A Comprehensive Approach to Visual Resource Management for Highway Agencies[1]

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Abstract: To help ensure that visual effects are considered at all stages of highway agency decision-making, the Federal Highway Administration contracted with Jones & Jones to develop and conduct a five-day training course to guide highway professionals in developing VRM processes for their own agencies.

The training course emphasizes overall principles, the need for a comprehensive approach that deals with all the elements of visual management problems, and the ability to tailor the level of VRM effort to the needs of a specific project. The concept of the VRM objective links assessment to management. The VRM objective is a tool for defining visual management problems and evaluating the effectiveness of alternative solutions. Several examples are included in this paper.

INTRODUCTION

Need And Context

Most major roads are part of the Federal-aid Highway System. As the phrase implies, the primary source of capital funds for these highways is the federal government, but the direct responsibility for planning, design, construction and maintenance rests with the states. The Federal Highway Administration (FHWA) has funding and review responsibilities for Federal-aid highways at various points in the highway development process.

FHWA relies heavily on research and technical assistance to help the state highway agencies (SHA's) continue to improve their transportation product, comply with federal environmental legislation, and reach highway decisions that are appropriate, feasible, timely and -- absolutely essential to implementation -- acceptable to the general public. An extensive training program is administered by the National Highway Institute (NHI) as part of the FHWA technical assistance effort.

FHWA has long recognized the importance of highway esthetics in its research program (Hornback and Okerlund 1976). The Office of Environmental Policy recognized the need to follow through on the research and further assist the states by illustrating how visual considerations can be included in highway agency decision-making. In 1976, the Office decided to offer a five-day course on

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"Esthetics and Visual Resource Management for Highways" through NHI to guide highway professionals in developing and implementing explicit Visual Resource Management (VRM) processes for their own agencies.

Training Course

The Federal Highway Administration contracted with Jones & Jones, a Seattle planning and design firm, to develop and conduct the training course. R. Burton Litton, Jr. assisted with concepts and critiques during the development phase, and Toner & Associates contributed their knowledge of training techniques and community involvement processes. In an unusual turnabout, Jones & Jones retained the Washington State Department of Transportation as subconsultants. The help of the Department's landscape architects, engineers and librarians was an invaluable guarantee that the course approach would tally with state highway agency needs and that the course techniques could be applied immediately to actual projects.

To accompany other group training materials, the consulting team produced a workbook (Jones & Jones 1978) which includes principles, processes, techniques and exercises, a comparative glossary and extensive references. To date, some 300 administrators and staff professionals from state and federal agencies have participated in the course. The course has been enthusiastically received.

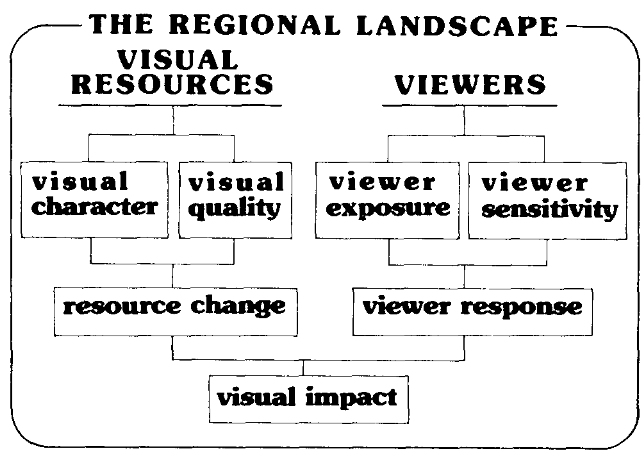
The course is intended to help participants integrate visual resource considerations into their own agency decision-making systems. For this reason, the course emphasizes overall principles as well as illustrating specific techniques which can be (and are) applied immediately to actual projects by participants. It stresses the need for a comprehensive process of visual resource assessment and evaluation that can provide the factual groundwork for later management deliberations. This process must deal with all the elements of visual management problems from systems planning through project maintenance.

The course also stresses the need for flexibility, i.e., the ability to tailor the level of VRM effort on any specific project to the needs of that project. Because of the needs for flexibility, ease of communication, and detailed consideration of project alternatives, the course primarily utilizes descriptive approaches to visual resource assessment. However, computer-assisted and psychometric approaches can also be effectively employed.

ASSESSMENT PROCESS

The general organization of the assessment process is illustrated in figure 1. The major components to be assessed are the regional landscape in which a project is to be constructed, the visual resources of the site, and the viewers who will be affected by the visual impact of the project. In the assessment process, equality of consideration is implied between viewers and visual resources. Relative importance varies from project to project and can only be determined by the results of the assessment process or an abbreviated version of it -- a "scoping study."

Figure 1--Visual resource assessment process.



This assessment process is similar in outline to the VRM systems employed by several major federal agencies. The similarity is deliberate, because many SHA's have to respond to the requirements of these agencies, particularly in the West.

Regional Landscape

The entire assessment process is encircled by the <u>regional landscape</u> to emphasize the importance of identifying the visual context of both state-wide programs and individual projects. The starting point of landscape classification is identification of the region's <u>landscape components</u>: its landform and landcover (water, vegetation and manmade development). Characteristic combinations of these components are termed <u>landscape types</u> and recur throughout a landscape region. A landscape type is visually homogeneous and is usually only one of several types visible in a given landscape unit. Unlike a landscape type, a landscape unit is a visually distinct combination of landscape components with a "sense of place" -- frequently based on spatial enclosure. The visual resources of landscape units can be compared and assigned management priorities within the context of the regional landscape.

Visual Resources

Once the landscape setting has been placed in its regional context, the next step in the assessment process is the assessment of the setting's visual resources.

Visual character is seen in terms of pattern elements (e.g., form, line, color, texture) and the pattern relationship between these elements (e.g., dominance, scale, diversity, continuity). Assessments of visual character are descriptive (Viohl 1976) and utilize concepts readily understood by persons inside or outside the design professions. It is therefore relatively easy to train persons in their use and to obtain consistent, predictable results (Craik 1972).

If explicit and well-defined criteria are used, evaluative appraisals of specific aspects of visual quality in the landscape can be objective in the sense that "reliable" results are obtainable from different observers. Such appraisals can also predict judgments of visual quality by the general public if appropriate criteria are used. This predictive capability is another test of objectivity: evaluative criteria are "valid" if they measure factors related to general public judgments of visual quality.

Three evaluative criteria are introduced and applied in the training course: vividness, intactness and unity (Burnham et al.1974). These criteria are largely independent. For example one landscape may be vivid because of a billboard, while having low visual unity and quality. Another more natural landscape may be visually intact, exhibit a high degree of visual unity and yet lack vividness and therefore attain only moderate visual quality. The challenge to the highway professional is to achieve project-landscape relationships that exhibit all three characteristics in a moderate-to-high degree.

After assessment of existing conditions (visual quality, visual character and visual information), the next step in the process is measuring the resource change that will be introduced by the project. Changes in visual quality and visual character can only be accurately evaluated if careful simulations of a project are prepared from viewpoints representative of the locations from which the project will generally be seen.

Viewers

The other half of the assessment process outlined in figure 1 concerns the viewers. Several viewer issues are subsumed under viewer exposure. These include mapping a project's viewshed and identifying viewer numbers, viewer location and view duration, all of which can be resolved on the basis of visibility analysis and are well-suited to computer-assisted approaches such as VIEWIT (Travis and Elsner 1975).

Issues related to viewer concern for visual amenity are subsumed under viewer sensitivity. The level of viewer concern can vary significantly, depending upon viewer activity, local values and the broader cultural significance of specific visual resources. These issues can be addressed by combining the tools of the social scientist and the design professional. Psychometric approaches can be very useful; visual considerations should also be included in an agency's community involvement program. The program can then identify project issues, community preferences, specific valued resources, levels of concern and the degree to which expressed concerns are shared in the community.

Measuring viewer response to a projected resource change is essential in determining the acceptability of a project. Measures of response include the physical measures of visibility and viewer exposure and the social measures of viewer sensitivity discussed above. Simulations of project appearance are excellent tools for eliciting viewer response in community involvement programs. If the simulations are accurate and representative of actual viewing conditions, they can also help to dispel project opposition when it is based on exaggerated fears over project appearance.

Visual Impact

An adequate visual impact assessment must examine both the resource change introduced by a program or project and the viewer response to that change. Using community workshop techniques, it is possible to combine all the elements of visual impact into a single numerical rating. Whether this is an effective approach remains an open question. It may often be more useful to narrow the range of factors under final consideration to those that demonstrate significant differences among alternatives.

A documented visual assessment is often required for major projects at the EIS stage. VRM documentation can be useful at other stages, too, because of the long time periods inherent in the highway development process and the lack of staff continuity inherent in the organization of SHA's along functional lines. The staff for the next project stage needs to know the project context, visual issues and VRM decisions for effective follow-through.

MANAGEMENT PROCESS

Approach

The visual resource assessment process develops an information base. The next step is to use this assessment information to help make decisions about managing visual resources, from systems planning through maintenance.

Figure 2--Visual resource management process.

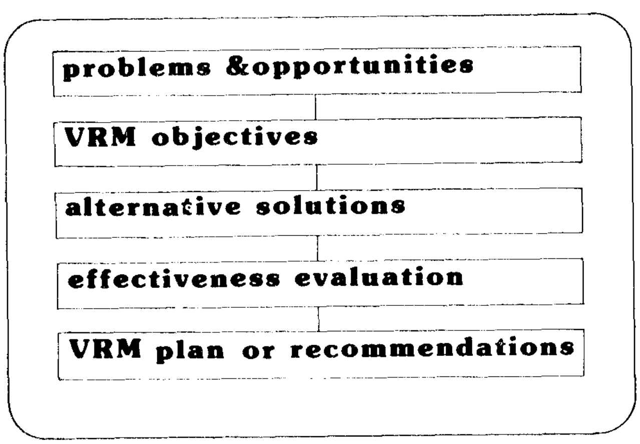


Figure 2 presents the management process in outline. The first step, identifying and prioritizing problems and opportunities, flows directly from the visual. assessment process. In the next step an important concept, the VRM objective, links assessment to management. The VRM objective is a tool for defining visual management problems and evaluating the effectiveness of alternative solutions to those problems. Based upon an explicit evaluation of effectiveness, a VRM plan or set of recommendations can be prepared for interdisciplinary consideration within other project issues.

VRM Objectives

"Management by objective" is widely used in government and industry, and is extremely useful for integrating VRM with other aspects of management. A VRM objective must specify the visual resources and viewer groups to be affected, the results to be achieved, the time for achievement and the measures by which achievement is to be evaluated.

The syntax for writing a VRM objective can be reduced to this formula: Environmental Management Principle + Assessment of Effect + Visual Resources + Viewer Groups. In essence, it is a visual "performance specification;" the key to the evaluation of alternative solutions is the appropriate assessment of effect. Environmental management principles are imperative verbs, such as "enhance" or "mitigate" that specify levels of achievement in relation to levels existing before the project or program.

VRM objectives can be as broad or as detailed as desired. As visual resources, viewer groups and assessment of effect become more specific, the ambiguity decreases and the likelihood of appropriate VRM treatment increases. For example, consider these two VRM objectives: "Enhance the views of major landmarks for drivers on the freeway;" "Enhance the duration of views of major downtown landmarks for northbound drivers on SR 509." It should be noted that a VRM objective need not be limited to visual character or quality issues, but can address any resource or viewer concern.

APPLICATION

Project

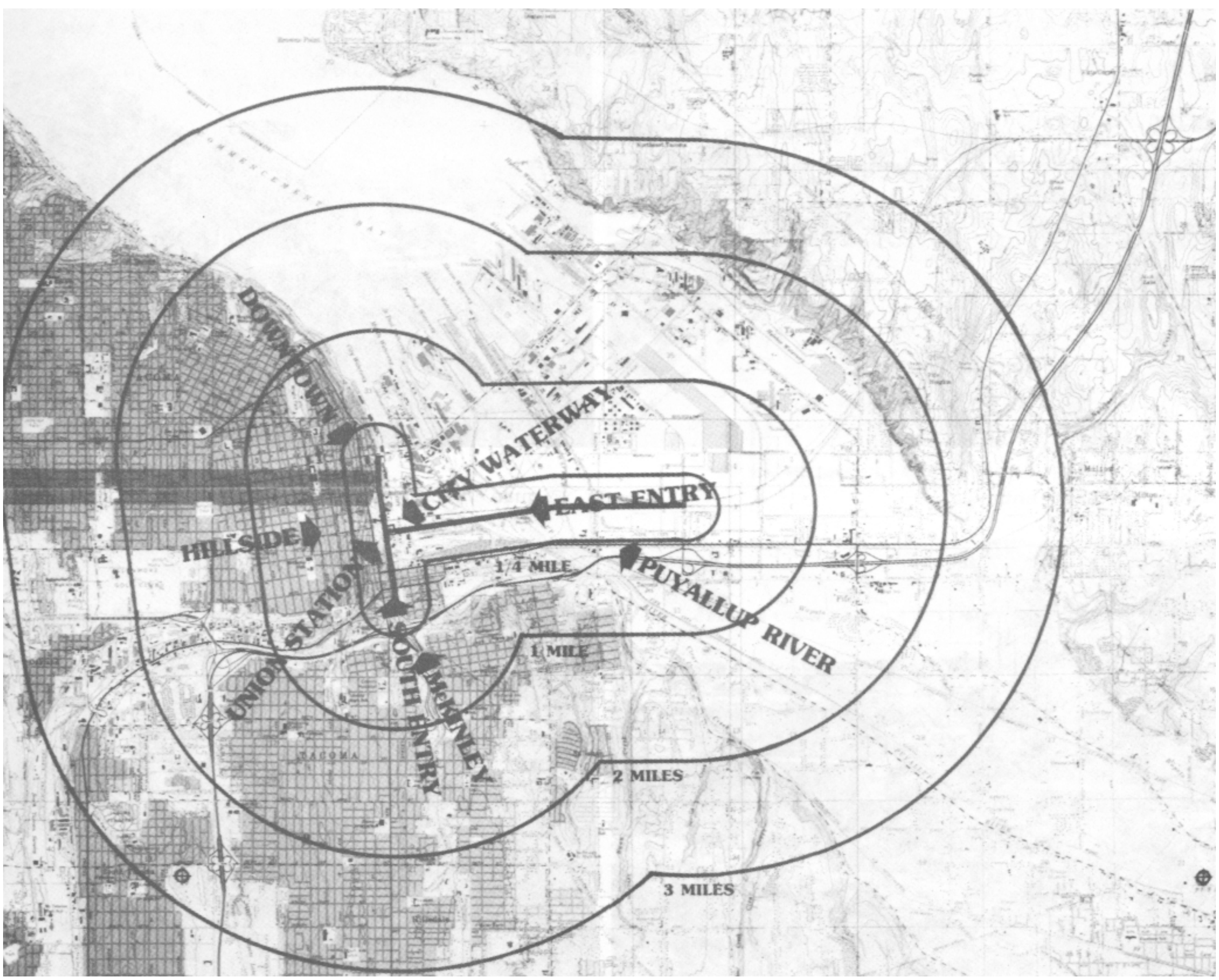
An application of these assessment and management processes, drawn from work in progress, demonstrates the usefulness of the VRM objective in highway decision-making. The example is an urban connector that has recently been added to the Interstate system. At the time of writing, this highway is in the project development stage, following the circulation of the Draft EIS. The corridor has been defined, but (a) final alignment, and (b) structural concepts are still at issue.

The setting is an urban waterfront. The road will be an elevated structure over railroad tracks, between an historic station on a low bank and a redeveloping marina and mixed-use area on the waterfront (fig. 3). Community concern over the visual effects of the highway is high because of the cultural significance of the station, local plans for the waterfront and local concern over the present character and quality of northbound city entry views.

Figure 3--Project corridor (heavy black line), distance zones and location of key views.

View Selection

There are potential conflicts between the visual needs and desires of two major viewer groups: the highway user and the highway neighbor. The public concern for improving the northbound entry to the downtown implies a high, straight road oriented to views of key buildings, including the station. On the other hand, concern over the road's impact on views of the station from upland areas and from the waterfront implies a low road, close to the bank or terrace, with more limited entry views. The level of community concern suggested the use of simulated views to demonstrate the future appearance of the road.



The location of these views has been carefully determined because these locations will become "landscape control points" for the conceptual design of the road (Litton 1973). The viewshed of the highway was mapped, using the end and middle points of the corridor and the highest likely roadway elevations (a worst-case assumption). Viewing distance zones were delineated and viewer groups were mapped on the basis of land use and travel routes. Eight key views have been selected as best representing concern. Four of these locations were used to evaluate alignment alternatives because of their importance:

View	Concern
South Entry	Enhance NB entry views
East Entry	Enhance WB entry views
Union Station	Minimize impact on views of station
City Waterway	Minimize impact on views from waterway

These views are located in figure 3 and reproduced in figures 4 through 7. They have been deliberately selected to give the least obstructed and clearest views from actual viewpoints accessible to the public.

Figure 4--South entry.

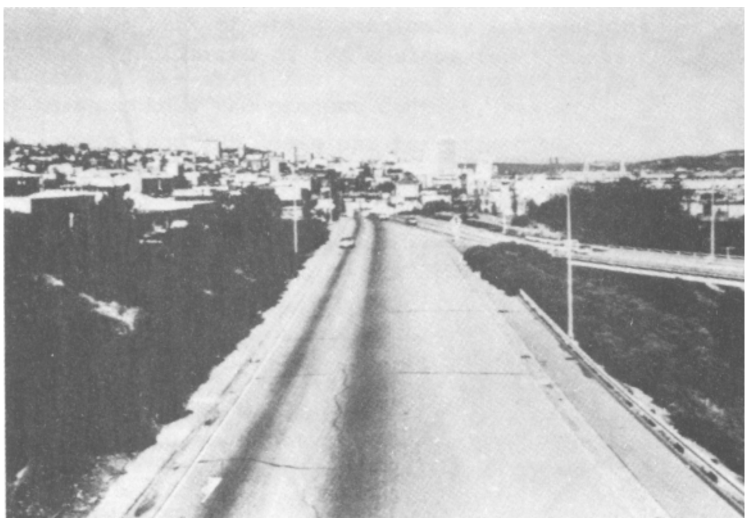


Figure 5--East entry.

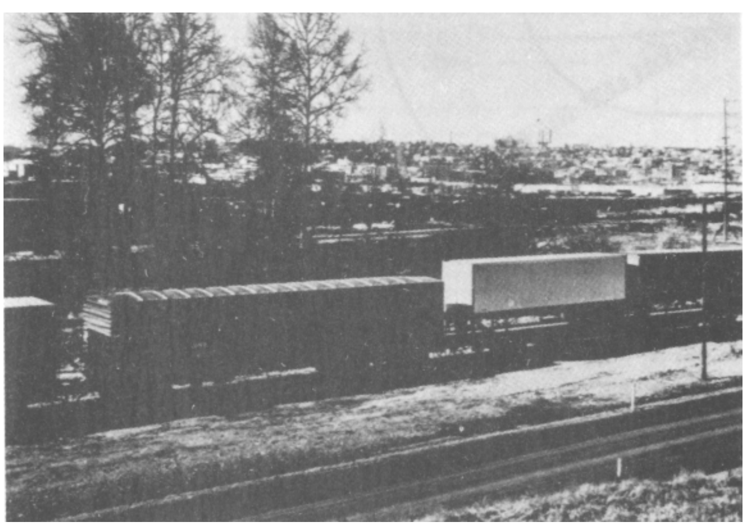


Figure 6--Union station.

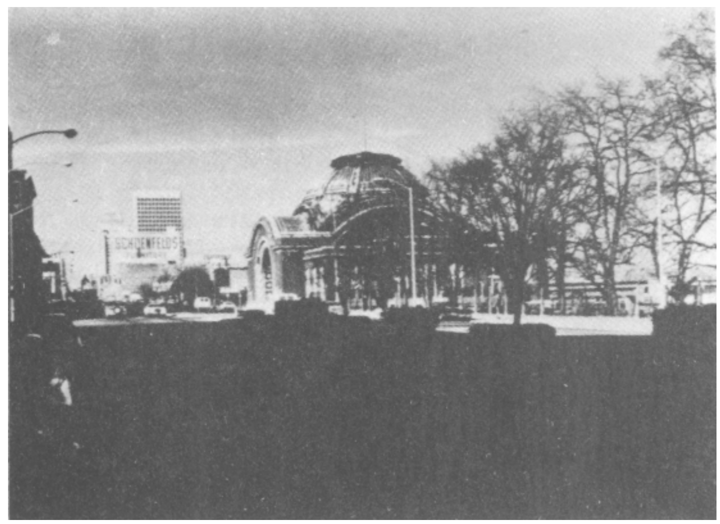
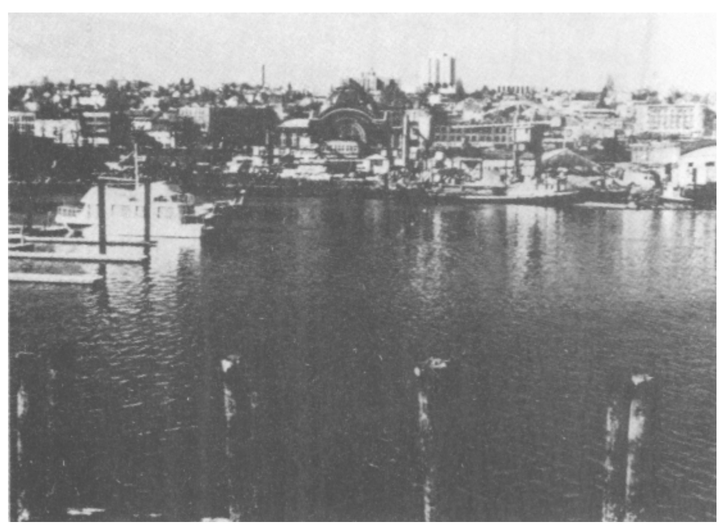


Figure 7--City waterway



Alignment Selection

For the development and evaluation of alignment alternatives, black-and-white sketches have been produced from each photograph. Generalized sketches of five concepts have been prepared for each of the four key views illustrated here. These sketches, illustrated in figures 8 through 11, are accurate, though simplified, versions of the key views. Accuracy is essential to their public credibility. Specific VRM objectives for each view have been used to help develop and evaluate the alternative alignment concepts displayed in the sketches; at this stage these objectives are related to viewer exposure:

South Entry--Maximize the duration of the northbound driver's view of Union Station and the PNB building (measure = lineal feet).

East Entry--Maximize the duration of the westbound driver's view of Union Station (measure = lineal feet).

Union Station--Minimize the extent of roadway and structure visible behind and adjacent to Union Station (measure = percent of foreground).

City Waterway--Minimize the extent of roadway and structure visible between Union Station and the water (measure = percentage of foreground).

Figure 8--South entry, alignment concept 1.

SOUTH ENTRY • PRELIMINARY SKETCH • CONCEPT 1

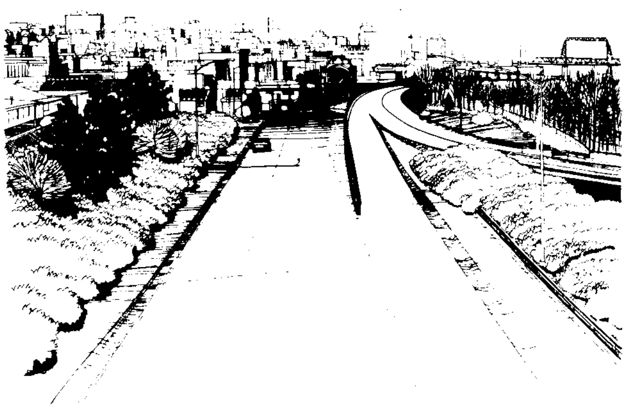


Figure 9--South entry, alignment concept 2.

SOUTH ENTRY • PRELIMINARY SKETCH • CONCEPT 2

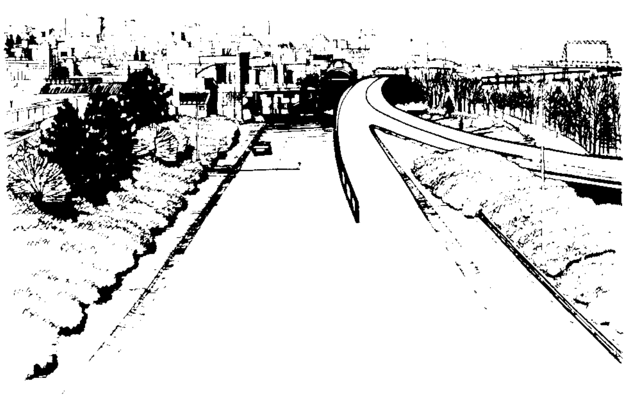


Figure 10--City waterway, alignment concept 1.

CITY WATERWAY • PRELIMINARY SKETCH • CONCEPT 1

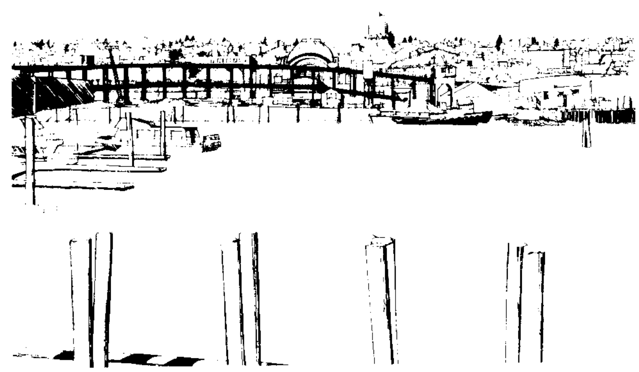
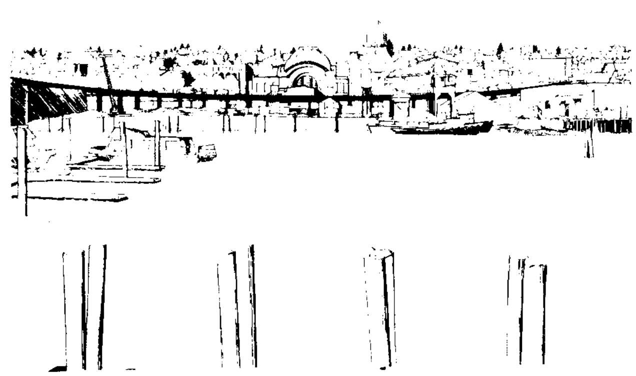


Figure 11--City waterway, alignment concept 2.

CITY WATERWAY • PRELIMINARY SKETCH •CONCEPT 2



The evaluations of the alignment alternatives in terms of these objectives are summarized in table 1. The rank order of the alignment concepts varies among the objectives. The importance attached to each objective and key view is largely a matter of viewer sensitivity, so members of the community were asked to assign an importance ranking to each of the eight key views. Table 2 presents these rankings, which can be combined with table 1 to identify alignments that best meet the visual criteria. This information is being considered as one input to the alignment selection process, along with engineering, cost and joint-use considerations.

Table 1--Visual effectiveness of alignment concepts (rank order)

Key View	CONCEPT				
	1	2	3	4	5
South Entry	5	2	1	3	4
East Entry	5	1	3	4	2
Union Station	5	1	1	4	3
City Waterway	5	1	2	4	3

Table 2--Perceived importance of key views (number of persons giving each importance rating, where 1 = highest importance, 8 = lowest importance)

Key View	IMPORTANCE							
	1	2	3	4	5	6	7	8
South Entry	5	5	3	2	0	1	0	0
East Entry	0	4	0	0	5	1	3	2
Union Station	4	4	2	5	0	1	0	0
City Waterway	2	4	4	1	1	2	0	0
Downtown	2	1	5	2	3	1	1	0
Hillside	1	1	1	3	3	2	3	1
McKinley	1	0	0	1	3	4	3	4
Puyallup River	0	0	0	1	0	2	4	8

Concept Design

Once an alignment is selected, design effort will be concentrated on development of structural and joint-use alternatives. Additional VRM objectives will be developed to help guide design. These objectives will go beyond viewer response to focus on the visual character of the roadway structures in relation to the urban setting and their effect on the overall visual quality of the project area.

CONCLUSION

This pragmatic and project-oriented VRM approach is very flexible; it directs effort to the specific visual resource or viewer response concerns that are most important at a particular project location. It has strong implications for design, since it stresses the regional context, the importance of assessing projects from key viewpoints used by the public, and directs the designer's attention to a reasoned strategy for visual compatibility and visual quality.

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