7.0 WATER RESOURCES

The following sections describe the surface and groundwater water resources of the project area and the potential impacts on those resources that could result from the four Build Alternatives and the No-Build Alternative. Where relevant, measures that could mitigate possible impacts are also discussed.

7.1 SURFACE WATER

7.1.1 Affected Environment

Various rivers, lakes, streams and wetlands exist within each of the Build Alternative corridors. Identification of the surface water resources within each corridor was based on a review of aerial photography, U.S. Geological Survey (USGS) maps, Minnesota Department of Natural Resources (MnDNR) public waters maps and field investigations.

As discussed in previous sections, the existing land uses are primarily agricultural for the majority of the length of the proposed Build corridors. Drainage from the agricultural landscape generally flows toward the Mississippi River, often through various wetlands, small lakes and creeks. Existing roadways within the Build corridors primarily utilize rural roadway designs where ditches and culverts are used to convey stormwater. The roadway drainage system conveys runoff from trunk highways and local roads and from adjacent off-road areas.

All of the alternative alignments lie within sub-watersheds of the Mississippi River watershed, which ultimately drains to the Mississippi River. Additionally, many of the Build Alternatives include small segments in watersheds of tributaries to the Mississippi River. Figure 7.1 shows the sub-watershed boundaries surrounding each alternative, along with the dominant flow patterns within each boundary. A brief description of the drainage patterns for each Build Alternative is provided below.

Alternative A

Alternative A lies primarily within a Mississippi River sub-watershed. The southern connection with I-94 is within the Plum Creek and Johnson Creek watersheds (see Figure 7.1), which ultimately drain to the Mississippi River. Drainage north of CSAH 8 flows through various wetlands to Long Lake before reaching the Mississippi River.

Alternative B

As shown in Figure 7.1, the I-94 interchange area (south of the Mississippi River) for Alternative B lies within the Clearwater River sub-watershed, which is regulated by the Clearwater River Watershed District. This is the only portion of all four Build Alternatives which lies within a watershed district that conducts watershed management activities within its boundaries. The existing TH 24 roadway drains overland to the river.

Alternative B follows existing TH 24 for much of the corridor, and utilizes a rural design section through the City of Clearwater. Stormwater in this segment is carried in shallow ditches that eventually drain down the bluff to the river. The central portion of Alternative B primarily drains to the Mississippi River. The far northern section of Alternative B would drain to various wetlands and waterbodies prior to draining to Clear Lake.

Alternative C

Alternative C is located within two Mississippi River sub-watersheds. The southern and central sections of Alternative C primarily drain to the Mississippi River. The northern third of the section is on the same alignment as Alternative B, and drains to various wetlands and waterbodies, including Clear Lake, prior to discharging to the River.

Alternative D

Drainage patterns for Alternative D flow toward the Mississippi River with the exception of a small portion at the northern tip of this alignment, which flows toward Elk River.

7.1.2 Environmental Consequences

The No-Build Alternative would not increase the amount of impervious roadway surface in the project area and would not alter the existing drainage conditions with regards to quantity of stormwater runoff. However, each of the four Build Alternatives would increase the amount of impervious area within their respective project corridors, decreasing infiltration, therefore, increasing the quantity of stormwater runoff. Of the four alternatives, Alternative B would have the smallest increase in impervious area, as the majority of the southern half of the proposed highway utilizes the existing TH 24 alignment. Alternatives A, C and D do not utilize existing roadway alignments to the degree that Alternative B does, and therefore, the percent increase of impervious area along these alternative alignments would be more than that of Alternative B. Although the Build Alternatives increase impervious area, increases in total surface water discharges will be minimal due to the rural highway design, where runoff from the impervious surface runs into grass ditches that allow for infiltration, decreasing total discharges.

The main difference among Build Alternatives would be the need to construct an urban roadway system for the portion of Alterative B in Clearwater. This system would use curb and gutter and storm sewer to convey runoff from the roadway and would likely utilize some type of energy dissipation measures as it carries stormwater down the bluff to the river.

7.1.3 Mitigation

The proposed rural roadway design within each project corridor would include vegetated ditches, culverts and open channels for the majority of the new alignment as opposed to the curb, gutter and storm sewer drainage system characteristic of urban drainage design. Rural drainage systems allow surface water from the roadways to more easily match existing drainage patterns, reduce the total volume of runoff and reduce peak flows through attenuation, infiltration and plant uptake. Bridge runoff would be directed to the ends of the bridge and eventually through ponding systems, which may attenuate the rate of discharge to the River. Water quality ponds, as described in the next section, may also provide opportunities to reduce peak discharge rates.

FIGURE 7.1 11 X 17 COLOR

BACK

7.2 SURFACE WATER QUALITY

This section presents background information regarding the waterborne pollutants of most concern with respect to highway stormwater runoff and a comparison of the DEIS alternatives with respect to opportunities for avoiding or mitigating water quality impacts.

7.2.1 Affected Environment

The Mississippi River is the dominant water body in the DEIS study area. This segment of the river is included in the state Wild and Scenic River system (see Section 6.10). The Minnesota Pollution Control Agency (MPCA) includes the Mississippi River from the CSAH 7 bridge in St. Cloud to the northwestern limits of Anoka County in their list of "Outstanding Resource Value Waters." Specifically, this segment of the river is classified as a "Federal or State Designated Scenic or Recreational River Segment"[1]. This classification places more stringent water quality standards on the river compared to some other waters in Minnesota as per the MPCA Chapter 7050 regulations.

The drainage area of the Mississippi River located upstream from the DEIS study area is relatively large. Therefore, water quality of the Mississippi River within and downstream from the study area is influenced by land uses and water quality improvement practices upstream from the study area.

Table 7.2.1 shows an assessment of the Mississippi River between Clearwater and Elk River that the MPCA prepared for the United States Congress under section 305(b) of the Clean Water Act. The purpose of this assessment is to understand the extent to which this portion of the river meets the goals of the Clean Water Act and Minnesota water quality standards. Based on the data contained within Table 7.2.1, water quality within the Mississippi River is relatively good, although in 2002, the MPCA added the section of the Mississippi River from the Clearwater River to the Elk River in its list of impaired waters, due to fecal coliform levels above swimmable waters limits and due to impaired biota identified as an aquatic life concern. The Clearwater River is also within the corridor at the south end of Alternative B. The section of the Clearwater River from Lake Betsy to Clear Lake (i.e., the confluence with the Mississippi River) is also on the impaired waters list, and has been since 1996, due to fecal coliform levels above swimmable water limits and due to low oxygen levels as an aquatic life concern.

Existing stormwater runoff along each of the proposed corridors is primarily from rural/agricultural land uses. Stormwater flows overland to the Mississippi River through a variety of lakes and wetlands. The exception is the existing TH 24 (and Alternative B) alignment through the City of Clearwater, which is a rural roadway section that conveys stormwater runoff via overland flow and grass ditches. Common pollutants from rural/agricultural and urban land uses include nutrients (e.g., nitrogen and phosphorous), pesticides, organic material that adds to biological oxygen demand (BOD) in surface waters, and sediment.

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[1] Minnesota Pollution Control Agency – Northern District Brainerd Office, Upper Mississippi River Basin Information Document – Section III: Mississippi River Basin, 2000.

TABLE 7.2.1
ASSESSMENT OF WATER QUALITY – MISSISSIPPI RIVER BETWEEN CLEARWATER AND ELK RIVER[2]

	Mississippi River – Clearwater River to Elk River
Oxygen Depletion	FS[A]
Turbidity	FS[A]
Un-Ionized Ammonia	FS[B]
Metals	No Data
Total Phosphorus	T[C]
Nitrite/Nitrate	No Data
Oxygen Demand (BOD)	No Data

[A] FS (Fully Supporting) – The state water quality standard is exceeded in fewer than 10 percent of the observations.
[B] FS (Fully Supporting) – The state water quality standard is exceeded in fewer than 2.8 percent of the measurements (no more than 1 violation in three years of monthly sampling).
[C] T (Threatened) – The ecoregion expectation is exceeded in 10 percent or more of the observations.

7.2.2 Environmental Consequences

Pollutants commonly found in roadway runoff include materials from a variety of sources: atmospheric fallout, vehicle exhaust, lubrication system losses, tire and brake wear, transportation load losses, deicing agents and paint from infrastructure. These sources can produce pollutants including: particulates, nitrogen, phosphorous, lead, zinc, iron, copper, cadmium, chromium, nickel, manganese, cyanide, sodium/calcium/chloride, sulfate and petroleum compounds. The extent to which these pollutants would affect water quality within the proposed alternative corridors is dependent upon the level of treatment provided for surface water runoff from roadways and bridges prior to discharge to a receiving water body.

It should be noted that roadway de-icing compounds used on roadways and river crossing bridges (and other developed areas) can present special water quality problems if their use is not monitored. Chloride and sodium, common components of de-icing salt, are not effectively removed in many detention ponds because they do not bind as readily to other compounds or to soil particles and, therefore, tend to stay in solution where they can be discharged with outflow water. In addition, a mixture of melted snow and de-icing agents can be sprayed from bridge decks over bridge railings and directly into the river below. Higher traffic speeds result in increased spray distances. The spray impacts plus the 'spring flush' of chloride/sodium from treatment ponds can combine to create relatively high levels of de-icing-related pollutants in early spring. The extent of these impacts varies with the winter and spring weather, that affects how much de-icing is needed in the winter and how much spring melt water and spring precipitation is produced to dilute the effects of the de-icing compounds.

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[2] Minnesota Pollution Control Agency, Assessment of Stream Water Quality – Based on the 2002 MN 305(b) Report to Congress of the United States, 09/20/02.

All of the DEIS alternatives have some potential impact on water quality because they all produce the pollutants described above. The differences among alternatives with respect to potential water quality impacts relate to 1) the amount of additional pollutants that will be produced and 2) the ability to provide design features to remove pollutants prior to discharge to a water body. The No-Build alternative would have the least increase in pollutant loading, since it would not result in construction of additional impervious pavement surface area. However, the increasing traffic volumes on TH 24 would continue to generate increasing pollutant levels in the future, especially as congestion levels result in increasing numbers of idling vehicles. The existing TH 24 corridor in the vicinity of Clearwater and the existing TH 24 bridge also provide limited opportunities for stormwater detention/treatment prior to discharge to the Mississippi River. The existing bridge surface drains directly to the river. If the bridge were reconstructed under the No-Build scenario, there would still be limited opportunities to incorporate effective treatment into the design, given space limitations in Clearwater.

All of the Build alternatives would generate approximately the same quantity of pollutants, since traffic volumes and impervious surface areas are approximately the same for all four alternatives. The primary differences among alternatives relate to opportunities for providing effective pollutant removal. Preliminary assessment of treatment options for the Build alternatives for this DEIS indicate that the primary factors that differentiate among alternatives are: 1) rural vs. urban location and 2) ponding location availability in the vicinity of the Mississippi River.

Alternatives A, C and D are located entirely within rural areas. Alternative B is located within a rural area for most of its length, but in an urban location for the approximately three-quarter mile segment through the City of Clearwater. Rural drainage systems consist of vegetated ditches, culverts and open channels. These systems reduce pollutant loading in highway runoff by promoting settlement, infiltration and plant uptake. Grass ditches within the upland drainage areas of each alternative would likely be quite flat, given the relatively flat topography, promoting slow flow and infiltration within the ditches, increasing pollutant removal. Conversely, urban curb and gutter drainage allows for little infiltration of runoff into soils and tends to convey most of the pollutants to the end of the conveyance system. The portion of Alternative B that passes through the City of Clearwater would likely be designed as an urban section, which presents water quality challenges due to the resulting restricted ponding and infiltration opportunities. Water quality mitigation in this segment would likely involve strategies such as underground systems to remove oil and sediments (with their associated pollutants). Opportunities to provide wet detention basins to treat water conveyed by the storm sewer system prior to discharge to the Mississippi River would be limited for Alternative B in Clearwater by physical and right of way constraints.

All of the alternatives involve relatively long bridges at the river crossings. Conveyance systems would likely be required due to their length and would involve some type of collection system to convey runoff to the ends of the bridge. The conveyance system design would likely need some type of energy dissipation as well as wet detention basins to prevent erosion, remove roadway pollutants and contain contaminated spills. The DEIS alternatives vary with respect to availability of ponding locations in the vicinity of the river to provide treatment of bridge runoff. Table 7.2.2 summarizes the preliminary assessment made regarding feasible ponding locations for each alternative. Since wet detention basins near the proposed bridge may be located partially or completely within the 100-year floodplain, design and construction of these features may require special consideration to prevent 100-year floods from impacting the effectiveness of these ponds.

Alternative B also would involve construction of an interchange with I-94 near the Clearwater River. Mitigation measures would be required to minimize impacts to the river.

Based on the above assessment, the Build alternatives would have sufficient space within or adjacent to the highway corridor to provide water quality treatment consistent with state and federal requirements by utilizing rural ditch flow/infiltration and/or detention/treatment ponds, with the possible exception of Alternative B within the City of Clearwater.

TABLE 7.2.2
PONDING OPPORTUNITIES NEAR THE BRIDGE FOR EACH ALTERNATIVE

Alternative	Opportunities
A	• Potential stormwater treatment ponding sites exist above the 100-year flood level on the southwest bluff.
B	• Potential ponding sites exist above the 100-year flood level on the northeast bluff. The City of Clearwater is located on the southwest side of the bridge, which would minimize ponding opportunities.
C	• Potential ponding sites exist in the proposed fill area on the northeast side of the river. (fully or partially within the 100-year floodplain)
D	• Potential ponding sites exist in the filled portion of the floodplain above the 100-year flood level on the southwest bluff.
No-Build	• Potential ponding sites exist above the 100-year flood level on the northeast bluff, but may have limited feasibility without major re-grading. The City of Clearwater is located on the southwest side of the bridge, which would minimize ponding opportunities.

7.2.3 Mitigation

As stated in Section 7.1, the Build alternatives would increase the volume and rate of runoff compared to No-Build conditions and, as described in Section 7.2.2, this runoff would contain contaminants common to roadways. Mitigation for the majority of the DEIS alternatives would involve utilizing the roadside ditches and culverts to encourage infiltration and evapotranspiration by plants. Other best management practices (BMPs) would be incorporated as required to meet state and federal water quality regulatory requirements. These may include wet detention basins, filter strips, and infiltration areas. These features would be designed to meet the regulatory requirements in effect at the time of final design.

To the extent practical, stormwater runoff from any of the proposed bridges would also be routed through a wet retention basin prior to discharging into the river. This level of treatment would provide both water quality treatment as well as contaminated spill containment. Section 7.2.2 describes the availability of ponding locations in the vicinity of the Mississippi River for each alternative.

Design of the various conveyance systems will also need to consider potential impacts to groundwater. The alignments of the northerly portion of Alternatives B and C lie close to the wellhead protection area for the Clear Lake municipal water supply (see Section 7.4.1). Conveyance systems may need to protect against infiltration in these areas (see Section 7.4.3).

As noted in Section 7.2.2 above, surface water quality impacts from winter de-icing materials present special problems. Mitigation strategies for these roadway pollutants include minimization and removal/treatment strategies such as:

- Use magnesium chloride instead of sodium chloride salt compound. (This does not resolve the chloride issue, but magnesium may be more readily removed in detention ponds than sodium.)

- Use of corn or sugarbeet-based de-icing compounds. (This reduces the sodium and chloride levels, but may result in other problems, like oxygen reduction in water bodies when these organic compounds are decomposed.)

- Carefully monitor timing, method and application rates of de-icing materials. Plow operators should be trained to lower application rates to the recommended amount and, when possible, be provided with new equipment (e.g., infrared sensors that measure pavement temperature) that increase efficiency of application. Plow operators should also be monitored for the amount of material they are applying, to identify operators who tend to over-apply. Pre-wetting can also be used to increase effectiveness of materials and help increase adhesion to the pavement surface, resulting in lower application rate requirements. These techniques currently offer the most promising mitigation to reduce de-icing impacts. They are currently a major emphasis of Mn/DOT maintenance staff.

7.3 FLOODPLAINS

7.3.1 Affected Environment

Figures 3.2-A.1 through 3.5-D.4 show the boundaries of the existing Mississippi River floodway and 100-year floodplain fringe for Sherburne, Stearns and Wright Counties, as defined by the Federal Emergency Management Agency’s Flood Insurance Rate Map (FIRM) for the project area. The terrain, and subsequently the floodway/floodplain width, varies greatly along the river corridor. Alternatives A, C and D have at least one gently sloping side of the river bank that causes these three alternatives to have relatively wide floodplains, while Alternative B exhibits steep side slopes that cause the floodplain to be relatively narrow.

7.3.2 Environmental Consequences

The No-Build Alternative would not result in further encroachment on the floodplain. This alternative assumes that the existing TH 24 bridge over the Mississippi River would be rebuilt by year 2040. However, it would likely be built using the same pier foundations and approach embankment as the existing bridge. Therefore, no additional floodplain impacts would result.

A floodplain assessment, consisting of an analysis of the flooding risks, excavation/fill impacts, and activities that would occur in the floodway and floodplain as a result of each alternative between the 100-year flood elevation and the normal water elevation, was performed to identify any areas of permanent impacts between these elevations. The floodplain will be affected in some way by all of the Build Alternatives through the possible introduction of project design elements such as bridge piers, retaining walls, fill to decrease the overall bridge length, and fill for the construction of berms around stormwater treatment pond(s). Specifically, the bridge crossings at Alternatives A, C and D would likely involve filling a portion of the 100-year floodplain to minimize the overall bridge length. No portion of the floodway would be filled as a result of constructing any alternative, as the bridges would have sufficient length to extend over the entire defined roadway. Table 7.3.1 summarizes the type and extent of the floodway and 100-year floodplain encroachments anticipated for each alternative.

TABLE 7.3.1
SUMMARY OF TYPE AND EXTENT OF 100-YEAR FLOODPLAIN IMPACTS WITHIN THE PROJECT AREA FOR EACH ALTERNATIVE

Alternative	Type of Encroachment	Length of Impact (ft)	Area of Fill (ac)
Alternative A	Transverse	430	3.6
Alternative B	Transverse	0	0
Alternative C	Transverse	370	2.4
Alternative D	Transverse	520	3.2

Presidential Executive Order 11988 on floodplain management sets the basis for consideration, evaluation and mitigation of floodplain impacts resulting from federally funded projects. Additionally, federal and state laws and rules establish a framework to address impacts to designated floodplains. This framework consists of four issues (discussed below) that have been evaluated to assess the impact each proposed alternative would have on a floodplain environment. If the assessment of these issues indicates the potential for significant floodplain impacts, then further assessment in the form of a floodplain finding, would be required. However, as can be seen from the following discussion, no floodplain finding will be required for any of the alternatives, as none of the alternatives exhibit a substantial encroachment on the floodplain.

- **There will be no significant interruption or termination of a transportation facility that is needed for emergency vehicles or provides a community's only evacuation route due to high floodwaters.**

  None of the alternatives would affect roadways needed for evacuation during periods of high floodwaters. All of the proposed Build Alternative bridges and connecting roadways would be constructed above the 100-year floodplain.

- **No significant adverse impacts on natural and beneficial floodplain values should result from the construction of any alternative.**

Alternative A

Of the four alternatives, Alternative A would require the most fill to accommodate construction of the river crossing. The only potential adverse impact this alternative would have on natural and beneficial floodway and floodplain values is on seasonally flooded ecosystems. However, when compared to the total floodplain area within the watershed, the area of fill required for this alternative is insignificant. Additionally, temporary and permanent erosion control measures would be used where appropriate and would be designed to meet regulatory guidelines. Therefore, no significant adverse impacts on natural and beneficial floodplain values should result from the construction of this alternative. See Figure 3.2-A.2 for a graphical representation of the floodway and floodplain relative to Alternative A.

Alternative B

This alternative would require minimal additional fill to accommodate construction of the river crossing. Temporary and permanent erosion control measures would be used where appropriate and would be designed to meet regulatory guidelines. As a result, any adverse impacts can be successfully avoided through careful design and construction considerations. See Figure 3.3-B.1 for a graphical representation of the floodway and floodplain relative to Alternative B.

Alternative C

The fill required to construct Alternative C has the potential to cause adverse impacts on natural and beneficial floodway and floodplain values with regard to seasonally flooded ecosystems and a floodplain forest on the north side of the river. However, when compared to the total floodplain area within the watershed, the area of fill required for this alternative is insignificant. As such, any adverse impacts can be successfully avoided through careful design and construction considerations. Additionally, temporary and permanent erosion control measures would be used where appropriate and would be designed to meet regulatory guidelines. Therefore, no significant adverse impacts on natural and beneficial floodplain values should result from the construction of this alternative. See Figure 3.4-C.2 for a graphical representation of the floodway and floodplain relative to Alternative C.

Alternative D

The fill required to construct Alternative D has the potential to cause adverse impacts on natural and beneficial floodway and floodplain values with regard to seasonally flooded ecosystems and a park and public water access (see Section 6.8) on the northeast side of the river. However, when compared to the total floodplain area within the watershed, the area of fill required for this alternative is insignificant. As such, any adverse impacts can be successfully avoided through careful design and construction considerations. Additionally, temporary and permanent erosion control measures would be used where appropriate and would be designed to meet regulatory guidelines. Therefore, no significant adverse impacts on natural and beneficial floodplain values should result from the construction of this alternative. See Figure 3.5-D.2 for a graphical representation of the floodway and floodplain relative to Alternative D.

- **No significant increased risk of flooding will result.**

  The Mississippi River hydraulic characteristics for existing and the four proposed Build Alternative conditions were analyzed using existing HEC-2 data for the MnDNR's current *Flood Insurance Study* (FIS) for the river. Table 7.3.2 provides a summary of the pertinent information from this analysis. Note that in an effort to ensure the bridge design accommodates the 100-year flood elevation, the minimum bridge low chord for each of the alternatives was set one foot above the 100-year water surface elevation. In addition, bridge lengths are sufficient to span over the entire width of the defined floodway at each river crossing.

TABLE 7.3.2
SUMMARY OF THE HYDRAULICS ANALYSIS FOR THE EXISTING AND PROPOSED CONDITIONS OF EACH ALTERNATIVE

Alternative	$Q_{100\ year\ event}$ (cfs)	$V_{100\ year\ event}$ (ft/s)	$Elev._{100\ year\ event}$ (ft.)[1]	Approx. Floodplain Width (ft)[2][3]	Approx. Bridge Length (ft)	Estimated Volume of Floodway/ Floodplain Fill (CY)
A – Existing	58,478	6.4	953.9	1,225	N/A	N/A
A – Proposed	58,478	7.1	954.0	795	1,070	24,000
B – Existing	59,570	6.0	947.8	800	1,121	N/A
B – Proposed	59,570	6.0	947.8	800	1,150	0
C – Existing	60,200	2.9	946.8	1,960	N/A	N/A
C – Proposed	60,200	3.0	946.9	1,590	1,690	8,000
D – Existing	60,200	3.1	936.7	1,830	N/A	N/A
D - Proposed	60,200	3.9	936.8	1,310	1,370	21,000

(1) The minimum bridge low chord for each proposed alternative was set one foot above the 100-year flood elevation in the HEC-RAS analysis.

(2) Width at the crossing locations was approximated by measuring from MnDNR's *Flood Insurance Study.*

(3) The proposed floodplain width is calculated as the existing floodplain width minus the proposed fill length.

The results of the hydraulic analysis show that no significant increases in the 100-year flood stage would result from constructing the bridge and/or filling a portion of the floodplain at any of the alternatives, since the bridge and associated floodplain fill at each alternative is only a negligible percent of the overall river and floodplain volumes.

- **This project will not result in any incompatible floodplain development.**

  No incompatible floodplain development will result from constructing any of the Build Alternatives since the proposed project does not provide local access in the vicinity of floodplain areas. Also, county and city ordinances govern development within the floodplain.

Based on the above assessment, no significant floodplain impacts are expected from any of the alternatives.

7.3.3 Mitigation

The analysis of each alternative shows that negligible flooding increases would occur as a result of constructing any of the alternatives. However, once a preferred alternative is selected and preliminary design begins, further evaluation of mitigating floodplain effects would be analyzed in an effort to minimize impacts on the floodplain. Additionally, coordination with the appropriate governmental agencies would be maintained to ensure floodplain impacts are minimized throughout all phases of the project.

7.4 GROUNDWATER

7.4.1 Affected Environment

Information presented in this section was taken from *Water Resources of the Mississippi and Sauk Rivers Watershed, Central Minnesota, Helgesen and Others, U.S. Geological Survey, 1975*. In addition, the Minnesota County Well index was used to determine locations of wells, soil stratigraphy, depth to bedrock and depth to groundwater. The well index is a database of all registered wells in Minnesota and includes boring logs, static water levels and well construction data.

Soils in the project area generally consist of relatively permeable sandy outwash deposits. These sandy outwash deposits extend to depths generally ranging from 100 to 200 feet below the surface and may be as shallow as 30 feet or as deep as 400 feet. Groundwater is present in this sandy soil at depths ranging from the ground surface near water bodies up to approximately 60 feet deep. In general, groundwater depth along the four Build alignments is 20 to 50 feet deep.

Regional groundwater movement in the project area is towards the Mississippi River. Local, smaller scale groundwater movement varies based on terrain and may be discharged to lakes and streams. In the vicinity of the river valley, the water table generally slopes down towards the elevation of the river. Groundwater discharge areas can occur in this environment where the water table intersects with the sloping bluff. One such area was identified at the base of the east bluff near Alternative A. Groundwater discharges in this location from the bluff side and through a flowing spring.

While some layers of marl, clay and silt are present at varying depths, there does not appear to be a regional confining layer in the outwash aquifer. The glacial outwash aquifer is used by residential, commercial, municipal and irrigation wells. Water supply wells in the project area are typically drilled 50 to 100 feet into the outwash where water is drawn from the permeable, sandy soil. Yields of wells vary widely and range from 100 to 1,000 gallons per minute. Wells are rarely drilled into bedrock due to its low yields.

Water supply wells are common in the study area. The majority of the wells are private residential water supply wells and generally are present at each residence outside the cities of Clear Lake and Clearwater. Irrigation wells are also common in the study area. Municipal water supply wells exist in the Cities of Clear Lake (the Clear Lake municipal well is located approximately one mile east of the northern end of Alternatives B and C) and Clearwater (the Clearwater supply wells are located in the city, approximately one quarter mile south of Alternative B).

Due to the relatively permeable soils and lack of a continuous confining layer between the surface and utilized aquifer, groundwater supply wells in the study area are vulnerable to contamination. A wellhead protection area has been developed for the Clear Lake municipal water supply well. This wellhead protection area shows a Drinking Water Supply Management Area extending approximately one mile to the northwest of the City with high, medium and low vulnerable zones mapped within the area. The wellhead protection area extends north (up gradient with respect to groundwater flow) approximately one mile from the water supply well and includes a small portion of the TH 10 roadway. While no wellhead protection plan is available for Clearwater, a similar area of vulnerability is likely with an assumed vulnerable area extending southwest (in the likely up-gradient direction of groundwater flow) of the water supply wells. Existing threats to groundwater quality in the study area consist primarily of agricultural use of fertilizers and pesticides and development within the cities of Clear Lake and Clearwater. As described in Section 6.4, no known groundwater contamination resulting from past or present land uses exists along any of the corridors.

7.4.2 Environmental Consequences

Grading for project construction is not expected to intersect the water table. No dewatering or direct impacts to groundwater are expected for any of the alternatives. Potential project related sources of ground and surface water contaminants include spills during construction and traffic related spills and runoff after the project is built. During construction, spills could occur from on-site transport, storage and transfer of fuels for construction equipment. After construction, spills of fuel and various hazardous materials can occur along roads primarily as the result of crashes. Road runoff can also contain contaminants such as heavy metals, salt, hydrocarbons, sediment, and debris.

The potential for transportation-related spills to affect ground and surface water is a problem statewide. Permeable soils and the consequent susceptibility of groundwater contamination from surface spills is a complicating factor in the project area. Municipal water supply wells are present near Alternative B, in the City of Clearwater and near Alternatives B and C in the City of Clear Lake. In addition, under Alternative D, additional traffic using the new river crossing would be routed along TH 10 near the wellhead protection area of the Clear Lake water supply well. Numerous private water supply wells also exist along each corridor.

Runoff from road surfaces can contain various organic and mineral pollutants. Road runoff is considered a non-point source of pollution with relatively low concentrations of pollutants, generally measured in parts per million. These pollutants generally include heavy metals, hydrocarbons, sediment, and debris that can threaten the quality of surface waters if not properly controlled. Road runoff is not considered a major source of groundwater contamination due to the relatively low concentrations of pollutants in road runoff and the ability of soil to filter these pollutants as water infiltrates through soil.

Construction of additional impervious surfaces can impede recharge of groundwater. However, construction of any of the alternatives would not likely have any regional affect on groundwater recharge because road runoff would likely infiltrate into the permeable soils along the road ditches.

Construction of Alternative A is not likely to affect the hydrology of the adjacent groundwater discharge (seep) area. Construction of the road bridge approach would require approximately 20 feet of excavation into the east bluff. Based on well logs near the east bluff, groundwater depth is 30 to 40 feet in this area. Therefore, construction would not intersect the water table and is not likely to interrupt or diminish groundwater flow. Similarly, the profile of the other alternatives is not likely to intersect the ground water table, thus, no substantial impacts to ground water are expected.

7.4.3 Mitigation

Measures such as vegetated filter strips along road embankments, grassed swales/ditches and detention basins can be implemented to promote infiltration/groundwater recharge of highway runoff. As discussed in Section 7.2, best management practices will be implemented as part of the proposed project to treat road runoff and to minimize water quality and drainage impacts.

Any one of the proposed Build Alternatives would improve safety compared to the existing condition. Improved traffic flow and safety on roads would reduce crashes thereby preventing spills that could impact groundwater.

If necessary, roads that encroach on wellhead protection areas can be constructed with additional containment features such as clay-lined ditches that would contain spills and prevent contamination to water supply aquifers. Not all Build Alternatives are located in the vicinity of wellhead protection areas; therefore, the need to address special design issues related to wellhead protection will be addressed in the FEIS, when a preferred alternative is identified.

7.5 WETLANDS

This section identifies and characterizes wetlands that may be impacted by each of the alignment alternatives. This section contains an inventory and an analysis of potential impacts for each alternative.

Wetlands are recognized as providing valuable functions such as wildlife habitat, water quality improvement, flood storage, aesthetics and recreation and, as a result, are protected by state and federal regulations. These regulations require avoidance and minimization of wetland impacts where possible and compensation for impacts that cannot be avoided.

At the federal level, Executive Order 11990, "Protection of Wetlands" (1977) established a national policy requiring that adverse impacts on wetlands be avoided and minimized to the greatest extent practicable. The U.S. Army Corps of Engineers regulates the placement of fill in waters of the United States, including wetlands, through Section 404 of the Clean Water Act.

At the state level, the Minnesota Wetlands Conservation Act (WCA) of 1991 established requirements for wetland protection in the state to be managed by the Board of Water and Soil Resources (BWSR). The WCA requires Local Governmental Units (LGU) to administer the wetland permitting process and enforce mitigation requirements. In addition, the MnDNR regulates lakes and larger wetlands that are identified as state public waters. These waterbodies are identified on public waters inventory maps by an assigned number designation.

7.5.1 Affected Environment

Identification and Delineation

Wetlands along each corridor were identified based on published mapping, examination of aerial photos, soil surveys and finally a field inspection of each alignment corridor. Wetlands likely to be impacted by each alternative were delineated using methodologies contained in the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual, based on: 1) a prevalence of vegetation that is adapted to wet soil conditions, 2) saturated or inundated hydrologic conditions for a significant period of the growing season, and 3) the presence of hydric soils. As the alternatives were refined, alignment shifts and interchange configurations caused some potential impacts to a few non-delineated wetlands. The boundaries of these wetlands are based on aerial photo and topographical map interpretation. While many wetlands were identified and delineated in the vicinity of each corridor, only those that would potentially be impacted by each alternative are described here.

Classification

All identified wetlands are classified in accordance with two classification systems. The simpler of the two systems is known as the Circular 39 system, and it groups wetland basins into one of seven "types," based on the predominant water regime. The classification system used on national wetland inventory (NWI) mapping is known as the Cowardin system. It subdivides wetland basins into different classifications if different types exist within one wetland complex. These two systems are summarized in the table below.

TABLE 7.5.1
WETLAND CLASSIFICATION SYSTEM DESCRIPTORS/MODIFIERS

Circular 39 System

Type 1	Seasonally flooded basins and flats
Type 1L	Seasonally flooded hardwoods
Type 2	Inland fresh meadow, saturated at or near the surface after heavy rains or seasonally
Type 3	Inland shallow fresh marsh, flooded up to 6-foot depth
Type 4	Inland deep fresh marsh, flooded up to 3-foot depth
Type 5	Inland open fresh water, flooded up to 10-foot, marshy border may be present
Type 6	Shrub swamp, flooded up to 6-inch depth

Cowardin System

System/Subsystem	Class/Subclass	Water Regime
P – Palustrine	EM – Emergent	A – Temporarily Flooded
	1 – Persistent	B – Saturated
R – Riverine		C – Seasonally Flooded
	FO – Forested	F – Flooded
L – Lacustrine		G – Intermittently Exposed
1 – Limnetic	SS – Scrub-Shrub	
2 – Littoral		H – Permanently Flooded
	UB – Unconsolidated Bottom	J – Intermittently Flooded
		D – Partially Drained/Ditched

A summary of identified wetlands that could be impacted by each of the Build Alternatives is presented in Tables 7.5.2 through 7.5.4 below. These tables include information on each wetland type, size, dominant vegetation and topographic setting. Locations of these wetlands are shown on Figures 3.2-A.1 through 3.5-D.4.

The wetlands identified in the project area generally consist of either floodplain wetlands in the river valley or depressions in the surrounding outwash plain. Most of the identified wetlands are vegetated with cattails and/or reed canary grass. Surrounding uplands are commonly agricultural fields. A detailed assessment of wetland functions was not completed for the DEIS; however indicators of high functional levels are noted with respect to potential impacts in Section 7.5.2. The indicators of high functional levels noted below include the presence of notable plant communities, records of the presence endangered or threatened wildlife species or species of concern in or using the wetland or known adjacent lands and the presence of ground water discharge areas. A functions analysis, using the Minnesota Routine Assessment Method (MnRAM) will be completed in the FEIS for select, representative wetlands that would be impacted by the selected Alternative. Results of the functions analysis will be used to develop appropriate mitigation.

Wetlands identified along Alternative A are shown on Figures 3.2-A.1 through 3.5-D.4. Those wetlands that would be impacted by the alternative are summarized in Table 7.5.2.

TABLE 7.5.2
WETLAND INVENTORY: ALTERNATIVE A

Wetland Basin Number	Approximate Size (acres)	Cowardin Classification	Circular 39 Type	MnDNR No.	Dominant Vegetation	Topographic Setting
A-1	10	PEM1A	2	-	Cattails, shrubs	Flow through
A-2	64	PEMF	3	422W	Cattails	Isolated
A-3	2.8	PFOJ/PEMB	1	-	Wooded	Slope – groundwater discharge area
A-4	15	PEMC	3	-	Cattails	Isolated
A-5	1.8	PEMC	3	-	Cattails	Isolated

Wetlands identified along Alternatives B and C are shown on Figures 3.3-B.1-3.4-C.4**.** Those wetlands that would be impacted by these alternatives are summarized in Table 7.5.3.

TABLE 7.5.3
WETLAND INVENTORY: ALTERNATIVES B AND C

Wetland Basin Number	Approximate Size (acres)	Cowardin Classification	Circular 39 Type	MnDNR No.	Dominant Vegetation	Topographic Setting
B-1	1.9	PEMB	2	-	Sedge	Isolated
B-2	0.1	PFOJ	1	-	Forested	Isolated
B-3	0.8	PEMF	3	-	Cattails, open water	Isolated
C-1	0.3	PEMA	1	-	Reed canary grass	Isolated
BC-1	1.0	PEMA	1	-	Reed canary grass	Isolated
BC-2	4.6	PEMF	3	-	Cattails, open water	Isolated
BC-3	3.1	PUBG	5	-	Cattails, open water	Isolated
BC-4 Cater Lake	30	PUBG	5-Lake	157P	Open water	Isolated

Wetlands identified along Alternative D are shown on Figures 3.5-D.1 through 3.5-D.4**.** Those wetlands that would be impacted by this alternative are summarized in Table 7.5.4.

TABLE 7.5.4
WETLAND INVENTORY: ALTERNATIVE D

Wetland Basin Number	Approximate Size (acres)	Cowardin Classification	Circular 39 Type	MnDNR No.	Dominant Vegetation	Topographic Setting
D-1	0.2	PEMAd	1	-	Reed canary grass	Isolated
D-2	0.6	PEMAd	1	-	Forested/shrub	Flow through
D-3	0.9	PEMA	1	-	Reed canary grass	Isolated
D-4	0.7	PSS1	6	-	Willow	Flow through
D-5	0.7	PSS1	6	-	Willow	Flow through
D-6	1.2	PEMCf	1	-	Farmed	Flow through
D-7	1.4	PEMA	1		Reed canary grass	Flow through
D-8	0.2	PEMC Ditch	3	-	Cattails	Flow through
D-9	0.1	PEMC Ditch	3	-	Cattails	Flow through
D-10	6.3	PEMF	3	-	Cattails, open water	Flow through
D-11	3.4	PEMF	3	-	Cattails, open water	Flow through

The river channel was inspected at each of the three potential new river crossing sites (Alternatives A, C and D). The majority of the floodplain area in the river valley is not flooded frequently or long enough to create wetland conditions. Wetlands adjacent to the river were generally confined to a narrow band of wooded area along each bank. Based on the design information available at the time of this writing, no impacts to these riverside wetlands are proposed for any of the alternatives.

7.5.2 Environmental Consequences

Preliminary construction limits for each alternative were compared to delineated wetland boundaries to estimate the area of potential fill impacts for each of the proposed Build Alternatives as summarized in Tables 7.5.5 through 7.5.8. Wetland impacts from the No-Build Alternative are discussed but not detailed in the tables. High quality or rare wetland features present are also noted **in bold type** in each table and described below. Table 7.5.9 compares the total area of potential wetland impacts among alternative by Circular 39 wetland types.

No-Build

Wetlands B-1 and B-2 are located at the base of the east river bluff, at the bottom of the existing TH 24 roadway embankment. Reconstruction of the existing TH 24 bridge could require widening of the existing roadway at each approach. If widening is required, then the No-Build Alternative could impact these wetlands.

Alternative A

Wetlands A-1 and A-2 are larger wetlands with relatively undisturbed adjacent uplands. Wetland A-2 is located in an area that contains potentially important Blanding's Turtle habitat. The proposed impact to Wetland A-1 would be along the edge of the wetland at an existing roadway. The impact to Wetland A-2 would be along a wetland/upland fringe and would isolate the wetland from a portion of adjacent upland.

No permanent impacts to Wetland A-3 are proposed, however construction of a bridge at this location would require temporary disturbance to this groundwater discharge wetland and would permanently alter its setting by covering a portion of it with a bridge. Wetlands A-4 and A-5 are surrounded by farmland and dominated by cattails.

TABLE 7.5.5
WETLAND IMPACT SUMMARY: ALTERNATIVE A

Wetland Basin Number	Total Wetland Area (Acres)	Estimated Impact Area (Acres)	Percent of Wetland Impacted	Wetland Impact Description
A-1	10	0.8	8	Fill impact to edge of a **flow through wetland with diverse shrub, emergent vegetation**.
A-2	64	0.4	<1	Fill impact to edge of large **MnDNR public wetland with relatively undisturbed upland, possible home to Blanding's turtle population. The impact isolates wetland from adjacent upland habitat**.
A-3	2.8	0	0	Bridge constructed over or adjacent to groundwater discharge area, wooded hillside and stream. No direct impact.
A-4	15	3.8	19	Widens existing road that bisects cattail marsh in farm field
A-5	1.8	0.3	17	Fill impact to edge of a cattail marsh in farm field.
Total		**5.3**		

Alternative B

Wetland B-1 is a sedge-dominated wet meadow, an uncommon wetland type in the project area. This wetland is shown on the Sherburne County Biological survey as a wet meadow. Alternative B would impact a small portion of this wetland along its east edge. Wetlands B-2 and B-3 are disturbed or degraded by adjacent excavation and farming and would be 50 percent and 12 percent filled by this alternative, respectively. Wetlands BC-1 and BC-2 would be mostly filled by construction of the interchange with the remainder of the basins surrounded by new freeway ramps. These basins are therefore considered as 100 percent impacted. The potential impact to Wetland BC-3 would occur along its southern boundary where relatively undisturbed grassy and wooded upland is adjacent to the wetland. The potential impact to Cater Lake would occur along an already disturbed edge of the lake along TH 10.

TABLE 7.5.6
WETLAND IMPACT SUMMARY: ALTERNATIVE B

Wetland Basin Number	Total Wetland Area (Acres)	Estimated Impact Area (Acres)	Percent of Wetland Impacted	Wetland Impact Description
B-1	4.5	0.2	<1	Fill impact to edge of **sedge meadow at base of east bluff.**
B-2	0.1	0.1	100	Fill impact to approximately half of a wooded wetland that is disturbed by adjacent excavation and filling.
B-3	0.8	0.1	12	Fill impact to reed canary grass depression in farm field.
BC-1	1.0	0.8	80	Fill and isolation impact to reed canary grass depression/drainage way adjacent to TH 10.
BC-2	4.2	4.2	100	Fill impact to entire open water basin.
BC-3	3.1	0.1	3	Fill impact to deep marsh along an adjacent undisturbed upland.
BC-4	30	1.0	3	Fill impact to **edge of Cater Lake along** TH 10.
Total		**6.5**		

Alternative C

Wetland C-1 is a small, reed canary grass depression adjacent to a floodplain farm field that would be completely filled by this alternative. Wetlands BC-1 and BC-2 would be mostly filled by construction of the interchange with the remainder of the basins surrounded by new freeway ramps. These basins are therefore considered as 100 percent impacted. The potential impact to Wetland BC-3 would occur along its southern boundary where relatively undisturbed grassy and wooded upland is adjacent to the wetland. The potential impact to Cater Lake would occur along an already disturbed edge of the lake along TH 10.

TABLE 7.5.7
WETLAND IMPACT SUMMARY: ALTERNATIVE C

Wetland Basin Number	Total Wetland Area (Acres)	Estimated Impact Area (Acres)	Percent of Wetland Impacted	Wetland Impact Description
C-1	0.2	0.2	100	Fill impact to entire reed canary grass depression adjacent to farm field.
BC-1	1.0	0.8	80	Fill and isolation impact to reed canary grass depression/drainage way adjacent to TH 10.
BC-2	4.2	4.2	100	Fill impact to entire open water basin.
BC-3	3.1	0.1	3	Fill impact to deep marsh along an adjacent undisturbed upland.
BC-4	30	1.0	3	**Fill impact to edge of Cater Lake along TH 10.**
Total		**6.3**		

Alternative D

The wetlands that would be impacted by this alternative are scattered around the proposed I-94 interchange. These wetlands are surrounded by farm fields and roadways and do not possess any rare or high quality features. While these basins have been disturbed by road construction and farming activities, water flows through them generally to the south and they provide water quality and quantity functions.

TABLE 7.5.8
WETLAND IMPACT SUMMARY: ALTERNATIVE D

Wetland Basin Number	Total Wetland Area Acres	Estimated Impact Area Acres	Percent of Wetland Impacted	Wetland Impact Description
D-1	0.2	0.2	100	Fill impact to entire partially drained reed canary grass depression in farm field.
D-2	0.6	0.4	66	Fill impact to wooded/shrub drainage way in farm field.
D-3	0.9	0.1	11	Fill impact to reed canary grass depression bounded by farm field and roadway.
D-4	0.7	0.2	29	Fill impact to willow shrub depression bounded by farm field and roadway.
D-5	0.7	0.2	28	Fill impact to willow shrub depression bounded by farm field and roadway.
D-6	1.2	0.1	8	Fill impact to farmed wetland.
D-7	1.4	0.9	64	Fill impact to reed canary grass drainage way.
D-8	0.2	0.2	100	Fill impact to entire wetland between roadway and railroad.
D-9	0.1	0.1	100	Fill impact to entire wetland between roadway and railroad.
D-10	5.7	3.2	56	Fill impact to open water marsh.
D-11	3.4	3.4	100	Fill impact to entire open water marsh.
Total		**9.0**		

TABLE 7.5.9
ESTIMATED TOTAL WETLAND IMPACTS BY WETLAND TYPE (CIRCULAR 39)

Type (Circ. 39)	Alternative A	Alternative B	Alternative C	Alternative D
	Acres	Acres	Acres	Acres
1		0.9	1.0	1.7
2	0.8	0.2		
3	4.5	4.3	4.2	6.9
5		1.1	1.1	
6				0.4
TOTALS	**5.3**	**6.5**	**6.3**	**9.0**

7.5.3 Mitigation

Federal and state wetland regulations require the use of a sequenced approach when projects have potential impacts on wetlands. Sequencing requires first avoiding wetland impacts if possible, and if impacts are not avoidable, they must be minimized to the greatest extent practicable. Sequencing also includes rectification of temporary impacts and reduction or elimination of impacts over time. After all options for avoidance, minimization, rectification and long term reduction of impacts have been considered and implemented, compensation that will replace lost wetland functions is required for those impacts that are not avoidable.

Efforts to avoid wetland impacts from the proposed river crossing began when potential alignments were being developed. As described in the 1997 scoping document for this project, the initial (broad-width) corridors considered for the I-94/TH 10 Interregional Connection were selected in areas where wetlands and lakes are not abundant. Alignments within each broad corridor were refined during scoping to avoid/minimize wetland impacts. Minor shifts in the alignments as they were developed during the DEIS process avoided wetland impacts where possible. Complete avoidance of wetland impacts was not possible in all cases due to the need to avoid impacts to other natural communities and the need to minimize other impacts such as property acquisition, floodplains and traffic noise while satisfying the transportation need with a cost effective project.

Further minimization, rectification, long term reduction and compensation of wetland impacts would be addressed after a preferred alternative is identified. Additional design modifications would be considered during the design of the final project to further minimize wetland impacts. Designing road profiles as low as possible and designing inslopes (beyond the required clear zone) as steeply as possible may further minimize impacts. Best management practices would be incorporated into final project design to minimize indirect wetland impacts. Erosion prevention and sediment control measures would include provision of silt fences and traps, hay bales, and temporary ponding areas.

Long term reduction of impacts will be accomplished by maintaining the existing hydrologic characteristics of basins experiencing partial impacts as a result of the project. Specifically, this would be accomplished through measures that ensure that drainage patterns between and through wetlands are maintained and prevent wide fluctuations from existing water levels.

In Minnesota, impacts on public waters (MnDNR Public Waters and their wetlands) are subject to additional regulation. Basins BC-1 and BC-6 (Imholte Lake and Cater Lake) are MnDNR Public Waters. Additional replacement wetlands or compensation may be necessary for impacts on these basins.

After a preferred alternative is identified, a wetland compensation plan for replacement of the affected wetland areas would be developed. That plan would reassess the areas of wetland impacts (and mitigation needed) based on refined design plans, wetland delineations, and the current and applicable wetland mitigation guidelines and regulations in effect at that time. The intent of the wetland mitigation plans would be to replace lost wetland functions in the project area, where possible, by creating new wetlands or restoring degraded wetlands. If a suitable on-site location is not available, an off-site wetland mitigation area, preferably within the same watershed may be considered to accomplish some of the required mitigation.

Wetland mitigation strategies will be addressed in the FEIS when the preferred alternative is selected. The mitigation strategies and implementation will be developed, permitted and carried out in coordination with the appropriate state and federal wetland regulatory agencies.