

PLANNING CASE STUDIES

TAB 4

PLANNING CASE STUDIES

[REDACTED]

Array of Plans Considered

Corps-wide planning guidance, public and interagency inputs, and sound planning principles require screening of an array of possible alternatives. Accordingly, an array of potential permanent Federal plans was specifically considered at various times during the plan formulation process. Specific flood damage reduction strategies that were identified and considered for incorporation into the Roseau plan formulation included the following:

1. No action alternative, which would rely on flood insurance and flood emergency actions in the study area.
2. Nonstructural alternatives that would rely on flood proofing actions in the study area.
3. Upstream floodwater storage features (reservoirs) as a primary and secondary flood damage reduction strategy for the Roseau area.
4. A series of large diversion plans, including west and east diversions, that would divert flows from the main channel of the Roseau River around the city of Roseau.
5. A permanent levee/floodwall system to provide flood reduction capacity. Both 100-year and 500-year floods were considered. This alternative would upgrade and expand the city's current temporary levee system.

6. A series of smaller diversion plans, including north and northeast diversions, that would be shorter in distance than the larger diversions and would also rely on diverting flows from the main channel.
7. A variety of in-town channel modifications were considered. These modifications were largely integrated with the permanent levee plans.
8. Two downstream high-flow channel cutoffs. These cutoffs would bypass flows once the 3-year or 5-year flood stage is realized.
9. Railroad bridge modifications were considered. Public input indicated that the bridge was acting as a constriction point. This alternative was considered as a primary and secondary flood damage reduction strategy.
10. Ecosystem restoration and recreation features were considered as optional features that could greatly enhance the overall beneficial effects of the project.

Sequence of Screening Efforts

The general formulation strategy and sequence of the plan formulation used for this study were as follows:

- Define array of possible primary and secondary features. These features were considered as measures that could potentially address some of or all of the planning objectives, opportunities, and concerns. See below for a description and list of plans considered.
- Analyze a range of capacities/sizes for each identified feature as a standalone feature (examining cost and benefits, engineering effectiveness, and social and environmental impacts); that is, how effectively can they meet the goals and objectives of the study while maintaining the economic, social and environmental criteria.
- Determine the most cost effective size for each feature by comparing net benefits associated with each feature (Note: this process is used to establish project feature sequencing with the feature having the highest net benefits being the first in place).
- Determine the extent that this cost effective sized feature could meet the overall project design objectives. Those features that are primary features would significantly solve the problem defined; secondary/lesser features are ways to fine-tune the formulation.
- Identify combination plans of primary features and rank features using relative net benefits as the ranking method.

- Analyze the combined plans to optimize the primary features
- Analyze the secondary features as add-on features to see if, when added, each is incrementally justified – as last in place features thereby optimizing the formulation as the NED plan.
- Determine the overall level of flood damage reduction the NED plan would provide and compare that to the desired project design objectives.
- Coordinate with sponsors and stakeholders to determine if optional aesthetic, recreational and environmental restoration features are to be integrated into a multipurpose project and show the feasibility of any recreational or environmental increments to be added to the NED plan.
- Define the recommended plan, conferring with the non-Federal sponsors to determine if they have an LPP and to integrate fully coordinated multipurpose features, as desired by sponsors.
- Document the recommended NED/LPP plan.

The initial and final screening of alternatives documented in this report was done consistently to allow consideration and comparison of a variety of possible alternatives. The alternatives were analyzed in a similar manner with a similar level of detail, and results were based on project functionality, costs, and environmental and social impacts. Those alternatives that were not eliminated from consideration were analyzed in greater detail as the formulation process progressed. The cost estimate for the recommended plan presented in this report was done at a Microcomputer Aided Cost Estimating System (MCACES) level of detail. This report includes an environmental assessment, and a signed Finding of No Significant Impact (FONSI).

Plan Descriptions

The results of past flood damage reduction studies conducted on the Red River and more specifically in the Roseau River watershed were researched for possible application, and many possible flood damage reduction strategies were considered for implementation at Roseau. Alternative flood damage reduction plans and features that were identified during the reconnaissance phase/Section 905(b) analysis study have also been reviewed, refined, and further evaluated.

Scoping meetings were held with the public and agency representatives to help identify existing and future without project conditions, water resources problems and opportunities, and possible alternative flood damage reduction solutions. This process has led to identification of additional flood damage reduction features that have been added to the array of alternatives evaluated and screened.

A graphic (figure 2) shows the various diversion plans that were considered in this feasibility study screening. The in-town levee alternatives, not labeled in figure 2, were to follow the alignment of the river.

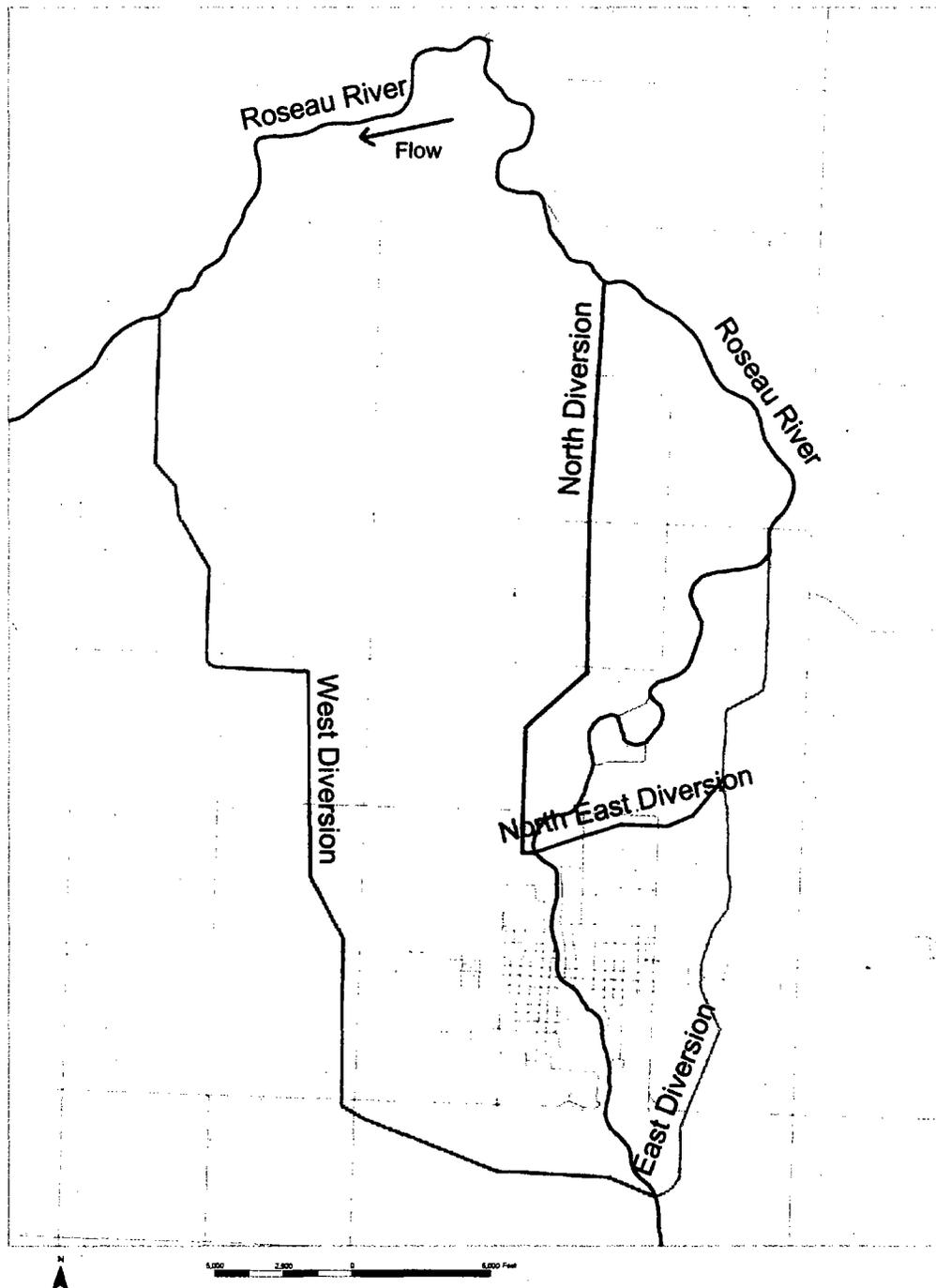


Figure 2 - Alternatives Considered

It is important to note that the flood damage reduction alternative measures considered would provide enough flood damage reduction so as to be primary features, and other measures evaluated could only be viewed as secondary features that might be used in combination with primary measures (for example, modification of the railroad bridge could only reduce flood stages by 0.2 to 0.3 foot for a small downstream reach and could not physically meet the flood damage reduction objectives as a primary feature because it would not be a solution as a standalone plan). The secondary features that were eliminated as standalone plans were further analyzed during optimization of the selected plan.

Initially, the project delivery team developed a list of possible alternatives that could potentially meet the goals and objectives of the project, while being economically, environmentally, and socially feasible. In addition to the initial plans, some proposals were added to the screening as a result of increasing knowledge of the project area along with public and interagency inputs. The following is a list of those potential flood damage reduction plans.

- No action
- Upstream floodwater storage
- Permanent levee/floodwall system
- West aligned diversion plan
- East aligned diversion plan
- North aligned diversion plan
- Northeast aligned diversion plan
- Channel modifications/riverbank unloading
- High-flow cutoff channels
- Railroad bridge modifications
- Nonstructural measures

In addition to the potential flood damage reduction plans, ecosystem restoration and recreation features were included as possible standalone features that would add to the overall viability and desirability of the project. A brief description of the plans considered is provided below:

No Action Plan

The no action plan would result in the Federal Emergency Management Agency (FEMA) establishing a new regulatory floodplain with a large portion of the city in the regulatory floodplain. The city would continue to rely on heroic flood fighting efforts and emergency levees, which are prone to failure, to combat floodwaters. Expected average annual damages from this alternative would be \$2.5 million. This condition would continue to have negative social and economic impacts on the city and its populace. Roseau would continue to be susceptible to flooding and future damages would continue. It is anticipated that environmental damages would result during large floods where sewage and other contaminants could be released.

Upstream Floodwater Storage

Upstream floodwater storage would require holding back significant amounts of water in a reservoir and releasing the water after the flood threat had subsided. This water retention could be done with a dam or other structure to hold back flows upstream of Roseau. This plan would require an impoundment structure and large areas of land, resulting in relocations and potential environmental effects. This alternative could alter high quality riverine and wetland habitats.

Diversion Plans

The diversion plans were looked at in four primary areas. The concept behind these plans was to divert flows from the main channel through a diversion to reduce stages in town. Options for diverting flows upstream of Roseau were the east and west aligned diversion. The north and northeast diversions were designed to divert flows downstream of Roseau. These plans all would have similar social and environmental effects, primarily depending on the length of the diversion being proposed. The west diversion plan was significantly longer than the other diversions and would have the most environmental effects on woodland and wetlands. The other diversion plans considered (north, east, and northeast) were all similar in length and would have similar social and environmental effects, primarily minor effects on woodland and wetlands, with no measurable loss in habitat. Each of these plans would include a channel, inlet and outlet structures, a restriction bridge, highway bridges and a railroad bridge (east and west diversion only).

Levee/Floodwall Plans

The levee/floodwall plans were proposed to hold back floodwaters as they encroached on the town. The plan called for the alignment to follow the river through town. The city already had existing emergency levees in place that would need to be analyzed (see the geotechnical appendix (Appendix G) for analysis). This alternative would include a series of main levees, tieback levees, closure structures, and possible pump stations. It would require the removal of a number of structures as the levee/floodwall would need to be set back from the river because of geotechnical conditions along the river channel. In addition to the large social effects, the river channel itself would need to be modified, which would affect large amounts of riverine habitat and permanently alter the river channel.

Channel Modifications

Channel modifications would have been designed to increase the efficiency of the channel. This alternative would straighten the river channel and would require some disposal areas for the excavated material. These plans could also be incorporated into the levee/floodwall plan to cut back the river side slope to accommodate the setback levees. As indicated with the levee/floodwall plan, this alternative would have large impacts on riverine habitat by permanently altering the river channel.

High-Flow Cutoff Channels

The high-flow cutoff channels concept was similar to that of the diversion channels but significantly smaller in size. Two channels located downstream of Roseau were considered. These channels would be designed so high flows would be able to move downstream faster than the without project condition. This alternative was designed to cut off two oxbows and would need an inlet and outlet at each cutoff. This alternative would have minimal social effects and environmental effects would be confined to the inlets, outlets, and channel cut.

Railroad Bridge Modifications

The railroad bridge modifications were proposed later in the planning process. It was discovered that the railroad bridge was acting as a bottleneck, and modifications to remove the bottleneck could potentially have positive results. This alternative was raised in public meetings and would alleviate some concerns the local citizens have about the railroad bridge. This alternative would have minor environmental effects because the area is already disturbed by the presence of the existing structure. This plan could also be a secondary alternative that could enhance the performance of another alternative.

Nonstructural Measures

The nonstructural measures were considered as a potential way to protect the city from flooding while avoiding a large construction project. Some possibilities would be flood proofing the structures, relocations, or utility relocations. This alternative would have a large social impact because the majority of the city is in the 100-year regulatory floodplain. On a small scale, the nonstructural solutions would be more socially desirable, and this alternative could be used to optimize other alternatives.

Ecosystem Restoration

Ecosystem restoration was considered as a possible way to enhance the overall project. Ecosystem restoration would have been in addition to the flood damage reduction portion of the project, and opportunities were present to restore habitat in areas that are currently marginal farmlands. This alternative would be a good way to enhance the environment in the region, providing additional high quality habitat near the city.

Recreational Features

Recreational features were considered as a way to enhance the overall project. The Roseau area is in rural northern Minnesota, and very few recreational opportunities are present in the area. The market area for Roseau would be those areas within a 1-hour drive. Potential features were multipurpose trails, off-road vehicle trails, a canoe trail, and camping facilities. Tree and native plantings would be used to enhance the overall recreational experience; these plantings would have some beneficial effects on the

environment. Socially, recreation features are very desirable and have been met with strong support from the city of Roseau and the citizens in the region.

Once the plans were defined, the project team did a preliminary analysis to eliminate those plans that conceptually would have extremely large costs and would not be expected to have a significant amount of flood damage reduction benefits (see table 1). It was determined that the upstream floodwater storage, channel modifications, and nonstructural measures would not be economically feasible because of their large costs or limited ability to reduce stage.

Table 1.

Measure	Reason for Elimination
Upstream Flood Water Storage	<ol style="list-style-type: none"> 1. The upstream storage would be very costly and have minimal ability to reduce the river stage in Roseau. 2. Much of the watershed is flat and creating a reservoir could have large environmental and social effects
Channel Modification	<ol style="list-style-type: none"> 1. Channel modifications would have high environmental impacts with minimal ability to reduce stage. 2. The ability to reduce stage would only be in limited areas, and overall net benefits are low with this alternative. 3. This plan was dropped as a stand alone plan but will be considered with the levee alternatives.
Non Structural measures	<ol style="list-style-type: none"> 1. Flood proofing is cost prohibitive because of the large numbers of properties due to the flat topography in the project area. 2. Relocations or buyout measures are not feasible as the majority of the city will be in the regulatory floodplain and the costs of relocating the city would not be justified. 3. This plan was dropped as a stand alone plan but will be considered as a way to optimize future plans

[REDACTED]

[REDACTED] showing the preliminary analysis, the project team conducted a final analysis of flood damage reduction measures. [REDACTED] those plans with lower net benefits were eliminated (see table 2).