

**Interim Planning Report
Upper Turtle River Dam 10 Watershed Plan
February 3, 2025**



April 2019, Turtle River near Manvel

Prepared for:

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**United States
Department of
Agriculture**

Planning for Upper Turtle River Dam 10 Watershed Plan was re-initiated in 2020, at the request of the Grand Forks Watershed District (GFWRD). In December 2021 the Grand Forks Soil Conservation District (GFSCD) requested to join as an official co-Sponsor of the Watershed Plan. This report was written to summarize work completed on the watershed plan up to February 2025, which included scoping, wetland delineation, preliminary design, and economic analysis.

1 PLANNING FRAMEWORK

The NRCS PL-566 watershed planning process is governed by numerous federal policies but is also intentionally led by Local Sponsor(s) (in this case the GFWRD and GFSCD) with input from the public and local, state, and federal agencies. Planning work may be terminated at any time, at the request of the GFWRD or NRCS, if issues arise that indicate the plan will not be feasible to implement.

1.1 Applicable Agency Authority

Public Law 83-566, the Watershed Protection and Flood Prevention Act of 1954, as amended, authorizes the Natural Resources Conservation Services (NRCS), under the US Department of Agriculture, to plan and implement watershed projects. Policies for planning and implementation of watershed projects under PL-566 are set forth in 7 CFR Part 622 and outlined in Title 390, National Watershed Planning Manual (NWPM). PL-566 sets forth the following general purposes for the program:

- Preventing damage from erosion, floodwater, and sediment
- Furthering the conservation, development, utilization, and disposal of water
- Furthering the conservation and proper utilization of land

Each project must contain benefits directly related to agriculture, including rural communities. Agriculture and rural communities must account for at least 20 percent of the total benefits of the project. All benefits of Upper Turtle Dam 10 would be for cropland, rural homes, and roads.

PL-566 authorities limit the contributing watershed to less than or equal to 250,000 acres (390.6 square miles).

1.2 Compliance with Other Federal Laws, Regulations, and Executive Orders

In addition to Public Law 83-566, several other federal laws, regulations, executive orders, and NRCS policies govern the UTR 10 planning effort. The following is a partial list of some of the key policies involved in development of the watershed plan:

- Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies (PR&G) specifies that federal water resources investments shall reflect national priorities, encourage economic development, and protect the environment by seeking to maximize sustainable economic development; seeking to avoid the unwise use of floodplains and flood-prone areas and minimizing adverse impacts and vulnerabilities in any case in which a floodplain or flood-prone area must be used; and protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems.
- PL 91-190 the National Environmental Policy Act, PL 92-500 the Clean Water Act, PL 93-205 the Endangered Species Act, EO 11988 Floodplain Management, EO 11990 Protection of Wetlands, and EO 13186 Migratory Birds will be followed in evaluating the environmental impacts of alternatives developed under this plan. An Environmental Assessment or Environmental Impact Statement, as appropriate, will be developed and go through formal agency and public review at conclusion of planning.

- PL 89-665 the National Historic Preservation Act, EO 13007 Indian Sacred Sites, EO 13175 Consultation with Tribal Governments, SO 3206 American Indian Tribal Rights will be followed in ensuring consultation with all Tribes with historic presence in the area as well as the ND State Historic Preservation Society.
- Watershed planning will be conducted in accordance with the Secretary of Agriculture's equal opportunity initiatives and in compliance with Executive Order 12898. This ensures elimination of any program practices that result in inequitable treatment of groups protected by the Civil Rights Act and equal access to the benefits of the Watershed Program.

1.3 Planning Team

The PL-566 watershed planning is a locally led, inter-agency, inter-disciplinary, and public process. The GFWRD and GFSCD, as the Sponsoring Local Agencies for the plan, are the ultimate decision makers within the framework of applicable federal, state, and local laws and policies. The following organizations and individuals were invited to participate in the planning process and their input was solicited during scoping (note that over time individuals in these positions changed, the following list is accurate, to the knowledge of NRCS, as of February 2025).

Table 1- Interagency Team

Category	Entity	Representatives
Sponsoring Local Organization	Grand Forks County Water Resource District	Tom Perdue, Chairman Bob Drees Jim Heider Tom Durkin Tim Farrell
Sponsoring Local Organization	Grand Forks County Soil Conservation District	Aaron Smestad, Chairman Jeff Clemetson Emily Montgomery Ben Draxton Travis Lockwood (Justin Parks, Watershed Coordinator) (Jill Kvasager, District Clerk)
Lead Federal Agency	Natural Resources Conservation Service	Dan Hovland, ND State Conservationist Christi Fisher, ND State Engineer Kevin Gietzen, Grand Forks County DC
Cooperating Federal Agencies	U.S. Army Corps of Engineers, Omaha District, Bismarck Office	Ben Soiseth, Regulatory Program Manager
	U.S. Fish and Wildlife Service	Christopher Swanson, ND/SD Project Leader
State Agencies	ND State Department of Water Resources	Randy Gjestvang, Red River Engineer Aaron Caranza, Regulatory Division Director
	ND Game and Fish	Bruce Kreft, Conservation Biologist

	ND Dept of Environmental Quality	Mike Ell, Water Quality Division
	ND Dept of Emergency Services	Cecily Fong, Public Information Officer
	ND Dept of Transportation	Ed Pavlish, District Engineer
	ND Parks and Recreation	Justin Robinson, East Regional Manager Larry Hagen, Turtle River State Park Manager
	ND State Historical Preservation	Lisa Steckler, Historic Preservation Specialist
Local Agencies	Grand Forks County	Grand Forks County Commissioners
		Sandra Simonson, Grand Forks County Floodplain Administrator
		Tom Ford, Director of Administration for Grand Forks County Commissioners
	Grand Forks Highway Department	Nick West, County Engineer
	Grand Forks County Emergency Management Office	Kari Goelz, Director
Organizations	Red River Retention Authority	Brian Fuder, Executive Director
	Red River Joint Water Resource District	Gary Thompson, Chair
Tribal Organizations	Spirit Lake Tribe of Fort Totten	Dr. Erich Longie, THPO
		Douglas Yankton, Sr , Chairman
	Turtle Mountain Band of Chippewa	Jeffrey Desjarlais, THPO
		Jaimie Azure, Chairman
	Upper Sioux Community (Minnesota)	Samantha Odegard, THPO
	Sisseton-Wahpeton Oyate	Kevin Jensvold, Chairman
		Dianne Desrosiers, THPO
	Red Lake Nation (Minnesota)	Kade Ferris, THPO
		Darrell G. Seki, Sr., Chair
	Fort Peck Assiniboine and Sioux Tribes	Dyan R. Youpee, THPO
		Floyd Azure, Chairman

The GFWRD reached out to local landowners and operators in the immediate vicinity of the proposed dam site for access permissions to complete planning and inventory work in the fall of 2020. NRCS met with several of the landowners individually to solicit their thoughts on the project, as well. The names and contact information for these individuals are not listed here, to protect their privacy.

The U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service agreed to be cooperating agencies on the planning effort. Consultation under Section 106 of the National Historic Preservation Act was initiated with the Tribal Organizations listed.

2 AUTHORIZED PL-566 PROJECT PURPOSES CONSIDERED

The primary authorized PL-566 project purpose for the Upper Turtle Dam 10 project was flood prevention (flood damage reduction). Three additional purposes were also considered during planning.

2.1 Flood Prevention (Flood Damage Reduction) - Primary

Flood prevention or flood damage reduction measures are installed to prevent or reduce damages caused by floodwater. This was the primary purpose identified by the Sponsors for the project when they originally approached NRCS to re-start planning in 2020.

2.2 Agricultural Water Management

Agricultural water management needs in this watershed include additional irrigation supply, by either groundwater recharge to the Elk Valley Aquifer or impoundment of surface water in a dam designed with a permanent pool. The proposed dam site overlies this shallow aquifer, from which water permits have been issued for 29,000 acres of irrigation to date. An additional 15,000 acres of irrigatable soils remain above the aquifer and there are pending permits not approved by the ND Department of Water Resources (NDDWR) due to lack of water supply. The ND DWR ranked the Elk Valley Aquifer South as having “very good” potential for managed aquifer recharge.

2.3 Public Recreation

Recreation developments, such as picnic areas, boat launches, trails, and campgrounds may be included in a watershed project plan when the SLO agrees to operate and maintain features for public recreation. The campground and associated recreational facilities operated by the Grand Forks WRD at Larimore Dam, a previous NRCS PL-566 project in the Turtle River Watershed, is heavily utilized.

2.4 Watershed Protection

Watershed protection measures may include project measures to address soil, water quality, wildlife habitat. Phosphorus and nitrogen loads in the Red River Basin, of which the Turtle River is a subbasin, are of international concern. Under the terms of Article IV of the Boundary Water Treaty with Canada, the United States government agreed to phosphorus and nitrogen objectives at the international border crossing of the Red River in 2022. At the international border crossing, the annual flow-averaged concentration of phosphorus in 2017-2021 exceeded the standard by 300-400%. The average nutrient load for phosphorus in 2017-2021 was 170% of the standard and for nitrogen was 125%. The Red River Basin is one of the largest artificially drained landscapes in the world and lies within the Prairie Pothole Region of the northern Great Plains, where restoration of wetlands and grasslands is a critical need for wildlife.

3 PLANNING HISTORY

The Upper Turtle River Watershed Plan (Plan) was developed in the late 1960's. Eight dams and 11.9 miles of channel were installed in the 1970's and early 1980's. Along with these structural elements, a recreation area was developed at UTR9 (Larimore Dam). A copy of the 1969 Watershed Work Plan Project Map is included in the Feasibility Report developed for the project, dated February 2022. Two original features of the Watershed Plan were not completed when the project stalled because of the sponsor's inability to obtain the necessary US Army Corps of Engineers 404 permits in 1992. The features were 14.6 miles of channel work and the acquisition of easements to protect approximately 1,387 acres of Type III, IV, and V wetlands. felt that the environmental impacts of constructing the

planned channels were unacceptable on the basis of laws in place by the early 1990s that had not been considered in the original plan. As a substitute for the channels not implemented, Dam Site 10 was proposed to provide flood control benefits to the Manvel area, originally planned to be provided by the channels, and planning commenced on the project in 1993. Planning in the 1990s evaluated various potential elevations of a permanent pool. One of the focuses was to not to simply mitigate for wetland functions that would be lost due to dam construction, but to provide wildlife habitat enhancements through the project. In total, a 200-acre wildlife pool (permanent pool) and an additional 160 acres of wetland and upland habitat were planned in conjunction with the dam project.

In addition to the project Sponsors (GFWRD and GFSCD), supporters of the project included the ND State Water Commission, Grand Forks County, Elk Valley Sportsman's Club, Grand Forks County Wildlife Federation, and individuals. Supporters of the project listed the following rationale as to its value:

- Reduction of flood damages on cropland
- Reduction of flood damages to roads, bridges, and culverts
- Improved wildlife habitat and related recreational opportunities
- Reduction of riverbank erosion and associated sediment load
- Water supply to irrigation and/or the aquifer recharge
- Wildlife habitat and related recreational opportunities

Opponents, or non-supporters in some cases, of the project included U.S. Fish and Wildlife Service, ND Game and Fish, ND Parks and Recreation Department, ND Chapter of The Wildlife Society, and individuals. Concerns listed included:

- Negative impacts to the downstream river ecosystem, particularly due to reduced flows during dry time periods and increased water temperatures that would be routed through the principal spillway from the permanent pool. The trout fishery at the Turtle River State Park was of particular concern.
- Negative impacts to a large marsh upstream of the dam, which would be inundated with deep water for a much longer duration than would be natural
- Negative impacts to the downstream riparian forest ecosystem and riparian wetlands due to interruption of natural hydrology and flood frequency
- Inability to continue grazing existing pastureland upstream of the dam
- Wasteful use of taxpayer funds; flooding is no longer a legitimate problem in the watershed
- Canoeists float the Turtle River the spring, and a dam that impeded that recreational opportunity would be undesirable.

Planning work on UTR10 continued through 1994, and included environmental assessments, cultural resource survey, engineering surveys, geologic investigation, hydrologic/hydraulic modeling, and economic analysis. Results of the economic analysis, utilizing output data from hydraulic models, were a benefit to cost ratio of less than 1. However, due to net wildlife benefits of the project NRCS technical staff in North Dakota were in strong support of the proposal. In 1996 planning ceased on UTR10 due to the fact that environmental concerns could not be resolved. Neither U.S. Fish and Wildlife Service nor ND Game and Fish agreed with NRCS on the wildlife habitat benefits of the proposed project.

In 2020, GFWRD approached NRCS about re-activating planning on UTR10 in light of multiple developments that have occurred since 1996. NRCS concurred that there are a number of factors that warrant consideration of UTR10 as a feasible plan. Some of these factors include:

- Adoption of the Red River Basin Commission Long Term Flood Solutions Report, with a goal for 20% flow reduction on the Red River. NRCS has been an active partner on the effort to develop

retention projects in the RRB. The average construction cost per ac-ft for other retention projects is over twice what the estimated construction cost for UTR10 was (adjusting for inflation), making it a very attractive potential project if environmental concerns could be addressed in a new iteration of planning.

- Water quality concerns, specifically related to dissolved phosphorus in the Red River mainstem, are a much greater concern currently than they were in the 1990s. Responding to the rapid and serious eutrophication issues in Lake Winnipeg, the U.S. and Canada have agreed to significant reductions in phosphorus export at the international border crossing. The particular climate, soils, land use, and topography in the RRB is such that common agricultural BMPs are not well suited to addressing reductions, however construction and operation of biomass harvesting areas in conjunction with a dry dam do have
- Planning in the 1990s appears to have only considered alternatives with a permanent pool at some elevation and a standard riser tower design for a principal spillway. Some of the environmental concerns noted in the past planning effort could be addressed through design of a dam with no permanent pool (so 10-15 day retention time period only) and with an on-grade box culvert for a principal spillway structure.
- Previous hydrologic and hydraulic analysis were done on the basis of 30-meter digital elevation models with old software that had significant limitations in terms of modeling floods in low topographic relief watersheds. At this point in time 3-meter LiDAR derived topographic data as well as sophisticated HEC-HMS and RAS models are available for use. It is unknown if the resulting economic benefits, from a flood damage reduction point of view, will increase or decrease as a result; but it is likely results will be significantly different than in the past using current data and analysis methods.

Given that UTR10 was not included in the original Turtle River Watershed Plan, and the previous 1990s effort did not result in a completed plan, NRCS is proceeding with the current planning effort as a new, stand alone, Watershed Operations Plan rather than a Supplement or Re-Authorization.

4 SCOPING

A public scoping meeting for the project was held on March 8, 2022 in Larimore. Attendees could join in person or via Teams. The meeting was advertised in both the Larimore Leader and in the Grand Forks Herald newspapers, as well as on the NRCS and Grand Forks WRD websites. The individual agencies, organizations, and Tribes were invited to attend the meeting or provide written scoping comments, as well. Landowners that would be directly impacted by a dam, including flood pools, and neighboring property owners were sent invitation letters to attend, as well. NRCS wrote and made available printed copies of the Feasibility Report and Public Participation Plan on the project website prior to and at the meeting.

The NRCS met with the WRD and SCD boards in January 2022 to go through a draft presentation for the public scoping meeting and discuss which potential purposes and dam alternatives they would like to have presented. They concurred with the NRCS plan to provide a dam alternative with a NRCS standard riser tower with small permanent pool, an alternative with a larger permanent pool, and a dry dam alternative with on grade principal spillway conduit. Likewise, they agreed with soliciting input on the 4 potential project purposes outlined in Section 2. Based on the sign in sheet, 49 individuals attended the scoping meeting in person and 11 attended online. The presentation provided at the meeting was recorded and placed on the ND NRCS website for the public to access. Questionnaires were provided and returned at the meeting, as well as later, all of which are provided in the appendix. A summary of input received is listed below.

Summary of Comments From 1-on-1 Landowners Meetings Feb 24 – March 3, 2022:

- Landowner 1, Feb 24th: Consensus was that they were opposed to a permanent pool option and were open to further study to further quantify cost-benefits
- Landowner 2 Feb 24th: Definitely opposed to large Auxiliary spillway on their property (Alt 1). Were open to further study on dry dam. Concerned about loss of road and large costs in general.
- Landowner 3 Feb 28th. Very concerned about the breach potential as he has just purchased homestead property immediately ds of dam. Interested in breach modeling and compensation options
- Landowner 4 March 3rd. Concerned about his property value, stagnant water. Thinks a large pool might be a better option for property values. Open to further study.

Summary of Verbal Comments/Questions at the March 8, 2022 Scoping Meeting

- Lorie Berthold – provided handouts on invertebrates, clams etc.. she had 4 main concerns which would apply to the permanent pool alternative:
 - Reduced flow – inadequate flow downstream for aquatic species
 - Increase nitrates and sediment
 - Displacement of animals and people and ecosystems
 - Decline of macroinvertebrates
- Q1 - 1992 the US Army Corp of Engineers put the project down, why
 - Response – Not Corps, project was not completed due to opposition and lack of funding for the program
- Q2– How far along is the cost/benefit analysis?
 - Response – C/B has not been completed, should the next phase progress, NRCS will develop calibrated hydrologic and hydraulic models and generate depth/duration grids for 2, 10, 25, 100, and 500 year events. A consulting economics will be hired to quantify and an Economist will complete the C/B
- Comment 1 – river was beautiful before dams were installed. During the 1980's droughts, it quit flowing
- Q3 – asked about aquifer recharge and stated the dry dam makes sense
- Q4 – Informal poll “let’s see a show of hands as to who is in favor of the project”
 - Permanent pool – 1
 - Alt 2 – 7-10
 - More Study 7-10
 - Opposed – 5
- Q5 – question on SWC Irrigation water allocations
 - Response from Randy Gjestvang
- Q6 – How do you protect downstream. landowners from breach?
 - Response – breach modeling will be completed on the proposed dam, those affected would have options such as dikes, relocating structures, etc...
- Q7 – Concerns about the sandy geology and high groundwater table
 - Response by Tom S. – disadvantages of large earthen spillway, however the dam may be feasibly constructed with detailed design considerations
- Nick West Comment 2 – “anything we can do to hold the water back will be good”
- Comment 3 – Is there a list of downstream landowners
 - Response – County Emergency Manager has a list

- Q8 – why not redesign existing dams to be dry dams?
 - Response – this is possible for dams not originally built with a recreation purpose
- Tom Perdue Comment – was originally in favor of permanent pool, but after seeing all alternatives now favors dry dam.
- Comment Rustebakke – why wasn't old channel completed 35 years ago
 - Response by Rich Axvig – landowner opposition and environmental concerns.

Results of Survey Forms as of March 15, 2022

- Responses weighted towards landowners affected by dam pool vs downstream landowners affected by flooding
- Very little support for either permanent pool option
- 4 responses from gov't agencies – poor response from Environmental agencies (i.e. Parks, G&F, USFWS – did not hear back from any of these)
- Of the 7 opposed to the project, 4 of them cited reasons that would not apply to the dry dam option such as ponding water on good cropland, reduced flows downstream and opposition to options that would increase irrigation

Preferred Option:

Large Permanent Pool: 1	7%
Small Permanent Pool: 1	7%
Dry Dam: 7	50%
Opposed to Any: 7	50%
Undecided/More Study: 4	29%

Resource Concerns of *High* Concern to >50% of the Respondents:

Agricultural Flood Damages
 Road/Bridge/Culvert Damages
 Ground Water Quality
 Surface Water Quality
 Soil Erosion/Soil Quality
 Wetlands
 Ecologically Critical Areas

Resource Concerns of *Medium* Concern to >50% and/or *High* Concern for >25% of Respondents:

Wildlife Habitat
 Land Use
 Streambank Erosion
 Forest Resources
 Riparian Areas
 Invasive Species
 Public Health and Safety
 Prime Farmland
 Wetlands
 Ecologically Critical Areas

On the basis of input provided and initial resource assessment, NRCS identified the following preliminary NEPA scoping concerns.

Item/Concern	Relevant to the Proposed Action?		Rationale
	Yes	No	
<i>Human Concerns</i>			
Environmental Justice	X		Potential presence of minority, low income, or tribal populations in the watershed. Federal projects must comply with E.O. 12898.
Social Issues	X		Disruption of community cohesion occurs during floods. Concerns regarding potential local tax assessments.
Land Use	X		Nutrient transport, wildlife habitat, and flooding is impacted by land use in the watershed.
Cultural Resources	X		Cultural resources are present in the watershed. Federal projects must comply with Section 106 of the National Historic Preservation Act.
Public Health and Safety	X		Standing water over roads and road washouts cause a risk to public safety during floods.
Scenic Beauty	X		No designated scenic sites, however visual impacts from alternatives may be present. Concern about impacts to the Turtle River from existing dams.
Parklands	X		Parklands are present in the watershed.
Noise	X		Potential temporary noise impacts due to construction.
Significant Scientific Resources		X	No scientific resources present in the watershed.
<i>Environmental Concerns</i>			
Fish and Wildlife	X		Fish and wildlife present, including the only trout fishery in North Dakota downstream in Turtle River State Park. Habitat impacted due to loss of native prairie and wetlands throughout the watershed. Aquatic invertebrates and freshwater clams specifically noted as concerns.
Essential Fish Habitat		X	There is no designated essential fish habitat in the watershed.
Invasive Species	X		Both terrestrial and aquatic invasive species are present in the watershed and could be spread by construction.
Migratory Birds, Bald and Golden Eagles	X		Migratory birds utilize the watershed. There is potential for Bald and Golden Eagle presence.
Threatened and Endangered Species	X		Potential presence of threatened and endangered species in the watershed. Federal projects must comply with Section 7 of the Endangered Species Act.
Ecologically Critical Areas		X	There are no designated ecologically critical areas in the watershed.

Item/Concern	Relevant to the Proposed Action?		Rationale
	Yes	No	
Coastal Management Zones, Coral Reefs		X	None are present in the watershed.
Natural Areas	X		Natural areas are present in the watershed.
Air Quality	X		Potential for temporary dust emissions during construction.
Soil Resources	X		Wind erosion and salinity is a concern with soils in the watershed.
Prime and Unique Farmland	X		Prime farmland is present in the watershed and regulated under the Farmland Protection Policy Act. A dam could both benefit and negatively impact prime farmland.
Riparian Areas	X		Riparian areas are present in the watershed. The riparian forest through Turtle River State Park downstream of the proposed dam was specifically mentioned as a concern.
Forest Resources	X		Forested riparian zones are present in the watershed. Concerns noted regarding whether reduced flooding due to another dam would impact mature forest in Turtle River State Park.
Floodplain Management	X		Designated floodplains exist throughout the watershed. Federal projects must comply with E.O. 11988.
Water Resources	X		Flood damages to cropland, roads, basements, and water quality is a concern. Elk River Aquifer, a shallow glacial drift aquifer underlying the Turtle River,
Sole Source Aquifers		X	There are no EPA designated sole source aquifers in the watershed.
Wild and Scenic Rivers		X	There are no wild and scenic river designations within the watershed.
Wetlands	X		Wetlands are present in the watershed and wetland loss within the region is an identified concern. Federal projects must comply with E.O. 11990. Construction of a dam with permanent pool could cause loss of a significant quantity of wetlands.
Waters of the United States	X		Waters of the United States are present in the watershed and impacts must be permitted by the USACE.
Water Quality	X		Water quality concerns exist within the watershed; the Turtle River downstream of the proposed dam site is listed for multiple impairments. Nutrient loads a concern. Concerns with flooding impacts on private drinking water wells.
Regional and International Water Resource Plans	X		International and regional water resource plans have identified the watershed as a priority for nutrient

Item/Concern	Relevant to the Proposed Action?		Rationale
	Yes	No	
			reduction and construction of flood retention projects.

After considering input from the scoping meeting, the Sponsors directed NRCS to proceed with evaluation of the dry dam alternative only.

5 RESOURCE INVENTORY

Wetlands are present through the Turtle River floodplain at the proposed dam site. Executive Order 11990 requires federally financed construction projects avoid, to the extent practical, impacts associated with the destruction or modification of wetlands. Sequencing under EO 11990 directs agencies to avoid, minimize, and mitigate impacts in that order of preference. Section 404 of the federal Clean Water Act regulates the placement of fill into waters of the United States, including wetlands adjacent or hydraulically connected to interstate or navigable waters. The Red River of the North is a navigable river therefore by definition, the Turtle River and tributaries would be considered Waters of the US and under the jurisdiction of USACE. To identify the locations and extent of wetlands at the proposed dam site and within the flood pool, field inventory was completed by NRCS staff in October 2020. That information is provided in the appendix to this document.

Agricultural land was categorized by field crop initially using the National Agricultural Statistics Service (NASS) data for 2020. As is customary with this remote sensing derived data, which is classified utilizing algorithms developed for the entire United States, there were apparent errors in the data. Random sampling of the visual data indicated that cropland was being miscoded as grassland in many grid cells. indicated that involving classification of cropland as grassland. Experts at the International Water Institute used the Turtle River watershed as a test case to explore improved image classification with machine learning, to improve the quality of NASS data. Although no dataset is 100% accurate, results were improved and cropland increased by 17% in the final dataset used as the basis of the economic analysis.

NRCS installed data loggers in 3 piezometers placed at the dam site and at the bridge on 24th Ave NE immediately upstream to record water levels from 2021-2023. NRCS also conducted water quality sampling using grab samples from the bridge taken in 2021-22. That data is on file at the ND NRCS State Office.

Extensive geologic investigation and soil mechanics testing had been conducted at the dam site in the 1990's planning effort, therefore no additional work was done for this preliminary design effort. As outlined in the concept design appendix NRCS completed topographic survey work in the immediate area of the dam. A licensed land surveyor with HDR, under contract with the Grand Forks WRD, completed survey work to identify property lines in the vicinity of the dam. HDR also surveyed river cross sections and road crossings for the hydraulic modeling and foundation elevations of homes along the river.

If the planning effort was to proceed further, additional inventory and assessment would need to take place related to vegetative communities, fish and wildlife habitat, riparian forests, and fluvial geomorphology.

6 PRELIMINARY DESIGN, EVALUATION

Per the decision by the Sponsors noted in Section 6, NRCS progressed to develop a concept design and conduct economic evaluation of the dry dam alternative presented in the feasibility report only.

Substantial effort was put into developing detailed HMS hydrologic and RAS hydraulic existing condition models for the Upper Turtle River. Calibration for the models was completed based the June 2000 precipitation driven flood and the April 2022 rain on snow driven flood. Detailed descriptions of model development are provided in the hydrology and hydraulics appendix report. Synthetic hydrographs for 2 through 500-year recurrence interval events from the HMS model were routed through the RAS model for both existing conditions and conditions with the dam. Gridded results with data for flood depth and duration were then exported to HEC-FIA to generate comparative flood damage results for structures and vehicles. Gridded data were exported and summarized in excel, as outlined in the economic analysis appendix, to generate comparative flood damages for roads and cropland.

Given the primary purpose of the project was identified as flood damage reduction, the dam was designed to maximize temporary flood retention based on site topography. A grass lined spillway was found to be infeasible, given soils at the site. Given the decision to utilize an on-grade principal spillway conduit, to avoid negative environmental effects associated with a riser inlet, use of an overtopping structural spillway was the efficient choice to have a combined stilling basin for both spillways. The design process included layout and cost estimates for both reinforced concrete and roller compacted concrete overtopping structural spillways. A variety of crest, stilling basin, and energy dissipation design options were also evaluated, on the basis of construction cost, to arrive at the proposed preliminary design. The dam would be a high hazard structure with a drainage area of 158.7 square miles, maximum height of 35 feet, and earthen embankment length of 3,000 feet with an interior cutoff wall. The principal spillway consists of a 160 ft long, 6 ft x 6 ft reinforced concrete box culvert, set on grade with the existing river channel to ensure no change in flows up to bankfull(<1.5-year RI) and natural sediment transport due to the project. The auxiliary spillway would be over the top of the principal and consist of 360 ft wide reinforced concrete chute with baffle blocks, with a reinforced concrete/riprap stilling basin. Relief wells would be installed across the floodplain, on the downstream toe of the dam and outlet into a channel drained towards the river channel. Roads upstream of the dam would be raised to ensure they were above the 100-yr flood inundation level. One home immediately downstream of the dam would need to be relocated and the owner compensated. Hydraulic, geotechnical, and structural design details, preliminary design drawings, and a detailed construction cost estimate are provided in the concept design appendix report.

Total implementation costs, based on a conservative estimate of having to pay full land value for flowage easements:

Item	Estimate
Final Engineering Design	\$ 550,000
Land Rights, Relocation	\$ 7,871,352
Sponsor Admin, Legal	\$ 310,000
Construction Engineering	\$ 750,000

Construction	\$ 12,472,132
<i>Total</i>	\$ 21,953,484

Annual Operation and Maintenance Costs are estimated at \$5,000 per year. The average annual equivalent of total costs, based on a 3.0% discount rate over a lifespan of 50-years, is \$836,243.

Results of the economic analysis indicate that the dam would provide an average annual benefit of \$151,231 per year: 64% for reduced damages to structures and vehicles, 21% for reduced cropland damages, 13% for reduced road damages, and 2% for national flood insurance program savings.

The net Benefit to Cost Ratio (B/C) is 0.2:1. Note that if a less conservative approach is taken for the projected value of flowage easements, that raises the net B/C to 0.3:1.

NRCS has not completed a thorough environmental evaluation on the project to date. That would be the next step in the planning process. Although the dam, as designed, has less than a 0.2-acre direct impact to wetlands an analysis into hydrologic modification impacts to downstream riparian wetlands and forested areas would need to be completed. Likewise, detailed considerations and consultations with other agencies on fish and wildlife impacts would need to be completed. The principal spillway design developed for the project does mitigate many of the environmental concerns associated with a standard riser tower, however it does not fully eliminate all concerns. In the 1990's planning effort an extensive field survey for cultural resources was completed and the dam determined to have no potential for impact. That would also need to be revisited by NRCS staff and consultations completed with SHPO and Tribes if the planning process was to move forward.

7 ALTERNATIVES TO MOVE FORWARD

Based on the B/C less than 1.0 the project cannot move forward under a flood damage reduction purpose only.

NRCS did consult with ND DWR on managed aquifer recharge potential; they have consulting hydrogeologists working on modeling effort currently for the Elk Valley Aquifer. Based on that discussion, the dry dam itself would provide some recharge as currently designed. Gravity recharge basins could be constructed in the floodplain to augment recharge volume. Unfortunately the aquifer is highly connected to the Turtle River; so the period of beneficial use for that recharge volume would only be 4-6 weeks after a flood event. That time period after a flood (most of which occur in early spring in this watershed), would not have value for irrigation. Development of a dam with a permanent pool that could be used for irrigation and/or recreation was eliminated due to the exorbitant cost of wetland mitigation with a federal project, as well as environmental impacts.

The one path forward for the project would be development and operation of constructed wetlands for dissolved phosphorus removal. That would tie into U.S. government obligations under the Boundary Waters Treaty with Canada. That benefit, plus watershed specific environmental benefits, has successfully been utilized to proceed with other Red River Basin PL-566 retention projects. Whether or not project sponsors want to proceed with a multi-purpose project will be discussed. If they choose not to, this report will be the final documentation for this planning effort.

8 PLANNING TEAM

Christi Fisher, P.E. State Conservation Engineer
Jon Petersen, P.E. Hydraulic Engineer

Tom Schanandore, P.E. Design Engineer
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Rita Sveen, Watershed Planner
Dana Whippo, PhD Economist

Note that multiple other field and state office staff assisted in the aquatic resources inventory work. Field office staff attended meetings with the Sponsors, public, and landowners.

9 APPENDICES

Scoping Comments

Aquatic Resources Report

Existing Conditions Hydrology and Hydraulics Report

Concept Design Report

Economic Analysis