

# River's Bend Golf Course

## *Flood Mitigation and Restoration Plan*

**Prepared For:**  
City of Flandreau  
1005 W. Elm Avenue  
Flandreau, SD 57028

**Prepared By:**  
Wyss Associates, Inc.  
728 6th Street  
Rapid City, SD 57701

July 2020



River's Bend Golf Course



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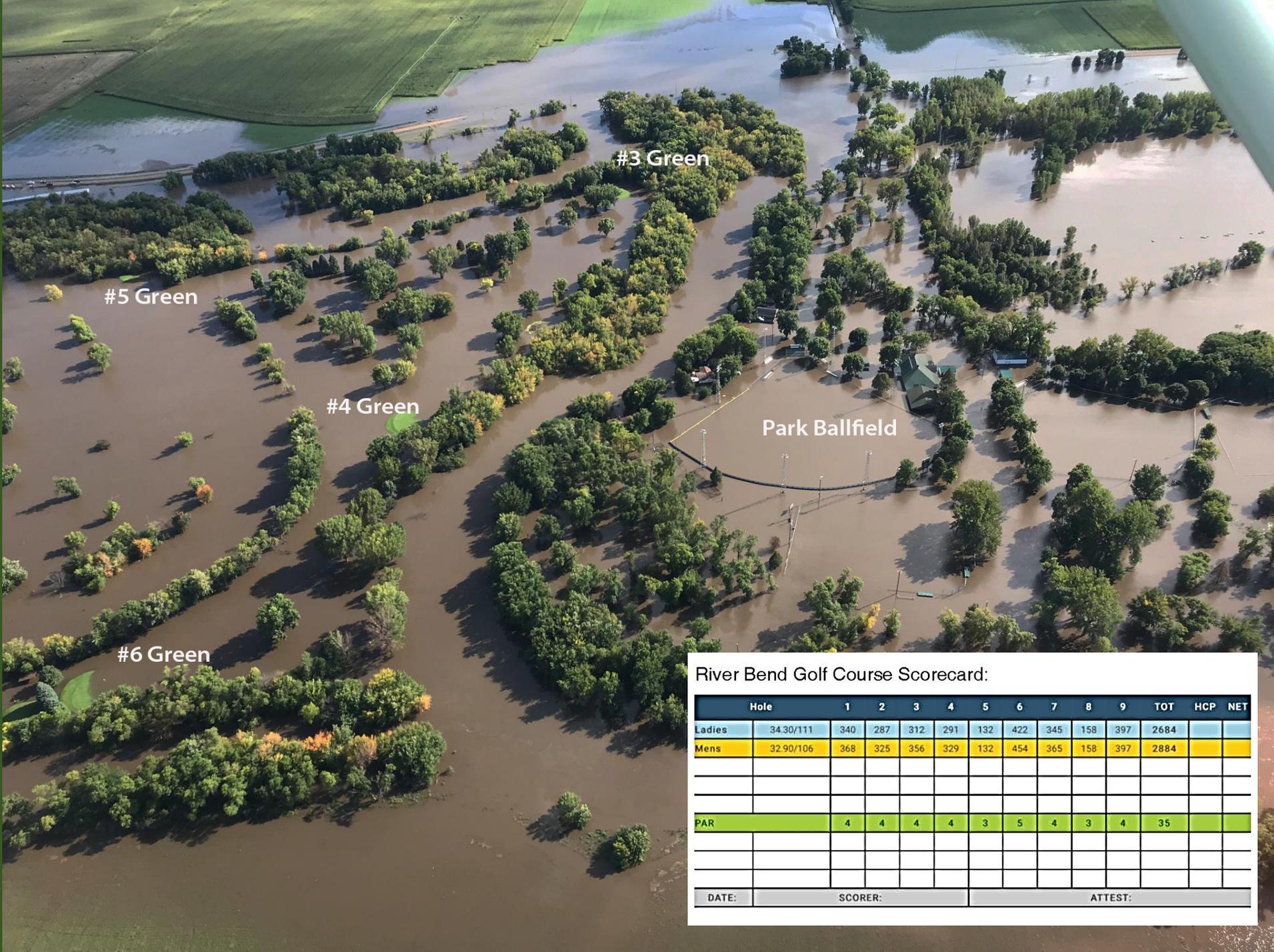
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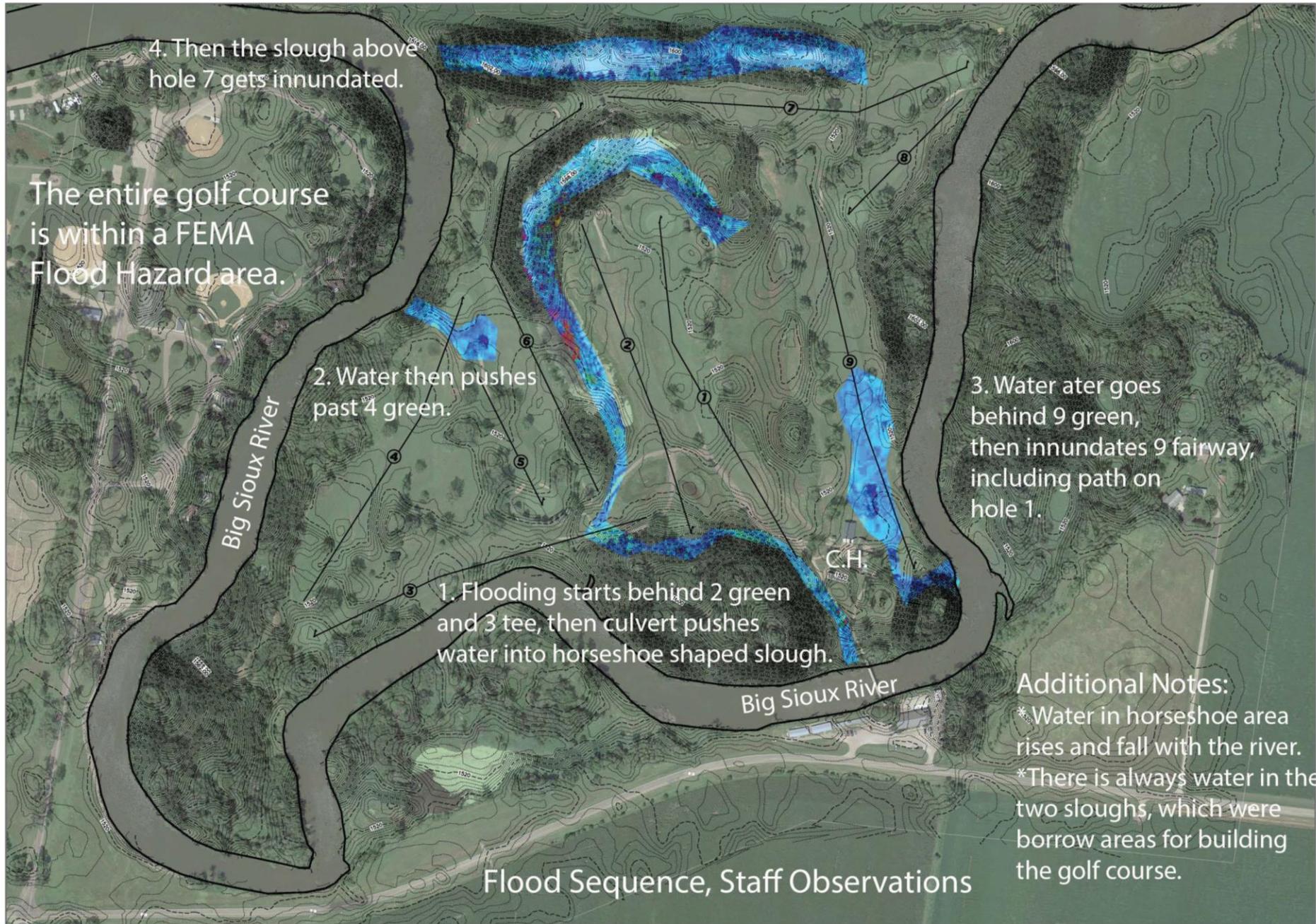


**River Bend Golf Course Scorecard:**

Hole	1	2	3	4	5	6	7	8	9	TOT	HCP	NET
Ladies	34.30/111	340	287	312	291	132	422	345	158	397	2684	
Mens	32.90/106	368	325	356	329	132	454	365	158	397	2884	
PAR	4	4	4	4	3	5	4	3	4	35		
DATE:	SCORER:					ATTEST:						



ELEVATIONS			
Hole #	Green	Tee	Fairway
Maint.	1528		
1	1526	1530	1520
2	1532	1520	1520
3	1536	1520	1520-30
4	1528	1520	1510-20
5	1532	1516	1520
6	1530	15209	1520-30
7	1536	1530	1510-20
8	1532	1534	1530
9	1540	1520	1510-20



The entire golf course is within a FEMA Flood Hazard area.

4. Then the slough above hole 7 gets inundated.

2. Water then pushes past 4 green.

3. Water ater goes behind 9 green, then innundates 9 fairway, including path on hole 1.

1. Flooding starts behind 2 green and 3 tee, then culvert pushes water into horseshoe shaped slough.

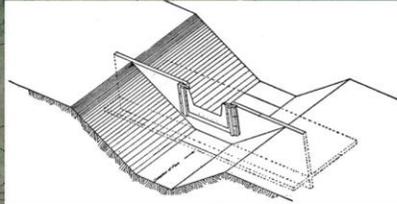
Additional Notes:  
 \*Water in horseshoe area rises and fall with the river.  
 \*There is always water in the two sloughs, which were borrow areas for building the golf course.

Flood Sequence, Staff Observations



*Flood Mitigation Plan A Measures include:*

- Earthworks/Embankments in low areas on holes #4 and #7.
- Drainage re-routing on hole #4, #7, the north slough and cleaning out the horseshoe slough.
- Hole re-routing options have been considered, but not recommended at this time.
- Upstream considerations include the installation of inflow and outflow weirs at the ends of the north slough.
- On-site drainage considerations are addressed in the Mitigation as well as the Restoration plans.



# Golf Course Mitigation Plan A

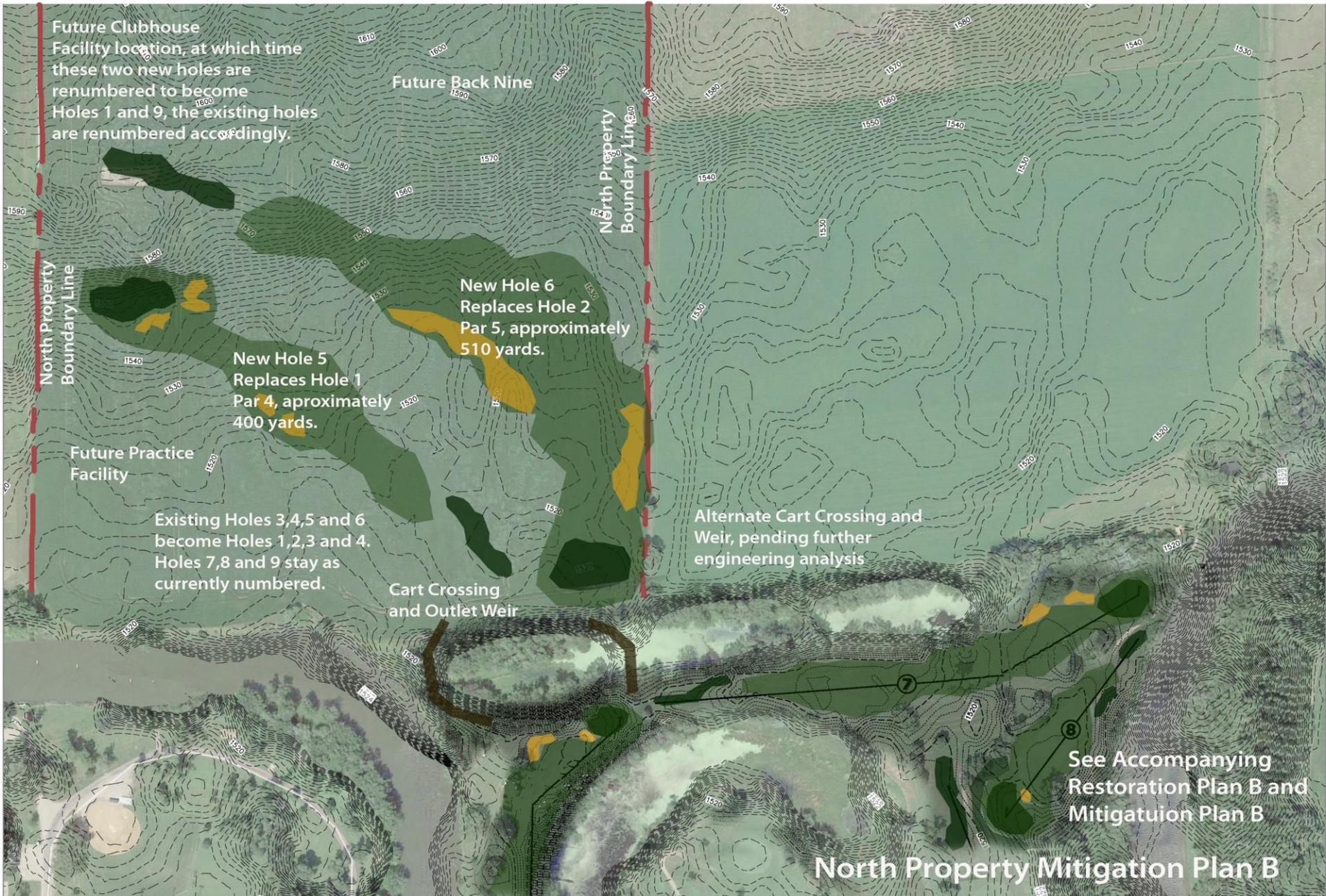
*Flood Mitigation Plan B Measures include:*

- Earthworks/Embankments in low areas on holes #4 and #7.
- Drainage re-routing on hole #4, #7, the north slough and cleaning out the horseshoe slough.
- Removing existing holes 1 and 2.
- Constructing two new holes on City property to the north.
- Upstream considerations include the installation of inflow and outflow weirs at the ends of the north slough.
- On-site drainage considerations are addressed in the Mitigation as well as the Restoration plans.





# Golf Course Mitigation Plan B



Hole #4, post flood, April 2020:

Fairway #4 Mitigation Measures:



Hole #7, post flood, April 2020:



Hole #7 Mitigation Measures:





- General Notes:**
1. All Tees are elevated about 2 ft - 5 ft for increased flood protection and extended forward for multiple teeing locations.
  2. All Fairways rototilled and prepped for new turf.
  3. New irrigation components and controls, including pumps with filters. Utilize existing piping where possible.
  4. New topmix on all Greens, some enlarged, in a modified USGA standard.
  5. All bunkers repaired and new subsurface draintile installed. New bunkers installed in the same manner.
  6. See accompanying Mitigation Plan for water runoff modifications.

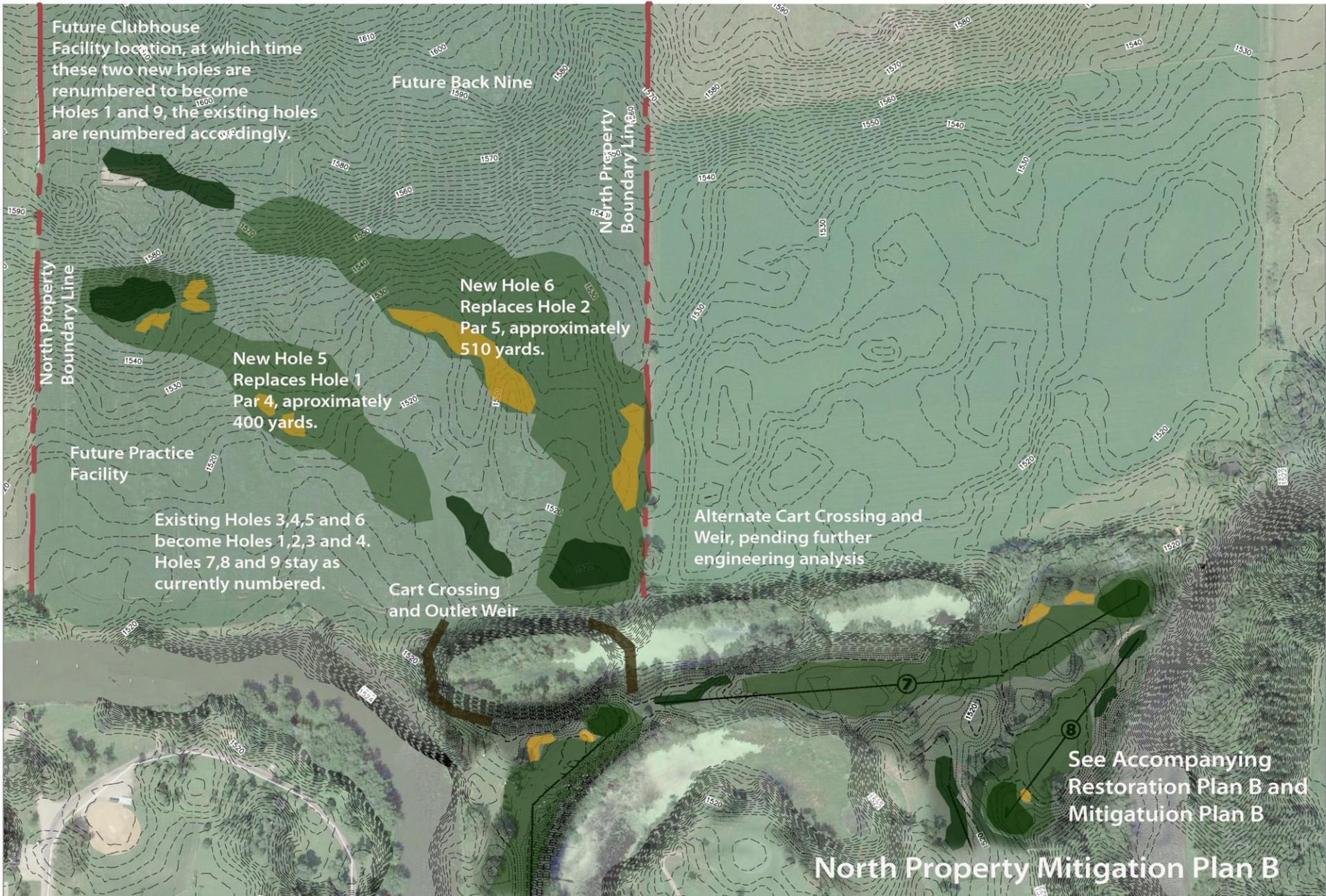
## Golf Course Restoration Plan A



See Accompanying North Property Mitigation Plan B for new Holes 5 and 6 and for Cart Crossing.

- General Notes:**
1. All Tees are elevated about 2 ft - 5 ft for increased flood protection and extended forward for multiple teeing locations.
  2. All Fairways rototilled and prepped for new turf.
  3. New irrigation components and controls, including pumps with filters. Utilize existing piping where possible.
  4. New topmix on all Greens, some enlarged, in a modified USGA standard.
  5. All bunkers repaired and new subsurface drain tile installed. New bunkers installed in the same manner.
  6. See accompanying Mitigation Plan for water runoff modifications.

## Golf Course Restoration Plan B



*Fairway #1, post flood, April 2020:*



*Proposed Fairway #1, with new turf established:*



*Existing hole #2, post flood, April 2020:*



*Proposed hole #2 with maintained water level in the ponds:*



*Existing fairway #9, post flood, April 2020:*



*Proposed restored Fairway #9 with new turf established:*



COURSE MITIGATION PLAN A	UNIT	QUANTITY	UNIT \$	SUBTOTALS	LOW SIDE	HIGH SIDE	NOTES
					Less 20%	Plus 20%	
<b>North Diversion</b>							
Mobilization, Dewatering	LS	1.00	50,000.00	50,000.00			<i>Each phase needs separate contractor mobilization</i>
Grading fairway 7 low area	CY	7,500.00	10.00	75,000.00			<i>Fill low area between landing area and hole 7 green, 5 ft. dpeth average</i>
Culvert allowance	LS	1.00	15,000.00	15,000.00			<i>Below Fairway fill area</i>
Wetland Mitigation	LS	1.00	25,000.00	25,000.00			<i>Specialized plantings and soil prep</i>
Revegetation, Erosion Control, Establishment	AC	1.50	7,500.00	11,250.00			<i>Rehabilitaion of disturbed areas</i>
BSR Bypass structures	LS	2.00	30,000.00	60,000.00			<i>Concrete weirs, final design to be determined</i>
Design and Contingency	LS	1.00	30,000.00	30,000.00			<i>Approximation</i>
<b>Total, North Diversion Phase</b>				<b>266,250.00</b>	<b>213,000.00</b>	<b>319,500.00</b>	

COURSE MITIGATION PLAN A	UNIT	QUANTITY	UNIT \$	SUBTOTALS	LOW SIDE	HIGH SIDE	NOTES
					Less 20%	Plus 20%	
<b>North Diversion</b>							
Mobilization, Dewatering	LS	1.00	50,000.00	50,000.00			<i>Each phase needs separate contractor mobilization</i>
Grading fairway 7 low area	CY	7,500.00	10.00	75,000.00			<i>Fill low area between landing area and hole 7 green, 5 ft. depth average</i>
Culvert allowance	LS	1.00	15,000.00	15,000.00			<i>Below Fairway fill area</i>
Wetland Mitigation	LS	1.00	25,000.00	25,000.00			<i>Specialized plantings and soil prep</i>
Revegetation, Erosion Control, Establishment	AC	1.50	7,500.00	11,250.00			<i>Rehabilitaion of disturbed areas</i>
BSR Bypass structures	LS	2.00	30,000.00	60,000.00			<i>Concrete weirs, final design to be determined</i>
Design and Contingency	LS	1.00	30,000.00	30,000.00			<i>Approximation</i>
<b>Total, North Diversion Phase</b>				<b>266,250.00</b>	<b>213,000.00</b>	<b>319,500.00</b>	
<b>Stormwater Runoff Mitigation:</b>							
Mobilization, Dewatering	LS	1.00	50,000.00	50,000.00			<i>Each phase needs separate contractor mobilization</i>
Grading fairway 4 low area	CY	7,500.00	10.00	75,000.00			<i>Average height, includes stripping and replacing topsoil</i>
Culvert allowance	LS	1.00	15,000.00	15,000.00			<i>Across #4 Fairway</i>
Allowance for ponds at #1 Tee and #2 Green	LS	1.00	30,000.00	30,000.00			<i>Pond edge stabilization and overflow structures</i>
Allowance slough dredging and overflow culverts	LS	1.00	35,000.00	35,000.00			<i>Actual quantity pending new topographic mapping</i>
Design and Contingency	LS	1.00	30,000.00	30,000.00			<i>Approximation</i>
<b>Total Stormwater Runoff Mitigation Phase</b>				<b>235,000.00</b>	<b>188,000.00</b>	<b>282,000.00</b>	

<b>COURSE RESTORATION PLAN A</b>							
Mobilization and Bonds	LS	1.00	50,000.00	50,000.00			<i>Each phase needs separate contractor mobilization</i>
Soil development and rehabilitation	AC	30.00	2,500.00	75,000.00			<i>Clean up from flood damage and flood deposits, much manual labor</i>
Tree and Brush clean up	ls	1.00	10,000.00	10,000.00			<i>As necessary</i>
Tee fill and expansion for flood protection	SF	25,000.00	4.00	100,000.00			<i>Elevating 2'-5', topdressing and leveling</i>
Green rehabilitation allowance	SF	70,000.00	2.00	140,000.00			<i>Topdressing, smoothing and soil amendments</i>
Fairway rehabilitation allowance	AC	20.00	5,000.00	100,000.00			<i>Primarily finishing prep after soil development noted above</i>
Finish Prepping	LS	1.00	25,000.00	25,000.00			<i>Getting ready for overseeding</i>
Bunker Reconstruction and expansion	LS	1.00	50,000.00	50,000.00			<i>Shaping, new sub-drainage and sand</i>
Erosion Control	AC	20.00	3,000.00	60,000.00			<i>Locations and extent to be determined</i>
Irrigation System, including new piping	LS	1.00	450,000.00	450,000.00			<i>Replace aging system including pumps (add filtering method)</i>
Sod perimeters (bunkers, tees and greens)	LS	1.00	30,000.00	30,000.00			<i>To protect from wash out around key golf features</i>
Grassing	LS	1.00	50,000.00	50,000.00			<i>Overseeding most of the course</i>
Cartpath resurfacing	SF	4,000.00	10.00	40,000.00			<i>Locations and extent to be determined</i>
Maturation and Establishment	AC	25.00	2,500.00	62,500.00			<i>Materials and manpower</i>
Topographic and Geotechnical Surveying.	LS	1.00	20,000.00	20,000.00			<i>Necessary to develop accurate construction documents</i>
Wetland mapping	LS	1.00	5,000.00	5,000.00			<i>DENR will require this</i>
Flood Hazard mapping and FEMA modification apps.	LS	1.00	25,000.00	25,000.00			<i>FEMA will require this</i>
Design and Construction Administration	LS	1.00	95,000.00	90,000.00			<i>Approximation</i>
Contingency	LS	1.00	130,000.00	130,000.00			<i>Approximately 10% at this preliminary phase</i>
<b>TOTAL COURSE RESTORATION PLAN A</b>				<b>1,512,500.00</b>	<b>1,210,000.00</b>	<b>1,815,000.00</b>	

COURSE MITIGATION PLAN A	UNIT	QUANTITY	UNIT \$	SUBTOTALS	LOW SIDE	HIGH SIDE	NOTES
					Less 20%	Plus 20%	
<b>North Diversion</b>							
Mobilization, Dewatering	LS	1.00	50,000.00	50,000.00			Each phase needs separate contractor mobilization
Grading fairway 7 low area	CY	7,500.00	10.00	75,000.00			Fill low area between landing area and hole 7 green, 5 ft. depth average
Culvert allowance	LS	1.00	15,000.00	15,000.00			Below Fairway fill area
Wetland Mitigation	LS	1.00	25,000.00	25,000.00			Specialized plantings and soil prep
Revegetation, Erosion Control, Establishment	AC	1.50	7,500.00	11,250.00			Rehabilitation of disturbed areas
BSR Bypass structures	LS	2.00	30,000.00	60,000.00			Concrete weirs, final design to be determined
Design and Contingency	LS	1.00	30,000.00	30,000.00			Approximation
<b>Total, North Diversion Phase</b>				<b>266,250.00</b>	<b>213,000.00</b>	<b>319,500.00</b>	
<b>Stormwater Runoff Mitigation:</b>							
Mobilization, Dewatering	LS	1.00	50,000.00	50,000.00			Each phase needs separate contractor mobilization
Grading fairway 4 low area	CY	7,500.00	10.00	75,000.00			Average height, includes stripping and replacing topsoil
Culvert allowance	LS	1.00	15,000.00	15,000.00			Across #4 Fairway
Allowance for ponds at #1 Tee and #2 Green	LS	1.00	30,000.00	30,000.00			Pond edge stabilization and overflow structures
Allowance slough dredging and overflow culverts	LS	1.00	35,000.00	35,000.00			Actual quantity pending new topographic mapping
Design and Contingency	LS	1.00	30,000.00	30,000.00			Approximation
<b>Total Stormwater Runoff Mitigation Phase</b>				<b>235,000.00</b>	<b>188,000.00</b>	<b>282,000.00</b>	
<b>COURSE RESTORATION PLAN A</b>							
Mobilization and Bonds	LS	1.00	50,000.00	50,000.00			Each phase needs separate contractor mobilization
Soil development and rehabilitation	AC	30.00	2,500.00	75,000.00			Clean up from flood damage and flood deposits, much manual labor
Tree and Brush clean up	ls	1.00	10,000.00	10,000.00			As necessary
Tee fill and expansion for flood protection	SF	25,000.00	4.00	100,000.00			Elevating 2'-5', topdressing and leveling
Green rehabilitation allowance	SF	70,000.00	2.00	140,000.00			Topdressing, smoothing and soil amendments
Fairway rehabilitation allowance	AC	20.00	5,000.00	100,000.00			Primarily finishing prep after soil development noted above
Finish Prepping	LS	1.00	25,000.00	25,000.00			Getting ready for overseeding
Bunker Reconstruction and expansion	LS	1.00	50,000.00	50,000.00			Shaping, new sub-drainage and sand
Erosion Control	AC	20.00	3,000.00	60,000.00			Locations and extent to be determined
Irrigation System, including new piping	LS	1.00	450,000.00	450,000.00			Replace aging system including pumps (add filtering method)
Sod perimeters (bunkers, tees and greens)	LS	1.00	30,000.00	30,000.00			To protect from wash out around key golf features
Grassing	LS	1.00	50,000.00	50,000.00			Overseeding most of the course
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Maturation and Establishment	AC	25.00	2,500.00	62,500.00			Materials and manpower
Topographic and Geotechnical Surveying.	LS	1.00	20,000.00	20,000.00			Necessary to develop accurate construction documents
Wetland mapping	LS	1.00	5,000.00	5,000.00			DENR will require this
Flood Hazard mapping and FEMA modification apps.	LS	1.00	25,000.00	25,000.00			FEMA will require this
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Contingency	LS	1.00	130,000.00	130,000.00			Approximately 10% at this preliminary phase
<b>TOTAL COURSE RESTORATION PLAN A</b>				<b>1,512,500.00</b>	<b>1,210,000.00</b>	<b>1,815,000.00</b>	

COURSE MITIGATION PLAN B	UNIT	QUANTITY	UNIT \$	SUBTOTALS	LOW SIDE	HIGH SIDE	NOTES
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Wetland Mitigation	LS	1.00	25,000.00	25,000.00			<i>Specialized plantings and soil prep</i>
Revegetation, Erosion Control, Establishment	AC	1.25	7,500.00	9,375.00			<i>Rehabilitaion of disturbed areas</i>
BSR Bypass structures and cart crossing	LS	1.00	220,000.00	220,000.00			<i>Concrete weirs, final design to be determined, west structure includes cart crossing</i>
Design and Contingency	LS	1.00	30,000.00	30,000.00			<i>Approximation</i>
<b>Total, North Diversion Phase</b>				<b>419,375.00</b>	<b>335,500.00</b>	<b>503,250.00</b>	

COURSE MITIGATION PLAN B	UNIT	QUANTITY	UNIT \$	SUBTOTALS	LOW SIDE	HIGH SIDE	NOTES
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<b>Total, North Diversion Phase</b>				<b>419,375.00</b>	<b>335,500.00</b>	<b>503,250.00</b>	
<b>Stormwater Runoff Mitigation:</b>							
Mobilization, Dewatering	LS	1.00	50,000.00	50,000.00			<i>Each phase needs separate contractor mobilization</i>
Grading fairway 4 low area	CY	7,500.00	10.00	75,000.00			<i>Average height, includes stripping and replacing topsoil</i>
Culvert allowance	LS	1.00	15,000.00	15,000.00			<i>Across #4 Fairway</i>
Allowance slough dredging and overflow culverts	LS	1.00	25,000.00	25,000.00			<i>Actual quantity pending new topographic mapping</i>
Design and Contingency	LS	1.00	30,000.00	30,000.00			<i>Approximation</i>
<b>Total Stormwater Runoff Mitigation Phase</b>				<b>195,000.00</b>	<b>156,000.00</b>	<b>234,000.00</b>	

<b>COURSE RESTORATION PLAN B</b>						
Mobilization and Bonds	LS	1.00	50,000.00	50,000.00		<i>Each phase needs separate contractor mobilization</i>
Soil development and rehabilitation	AC	25.00	2,500.00	62,500.00		<i>Clean up from flood damage and flood deposits, much manual labor</i>
Tree and Brush clean up	ls	1.00	10,000.00	10,000.00		<i>As necessary</i>
Tee fill and expansion for flood protection	SF	20,000.00	4.00	80,000.00		<i>Elevating 2'-5', topdressing and leveling, reduced to 7 teeing areas</i>
Green rehabilitation allowance	SF	57,000.00	2.00	114,000.00		<i>Topdressing, smoothing and soil amendments, reduced to 7 greens</i>
Fairway rehabilitation allowance	AC	17.00	5,000.00	85,000.00		<i>Primarily finishing prep after soil developmnt noted above, reduced to 7 holes</i>
Finish Prepping	LS	1.00	20,000.00	20,000.00		<i>Getting ready for overseeding, reduced to 7 holes</i>
Bunker Reconstruction and expansion	LS	1.00	40,000.00	40,000.00		<i>Shaping, new sub-drainage and sand</i>
Erosion Control	AC	20.00	3,000.00	60,000.00		<i>Locations and extent to be determined</i>
Irrigation System, including new piping	LS	1.00	400,000.00	400,000.00		<i>Replace aging system including pumps (add filtering method), for 7 of the holes</i>
Sod perimeters (bunkers, tees and greens)	LS	1.00	25,000.00	25,000.00		<i>To protect from wsh out around key golf features, for 7 of the holes</i>
Grassing	LS	1.00	40,000.00	40,000.00		<i>Overseeding most of the course, for 7 of the holes</i>
Cartpath resurfacing	SF	4,000.00	10.00	40,000.00		<i>Locations and extent to be determined</i>
New holes 5 and 6	LS	2.00	350,000.00	700,000.00		<i>Includes grading, irrigation, and construction of all features.</i>
Elevated path to first teeing area	LF	550.00	200.00	110,000.00		<i>Elevated path, 12 ft. width, Trex type durable decking.</i>
Maturation and Establishment	AC	30.00	3,500.00	105,000.00		<i>Materials and manpower</i>
Topographic and Geotechnical Surveying.	LS	1.00	20,000.00	20,000.00		<i>Necessary to develop accurate construction documents</i>
Wetland mapping	LS	1.00	5,000.00	5,000.00		<i>DENR will require this</i>
Flood Hazard mapping and FEMA modification apps.	LS	1.00	25,000.00	25,000.00		<i>FEMA will require this</i>
Design and Construction Adminstration	LS	1.00	95,000.00	90,000.00		<i>Approximation</i>
Contingency	LS	1.00	130,000.00	130,000.00		<i>Approximately 10% at this preliminary phase</i>
<b>Total Golf Course Rehabilitation Phase</b>				<b>2,211,500.00</b>	<b>1,769,200.00</b>	<b>2,653,800.00</b>

COURSE MITIGATION PLAN B	UNIT	QUANTITY	UNIT \$	SUBTOTALS	LOW SIDE	HIGH SIDE	NOTES
					Less 20%	Plus 20%	
<b>North Diversion</b>							
Mobilization, Dewatering	LS	1.00	50,000.00	50,000.00			Each phase needs separate contractor mobilization
Grading fairway 7 low area	CY	7,500.00	10.00	75,000.00			Fill low area between landing area and hole 7 green, 5 ft. dpeth average
Culvert allowance	LS	1.00	10,000.00	10,000.00			Below Fairway fill area
Wetland Mitigation	LS	1.00	25,000.00	25,000.00			Specialized plantings and soil prep
Revegetation, Erosion Control, Establishment	AC	1.25	7,500.00	9,375.00			Rehabilitaion of disturbed areas
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Design and Contingency	LS	1.00	30,000.00	30,000.00			Approximation
<b>Total, North Diversion Phase</b>				<b>419,375.00</b>	<b>335,500.00</b>	<b>503,250.00</b>	
<b>Stormwater Runoff Mitigation:</b>							
Mobilization, Dewatering	LS	1.00	50,000.00	50,000.00			Each phase needs separate contractor mobilization
Grading fairway 4 low area	CY	7,500.00	10.00	75,000.00			Average height, includes stripping and replacing topsoil
Culvert allowance	LS	1.00	15,000.00	15,000.00			Across #4 Fairway
Allowance slough dredging and overflow culverts	LS	1.00	25,000.00	25,000.00			Actual quantity pending new topographic mapping
Design and Contingency	LS	1.00	30,000.00	30,000.00			Approximation
<b>Total Stormwater Runoff Mitigation Phase</b>				<b>195,000.00</b>	<b>156,000.00</b>	<b>234,000.00</b>	
<b>COURSE RESTORATION PLAN B</b>							
Mobilization and Bonds	LS	1.00	50,000.00	50,000.00			Each phase needs separate contractor mobilization
Soil development and rehabilitation	AC	25.00	2,500.00	62,500.00			Clean up from flood dmage and flood deposits, much manual labor
Tree and Brush clean up	ls	1.00	10,000.00	10,000.00			As necessary
Tee fill and expansion for flood protection	SF	20,000.00	4.00	80,000.00			Elevating 2'-5', topdressing and leveling, reduced to 7 teeing areas
Green rehabilitation allowance	SF	57,000.00	2.00	114,000.00			Topdressing, smoothing and soil amendmets, reduced to 7 greens
Fairway rehabilitation allowance	AC	17.00	5,000.00	85,000.00			Primarily finishing prep after soil developmnt noted above, reduced to 7 holes
Finish Prepping	LS	1.00	20,000.00	20,000.00			Getting ready for overseeding, reduced to 7 holes
Bunker Reconstruction and expansion	LS	1.00	40,000.00	40,000.00			Shaping, new sub-drainage and sand
Erosion Control	AC	20.00	3,000.00	60,000.00			Locations and extent to be determined
Irrigation System, including new piping	LS	1.00	400,000.00	400,000.00			Replace aging system including pumps (add filtering method), for 7 of the holes
Sod perimeters (bunkers, tees and greens)	LS	1.00	25,000.00	25,000.00			To protect from wsh out around key golf features, for 7 of the holes
Grassing	LS	1.00	40,000.00	40,000.00			Overseeding most of the course, for 7 of the holes
Cartpath resurfacing	SF	4,000.00	10.00	40,000.00			Locations and extent to be determined
New holes 5 and 6	LS	2.00	350,000.00	700,000.00			Includes grading, irrigation, and construction of all features.
Elevated path to first teeing area	LF	550.00	200.00	110,000.00			Elevated path, 12 ft. width, Trex type durable decking.
Maturation and Establishment	AC	30.00	3,500.00	105,000.00			Materials and manpower
Topographic and Geotechnical Surveying.	LS	1.00	20,000.00	20,000.00			Necessary to develop accurate construction documents
Wetland mapping	LS	1.00	5,000.00	5,000.00			DENR will require this
Flood Hazard mapping and FEMA modification apps.	LS	1.00	25,000.00	25,000.00			FEMA will require this
Design and Construction Adminstration	LS	1.00	95,000.00	90,000.00			Approximation
Contingency	LS	1.00	130,000.00	130,000.00			Approximately 10% at this preliminary phase
<b>Total Golf Course Rehabilitation Phase</b>				<b>2,211,500.00</b>	<b>1,769,200.00</b>	<b>2,653,800.00</b>	

# Thank You

# Q & A



*River's Bend Golf Course in 2016  
(Image from Golf Club website)*

