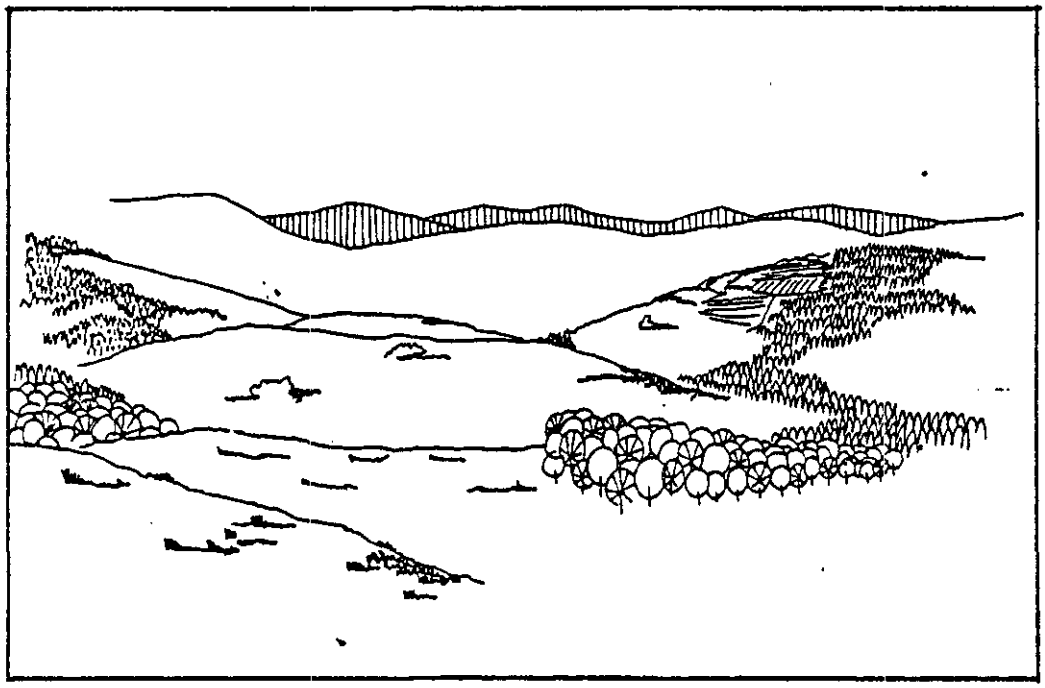


Vegetational Patterns - Higher Quality

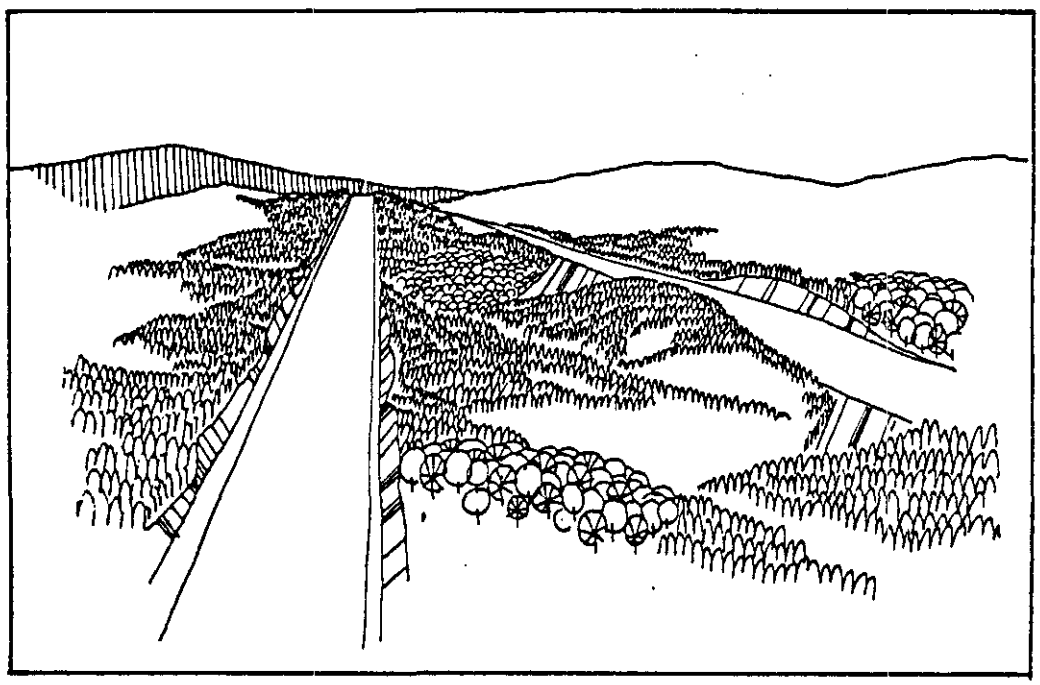


Vegetational Patterns - Lower Quality

Aesthetic Criteria	Criteria for High Quality	Criteria for Low Quality
	7. CULTURAL AND LAND USE PATTERN	
	Cultural and land use patterns indicate the presence of human occupation as characterized by field crops, pastures, grazing areas, roads, and other man-made elements. The form, texture, scale, and colour of the man-made changes can enhance or degrade the quality of the visual experience.	
Unity	Consistent pattern within visual unit that does not extend to larger region. Valley in crop pattern surrounded by continuous forest cover. Development patterns reinforce natural patterns. Highways paralleling drainage courses, fences following contour lines.	Development has no apparent pattern and appears to sprawl across landscape. Pattern that evidently conflicts with natural pattern. Highway zigzagging across drainage pattern.
Variety	Increase the richness of variation in natural patterns. Planting of hedgerows and field borders on flat plains; breaking of continuous forest cover with openings of meadows.	Development has evidently decreased the natural diversity by imposing a structured pattern of conformity. Grid street and utility layout. Removal of indigenous vegetation.
Vividness	Development of striking man-made features. Provides strong contrast to natural sweep of land or water.	Development of features that degrade the surrounding landscape. Industrial operations, logging scars, dumps, utility grids, etc.



Cultural and Land Use Patterns - Higher Quality



Cultural and Land Use Patterns - Lower Quality

A1.2 VISUAL UNIT EVALUATION

For each visual unit an assessment of the landscape components was made using the comparative visual qualities described in A1.1. The numerical ranking of the three assessors (Table A 1-1) was then normalized to determine the relative rankings of the visual units according to the normalized numerical values.

The normalized score was obtained by assigning to each assessor's highest score a value of 7, and a value of 1 to the lowest score. All values between the highest and lowest were distributed proportionately and assigned values between 1 and 7. This normalized numerical ranking indicated the assessor's relative ranking of the visual units to a set of common base values (Table A 1-2). The sum of the three assessors' values for unity, variety, and vividness was then totalled to determine the relative ranking of each visual unit to each other (see Table A 1-3).

The relative ranking of the visual units was then grouped into four levels of visual quality. In the highest level were those visual units having outstanding or unique visual qualities. They included Marble Canyon, Langley, Oregon Jack and Upper Hat Creek Valley. In the next level were those with high or above average visual quality and included Cattle Valley, Medicine Creek Valley and the Thompson River visual units. The third level comprised those of average visual quality and only included Highway #12. Both Cache Creek and Highway #1 were ranked at the lowest level and were in the fair to poor range of visual quality.

VISUAL QUALITY:	UNITY			VARIETY			VIVIDNESS		
ASSESSOR:	1	2	3	1	2	3	1	2	3
VISUAL UNIT:									
Marble Canyon	42	43	44	37	35	35	40	42	41
Upper Hat Creek Valley	37	46	41	33	37	40	30	38	32
Medicine Creek Valley	28	45	31	23	43	27	22	39	28
Cattle Valley	37	32	34	31	39	27	33	33	26
Highway # 12	34	30	36	26	26	31	28	28	33
Cache Creek	27	29	32	22	30	29	21	30	32
Thompson River	30	34	41	28	35	39	28	40	37
Highway # 1	23	38	30	20	29	24	20	36	26
Oregon Jack	39	39	44	34	44	37	38	39	37
Langley	40	45	44	36	40	37	37	44	37

Table A1.1: **Original Numerical Ranking of Visual Units**

VISUAL QUALITY		UNITY		VARIETY			VIVIDNESS		
ASSESSOR:	1	2	3	1	2	3	1	2	3
VISUAL UNIT:									
Marble Canyon	7	6	7	7	5	5	7	6	7
Upper Hat Creek Valley	5	7	6	6	5	7	4	5	3
Medicine Creek Valley	3	6	1	2	7	2	2	5	2
Cattle Valley	5	2	3	5	6	2	5	3	1
Highway # 12	4	1	3	3	4	4	3	1	4
Cache Creek	2	1	2	2	2	3	1	2	3
Thompson River	3	2	6	4	4	7	3	6	5
Highway # 1	1	4	1	1	2	1	1	4	1
Oregon Jack	6	4	7	6	7	6	6	5	5
Langley	6	6	7	7	7	6	6	7	5

Table A1.2: **Normalized Numerical Ranking of Visual Units**

VISUAL UNIT:	VISUAL QUALITY NUMERICAL RANK*	LEVEL OF VISUAL QUALITY
Marble Canyon	57	Outstanding
Upper Hat Creek Valley	48	Outstanding
Medicine Creek Valley	30	High
Cattle Valley	32	High
Highway # 12	27	Average
Cache Creek	18	Fair to Poor
Thompson River	40	High
Highway # 1	16	Fair to Poor
Oregon Jack	52	Outstanding
Langley	57	Outstanding

* Sum of normalized scores for unity, variety, and vividness.

Table A1.3: Sum of Normalized Scores and Level of Visual Quality

APPENDIX B

B1.0 EVALUATION CRITERIA

B1.1 CRITERIA FOR EVALUATING THE VISUAL IMPACT OF FORM

Description for High Impact	Description of Low Impact
CONTRAST: Exposed elements have contrasting textures, shapes, and colours that compete with existing features of the visual unit. Linear elements totally disregard topography of natural landscape.	COMPLEMENTS: Structures and other man-made elements are de-emphasized or concealed behind existing landscape components, by relating to the shape, colour, and texture of the unit.
DOMINATES: Project elements disregard existing scale or structure within the visual unit and become the focal point of the unit.	CONFORMS: Scale, shape or structure of the project element is modified to relate to existing landscape forms.
DEGRADES: Project elements disrupt existing vistas with their location and form. No apparent functional organization of project elements compete with natural visual unity.	ENHANCES: Project elements add variety, scale, and interest to visual unit. Linear elements aligned with existing water courses or topography to reinforce and organize visual qualities in unit.

B1.2 CRITERIA FOR EVALUATING CHARACTERISTICS OF VISUAL IMPACT

Description of High Impact	Description of Low Impact
IRREVERSIBLE: Project element's visual impact results in changes to the landscape that result in permanent scars or damage to the landscape components. Changes that create problems of erosion will take place over a period of time.	REVERSIBLE: Temporary project elements provide opportunity for land reclamation programs. Changes are shaped and landscaped to relate to existing vegetation patterns and land forms.
CONTRASTS: Contrasting shapes, colours, and textures, and introduced by the impact. These changes become more vivid and disrupt existing harmony of unit. Planting of species which detract from or provide sharp contrasts to natural materials.	COMPLEMENTS: Results of element's impact are concealed, or de-emphasized in the visual unit and the vistas. Changes provide opportunities to complete enclosures within units.
DEGRADES: Changes result in visible disruptions that minimize existing visual qualities. Provides opportunities to see vistas of high impact elements. Revegetation that does occur is haphazard and unrelated to the visual unit.	ENHANCES: Impact results in the opening of new vistas of high visual quality. Certain man-made changes add scale and variety to the unit that may otherwise have been featureless and bland. Changes result in modifications that are in keeping with visual quality and character.

B1.3 VISUAL IMPACT ASSESSMENT

Each impact cause and the visual units affected (See Figure 5.1) were evaluated according to the criteria outlined in B1.1 and B1.2.

Figure B 1-1 lists the numerical rankings assigned by the assessors to each impact cause and visual unit. Fibure B 1-2 was the average ranking of the visual impact of a project element on the visual units that were affected. The ranking of visual impacts falls into five categories. The highest level of visual impact was designated as "extreme". At the next level, which also contained the largest number of project elements, were those assigned a "high" level of visual impact. The "moderate" level comprised those in the third category, while those in the fourth level were designated as having "low" visual impact. The lowest level of visual impact was designated "insignificant". Figure B 1-2 also lists the number of visual units affected by each project element considered in the visual impact assessment.

		Marble Canyon		Upper Hat Creek Valley		Medicine Creek Valley		Cattle Valley		Highway # 12		Cache Creek		Thompson River		Highway # 1		Oregon Jack		Langley		Cornwall Lookout		Trachyte Hills		Total Score for a Project Element	Average Impact per Visual Unit
		Form	Char.	Form	Char.	Form	Char.	Form	Char.	Form	Char.	Form	Char.	Form	Char.	Form	Char.	Form	Char.	Form	Char.	Form	Char.	Form	Char.		
Plant & Related Facilities	Thermal Generation Plant and Cooling Towers	15 13 13 16	19 14 14 15	21 19 15 16	21 17 16 15	21 21 21 15	21 18 21 14	17 13 12 15	18 13 13 16	15 20 14 15	19 18 14 12											14 12 12 14	18 12 12 10	21 21 21 17	21 21 21 12	914	150.6
	Stack	19 13 13 16	18 14 15 15	19 17 16 14	16 16 16 16	21 20 17 13	18 19 13 15	18 15 13 16	18 15 12 16	20 19 10 13	18 18 12 17					17 12 10 13	15 12 12 14					18 13 12 11	18 14 10 15	21 20 18 17	21 18 17 16	993	124.2
	Ash Dump					21 19 21 21	21 19 21 20															17 14 15 18	18 15 15 18	21 19 20 21	21 19 20 20	454	151.4
	Water Reservoir					14 8 13 8	14 6 12 6															10 5 10 6	13 5 10 6	13 8 12 8	13 6 11 7	224	74.[illegible]
Pit & Related Facilities	Open Pit Mine			21 19 20 20	20 21 21 19	21 20 17 20	17 21 16 19			14 12 17 14	8 12 16 12													21 15 20 21	20 17 20 20	571	142.6
	Blending Facilities and Stockpiles	19 13 14 18	16 14 17 17	17 18 14 18	16 17 15 18	19 12 12 18	17 16 16 18			16 14 12 15	13 14 16 15													16 15 15 19	16 16 20 18	639	127.8
	South Meadow Dump	17 19 15 17	12 20 17 17	21 20 15 18	12 20 14 17	18 15 12 18	15 17 11 16			15 17 12 19	9 19 11 19											10 7 8 16	7 7 7 17	18 15 13 18	14 16 14 17	721	120.2
	Medicine Creek Dump	15 13 13 15	16 13 17 16	21 14 16 19	21 15 17 18	20 16 21 21	21 16 21 19																	21 14 17 21	21 14 18 19	553	130.3
	Hat Creek Diversion			17 15 13 16	12 16 13 15	18 13 13 14	14 13 10 14																	12 12 10 15	12 11 11 14	325	107.7
Linkages	Conveyor	20 13 14 17	19 13 17 15	21 13 15 17	20 13 16 15	19 14 13 15	19 14 17 14			19 9 12 13	18 12 12 12													21 10 15 17	21 11 14 16	615	123
	Access Road	21 12 12 11	17 12 15 11	17 13 12 11	15 14 16 12	16 16 17 15	16 15 18 14	20 17 17 16	16 16 16 15	13 7 10 12	14 11 10 12					14 14 14 11	14 15 12 10					17 10 16 12	15 11 14 15	19 13 19 14	15 13 17 14	900	113.5
	500 km. Transmission Corridor					14 16 16 16	16 16 14 15	19 18 16 17	16 18 16 16	16 17 17 18	14 18 17 17	13 13 14 16	14 13 13 16	18 16 16 16	16 17 16 15	21 16 15 19	18 17 15 19					17 17 16 19	16 17 16 17	18 17 16 20	18 18 16 20	1054	131.7
	Water Pipeline Corridor					14 10 14 14	13 9 13 12	14 9 13 13	11 9 10 12					21 7 11 12	18 9 9 12	14 7 11 12	12 9 9 12					15 6 12 15	14 8 9 13	18 9 12 13	17 9 9 12	576	96
	Airport															16 11 10 15	16 9 11 15									103	103
Water Intake & Related Facilities	Water Intake													18 16 13 13	15 16 12 12											115	[illegible]
	Storage and Pumping Facilities													16 15 12 12	13 13 12 10											103	103
Construction Facilities	Plant Construction					16 11 14 19	16 10 10 13																	19 11 12 21	18 10 10 14	224	112
	Mine Construction Camp	20 15 12 10	18 17 11 14	21 11 11 19	19 10 11 13																			20 9 16 18	19 6 12 13	355	118.3

Table B1.1
Numerical Ranking of Visual Impact Caused by Project Elements

Project Element	Average Ranking	Number of Visual Units Affected	Level of Visual Impact
Ash Dump	151.4	1	Extreme
Open Pit Mine	142.8	4	High
Medicine Creek Dump	138.3	4	High
500 Kv. Transmission Corridor	131.7	8	High
Generation Plant and Cooling Tower	130.6	7	High
Blending Facilities and Stockpile	127.8	5	High
Stack	124.2	8	High
Conveyor	123.0	5	High
Houth Meadows Dump	120.2	6	High
Mine Construction Camp	118.3	5	Moderate
Water Intake	115.0	3	Moderate
Access Road	113.5	8	Moderate
Plant Construction Camp	112.0	4	Moderate
Hat Creek Diversion	107.7	3	Moderate
Airport	103.0	1	Moderate
Storage and Pumping Facilities	103.0	3	Low
Water Pipeline Corridor	96.0	6	Low

Table B1.2 Average Ranking of Visual Impacts

Priority	Criteria		
	Visual Quality	Visual Impact	Views
1	Outstanding - High - Average	Extreme	Foreground - Middleground
2	Outstanding - High - Average	High	Foreground - Middleground
3	Outstanding - High - Average	Extreme	Background
4	Outstanding - High - Average	Moderate	Foreground - Middleground
5	Outstanding - High - Average	High	Background
6	Fair to Poor	Extreme - High - Moderate	Foreground - Middleground - Background
7	Outstanding - High - Average	Low - Insignificant	Foreground - Middleground - Background

Table B1.3 Visual Impact Priority Criteria

APPENDIX C

C1.0 IMPACT ASSESSMENT MATRICES AND FORMS

C1.1 MATRIX FORMAT

The following matrices summarize the findings of this study on Aesthetic Considerations. Resources on this matrix refer to the visual resources of the study area which has been divided into visual units and special features. The existing quality has been ranked in Appendix A and the significance of the impact in Appendix B.

The format for the matrices is based on ESCLEC's form M-1. It provided a common form for recording findings from the various environmental studies. For this study the entries that have or have not been made are explained below.

No entries have been made under absolute or percentage amounts because the figures would be misleading and in most cases difficult to calculate unless extensive use of the computer was made. However, during the assessment of the visual impact, approximate areas of the viewable areas for each project element were considered. These approximations were determined from field observations and topographic maps.

The letter designation entered under existing quality are taken from Table A 1-3. In appendix A 1.0 the methodology and the significance of these designations are reviewed.

Under impact significance, letter designations have been entered which indicate the importance of the visual impact caused by a project element on each visual unit. Appendix B 1.0 reviews the criteria and the evaluation. The entries on the following forms are taken from Table B 1-1. The following are the range of numerical values used to classify each impact:

Extreme:	140 and over
High:	110 to 139
Moderate:	80 to 110
Low:	40 to 79
Insignificant:	39 and under

C1.2 MATRICES

The following matrices have been completed as a summary of this study's findings and for review and analysis by others involved in the environmental study.

Matrix 1	Generation Plant and Cooling Towers
Matrix 2	Stack
Matrix 3	Ash Dump
Matrix 4	Water Reservoir
Matrix 5	Open Pit Mine
Matrix 6	Blending Facilities and Stockpiles
Matrix 7	Houth Meadow Dump
Matrix 8	Medicine Creek Dump
Matrix 9	Hat Creek Diversion
Matrix 10	Conveyor
Matrix 11	500 kv Transmission Corridor
Matrix 12	Water Pipeline Corridor
Matrix 13	Airport
Matrix 14	Water Intake
Matrix 15	Storage and Pumping Facilities
Matrix 16	Plant Construction Camp
Matrix 17	Mine Construction Camp
Matrix 18	Access Road

PROJECT ELEMENT GENERATION PLANT AND COOLING TOWERS

MATRIX 1 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT • ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O		B			
Upper Hat Creek Valley			O	B				
Medicine Creek Valley			H	F & B				
Cattle Valley			H		B			
Highway #12			A		B			
Cache Creek			F					
Thompson River			H					
Highway #1			F					
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O		B			
Trachyte Hill			H	F & M				

NOTES: • No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT STACK

MATRIX 2 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT * ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O		B			
Upper Hat Creek Valley			O		B			
Medicine Creek Valley			H		B			
Cattle Valley			H		B			
Highway #12			A		B			
Cache Creek			F					
Thompson River			H					
Highway #1			F			B		
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O		B			
Trachyte Hill			H	F & M	F & M			

NOTES: * No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT ASH DUMP

MATRIX 3 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT * ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O					
Upper Hat Creek Valley			O					
Medicine Creek Valley			H	F				
Cattle Valley			H					
Highway #12			A					
Cache Creek			F					
Thompson River			H					
Highway #1			F					
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O		B			
Trachyte Hill			H	M				

NOTES: • No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground, B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT WATER RESERVOIR

MATRIX 4 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT * ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O					
Upper Hat Creek Valley			O					
Medicine Creek Valley			H				M	
Cattle Valley			H					
Highway #12			A					
Cache Creek			F					
Thompson River			H					
Highway #1			F					
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O					
Trachyte Hill			H				M	

NOTES: • No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT OPEN PIT MINE

MATRIX 5 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT * ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O					
Upper Hat Creek Valley			O	F & M				
Medicine Creek Valley			H		B			
Cattle Valley			H					
Highway #12			A			B		
Cache Creek			F					
Thompson River			H					
Highway #1			F					
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O					
Trachyte Hill			H	B				

NOTES: * No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT BLENDING FACILITIES AND STOCKPILES

MATRIX 6 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT * ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O		F			
Upper Hat Creek Valley			O		F			
Medicine Creek Valley			H		B			
Cattle Valley			H			F		
Highway #12			A					
Cache Creek			F					
Thompson River			H					
Highway #1			F					
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O					
Trachyte Hill			H		B			

NOTES: • No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT HOUTH MEADOW DUMP

MATRIX 7 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT * ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O		M			
Upper Hat Creek Valley			O		F & M			
Medicine Creek Valley			H		B			
Cattle Valley			H					
Highway #12			A		M & B			
Cache Creek			F					
Thompson River			H					
Highway #1			F					
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O				B	
Trachyte Hill			H		B			

NOTES: * No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT MEDICINE CREEK DUMP

MATRIX 8 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT * ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O		B			
Upper Hat Creek Valley			O	F & M				
Medicine Creek Valley			H	F & B				
Cattle Valley			H					
Highway #12			A					
Cache Creek			F					
Thompson River			H					
Highway #1			F					
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O					
Trachyte Hill			H		M			

NOTES: • No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT HAT CREEK DIVERSION

MATRIX 9 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT * ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O					
Upper Hat Creek Valley			O		F & M			
Medicine Creek Valley			H			M		
Cattle Valley			H					
Highway #12			A					
Cache Creek			F					
Thompson River			H					
Highway #1			F					
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O					
Trachyte Hill			H			B		

NOTES: * No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground, B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT CONVEYOR

MATRIX 10 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT * ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O		B			
Upper Hat Creek Valley			O		M			
Medicine Creek Valley			H		M			
Cattle Valley			H					
Highway #12			A					
Cache Creek			F					
Thompson River			H					
Highway #1			F					
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O					
Trachyte Hill			H		F & M			

NOTES: * No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground, B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT 500 kv. TRANSMISSION CORRIDOR

MATRIX 11 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT * ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O					
Upper Hat Creek Valley			O					
Medicine Creek Valley			H		B			
Cattle Valley			H		F & M			
Highway #12			A		F M B			
Cache Creek			F					
Thompson River			H		F M B			
Highway #1			F		F M B			
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O		B			
Trachyte Hill			H	F M B				

NOTES: * No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT WATER PIPELINE CORRIDOR

MATRIX 12 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT * ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O					
Upper Hat Creek Valley			O					
Medicine Creek Valley			H				M	
Cattle Valley			H				F & M	
Highway #12			A					
Cache Creek			F					
Thompson River			H				M & B	
Highway #1			F				F M B	
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O					
Trachyte Hill			H			B		

NOTES: * No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT AIRPORT

MATRIX 13 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT * ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O					
Upper Hat Creek Valley			O					
Medicine Creek Valley			H					
Cattle Valley			H					
Highway #12			A					
Cache Creek			F					
Thompson River			H					
Highway #1			F			B		
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O					
Trachyte Hill			H					

NOTES: * No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT WATER INTAKE

MATRIX 14 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT • ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O					
Upper Hat Creek Valley			O					
Medicine Creek Valley			H					
Cattle Valley			H					
Highway #12			A					
Cache Creek			F					
Thompson River			H			F M B		
Highway #1			F					
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O					
Trachyte Hill			H					

NOTES: • No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT STORAGE AND PUMPING FACILITIES

MATRIX 15 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT * ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O					
Upper Hat Creek Valley			O					
Medicine Creek Valley			H					
Cattle Valley			H					
Highway #12			A					
Cache Creek			F					
Thompson River			H			F & M		
Highway #1			F					
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O					
Trachyte Hill			H					

NOTES: * No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT PLANT CONSTRUCTION CAMP

MATRIX 16 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT • ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O					
Upper Hat Creek Valley			O					
Medicine Creek Valley			H			M		
Cattle Valley			H					
Highway #12			A					
Cache Creek			F					
Thompson River			H					
Highway #1			F					
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O					
Trachyte Hill			H		M			

NOTES: * No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT MINE CONSTRUCTION CAMP

MATRIX 17 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT * ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O			B		
Upper Hat Creek Valley			O		M			
Medicine Creek Valley			H					
Cattle Valley			H					
Highway #12			A					
Cache Creek			F					
Thompson River			H					
Highway #1			F					
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O					
Trachyte Hill			H			B		

NOTES: * No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground, B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

PROJECT ELEMENT ACCESS ROAD

MATRIX 18 FOR AREA SEE FIGURE 1-1 (A, B, C-2, & C-3) SHEET 1-1

PHASE OPERATION PREPARED BY TOBY RUSSELL BUCKWELL & PARTNERS DATE JAN. 1978

RESOURCE	AMOUNT * ABSOLUTE	%	EXISTING QUALITY	IMPACT SIGNIFICANCE ** EXTREME	HIGH	MODERATE	LOW	INSIGN.
Visual Units								
Marble Canyon			O			B		
Upper Hat Creek Valley			O			F & M		
Medicine Creek Valley			H			F & M		
Cattle Valley			H			F & M		
Highway #12			A				B	
Cache Creek			F					
Thompson River			H					
Highway #1			F			F & M		
Oregon Jack			O					
Langley			O					
Special Features								
Cornwall Lookout			O			B		
Trachyte Hill			H			F & M		

NOTES: * No entries were made in this column since figures are misleading and in many cases indeterminate.

** Letter designation indicates type of view: F - Foreground, M - Middleground, B - Background.

Existing Quality: O - Outstanding
H - High
A - Average
F - Fair to Poor

APPENDIX D

D1.0 REFERENCE SECTION

D1.1 FOOTNOTES

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D1.3 GLOSSARY

Axial approach is one that follows a main line of direction formed by the linear arrangement of land forms and man-made elements.

Background refers to distant views that are usually over 5 km. away from the observer.

Berms refer to man-made landforms or mounds that have been integrated into the existing landscape to provide visual screens or enclosures. They are made from earth fill and covered with topsoil to accommodate a variety of vegetation types.

Boundary definition deals with those characteristics which visually establish the perimeter or edge of the visual unit within its general area.

Characteristics of visual impact caused by a project element consist of all the factors, with the exception of forms, that visually affect the perceived quality of the existing environment.

Colour enables the observer to differentiate objects having similar form or texture.

Compensation measures are taken to provide alternative actions for visual impacts that cannot be adequately mitigated.

Contrast provides visual compositions in which their components are immediately apparent to the observer because of the use of a variety of form, colour, line and texture.

Convergence occurs when major landforms, lines, and man-made elements tend to focus the observer's attention on one point or small area.

Cultural and land use pattern indicate the presence of human occupation as characterized by field crops, pastures, grazing areas, roads, and other man-made elements.

Digital terrain model (DTM) is a three dimensional grid that locates a series of grid points or cells from a stereopair of aerial photographs to a common reference point. The DTM is stored in a computer and can be used to generate topographic maps or to provide other types of analyses.

Enframement directs an observer's attention inwards and can be reinforced by other dominant principles such as axis or convergence.

Enclosure is formed by landscape components which surround or encompass a space.

Enhancement provides additional measures to enhance the existing visual quality.

Feature refers to a landform or landscape component that is the focal point of a visual unit or view.

Foreground refers to detail views within 0.8 km. of the observer.

Form is the mass of an object or combination of objects that appear unified.

General form relates primarily to the expression of the landform such as mountain, planes, and valleys.

High technology environment refers to a setting dominated by a group of man-made elements associated with an industrial or highly technical process such as an oil refinery.

Impact is defined as a change in the visual environment brought about by the introduction of a project element.

Landscape refers to the totality of natural and man-made surface features and elements in the study area.

Landscape components are elements of the landscape that define its particular characteristics or features in relation to other parts of the study area.

Landscaping involves the overall layout and development of vegetation and landforms such as trees, shrubs, groundcover, berms, swales and open areas, required to integrate man-made elements into the surrounding natural landscape. It involves enhancement and mitigation measures as well as site engineering considerations.

Line refers to natural and man-made elements that form a linear pattern or row.

Man-made refers to elements or changes that are introduced and produced by man.

Middleground are views within 0.8 to 5 km. of the observer.

Mitigation measures refer to courses of action that will reduce the severity of the visual impact.

Portals are visual openings within a visual unit caused by depressions such as a mountain pass or the natural drainage pattern.

Project action refers to any action taken during the development of this project that causes a direct or indirect change to the existing environment.

Project elements are the physical elements that result from the implementation of a project action.

Receptor is that visual unit or special feature which is visually affected by a project element.

Spatial sequence refers to a sequence of interconnected spaces that enhance the observers' experience as they approach a visual feature or focal point.

Special features are features within the study area that are not part of a visual unit.

Terrain pattern is the repetition of form-shape-colour-texture variation within the landscape.

Texture can be found on the surface of a tree trunk or in a clump of deciduous trees within an evergreen forest. Texture is dependent on the distance at which an object is observed.

Variety provides richness and diversity within the visual environment.

Vegetative pattern defines particular kinds or composition of vegetation cover having distinctive colour, texture and density.

Viewable area maps are maps defining points, within the study area, from which a specific object can be seen.

Visual features are those elements within the visual unit which stand out through dominant scale, isolation, distinctive shape or other special characteristics.

Visual impact is the change in the visual environment brought about by the introduction of a project element.

Visual sensitivity is the capability of the landscape to absorb visual change or modifications.

Visual unit is an area of distinctive visual character coinciding with the visual field in which an observer accumulates an impression of this character. The topography is the major criterion in recognizing visual units.

Vividness distinguishes the intensity of visual experience by giving distinctive visual clues.