April 9, 2012

Project Work Plan for DEC/ESD Grant Application Post-Hurricane Irene, Tropical Storm Lee Stream Restoration White Creek, Salem, NY

Town of Salem and Village of Salem
Washington County, New York

Prepared for:
Town of Salem and Village of Salem
214 Main Street
Salem, NY 12865

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C.T. Male Associates Project No: 12.2144

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PROJECT WORK PLAN
DEC/ESD GRANT APPLICATION
WHITE CREEK - SALEM, NY

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PROJECT WORK PLAN
DEC/ESD GRANT APPLICATION
WHITE CREEK - SALEM, NY

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1.0 INTRODUCTION

C.T. Male Associates Engineering, Surveying, Architecture & Landscape Architecture, P.C. (C.T. Male Associates) was retained by the Town of Salem to prepare a Project Work Plan for restoration of the White Creek stream corridor in both the Town and Village of Salem. This report was written to provide technical support for a grant application that is being submitted by Washington County to secure funds to restore White Creek to Pre-Hurricane and Tropical Storm Lee conditions.

Prior to making a field visit to witness the damage caused by the storms we reviewed several reports, photos and data that had been collected and assembled by the Salem Flood Group, Joseph Childs, John Braico and many others. In addition, we met with members of the Salem Flood Group, Town and Village officials, NYS DEC personnel and Washington County Soil & Water Conservation District personnel.

Based on our review of these reports, photos and data along with multiple site visits between March 9, 2012 and March 30, 2012 the three principal impacts that the storms had on the White Creek corridor was flooding, gravel deposition and streambank erosion. Where feasible, the restoration efforts included in the work plan are intended to mitigate future flooding, gravel deposition and streambank erosion.

This report describes specific work areas where restoration efforts are deemed to be the most critical. The report is formatted to provide a description of the problem identified followed by recommended restoration/mitigation measure(s). In addition, an order of magnitude cost estimate has been prepared for each of the recommended restoration/mitigation measures.

2.0 DESCRIPTION OF IMPACTED AREAS

2.1 Impacted Area # 1 – Archibald Street

Statement of the Problem – significant flooding occurred to homes on Archibald Street in the vicinity of the Archibald Street bridge. The channel capacity at the bridge crossing was insufficient to handle the flood flows. This lack of capacity is in part due to the restriction caused by the bridge opening and in part due to a significant accumulation

of gravel in this section of White Creek, both upstream and downstream of the bridge crossing.

2.1.1 Work Area # 1.1 – Archibald Street Bridge

The hydraulic restriction caused by the bridge girders should be addressed by permanently removing the girders and the bridge deck. The distance between the bridge abutments is wide enough such that they do not have to be removed. The abutments could potentially be used to support an arched pedestrian bridge at some time in the future.

2.1.2 Work Area # 1.2 – Archibald Street Bridge down to the RR Bridge

In this section of the creek there are some rock vanes that were constructed across the stream bottom that hinder movement of the bed load causing the stream to choke up with sediment and gravel. At least the center 8′ - 10′ portions of these rock vanes should be removed to facilitate bed load sediment transport through this area. Coupled with this effort the flood control berm along the south side of the stream should be lowered a bit (approximately 1.0′ higher than the top of the stream bank on the north side) and extended upstream into the backyard of the Bain residence to protect that home from flood damage. Also included in this work area is the removal of 2′ - 3′ of gravel in the center 8′ – 10′ of the channel and 1′ – 2′ between the center portion and the streambank.

2.1.3 Work Area # 1.3 – Downstream RR Bridge and Adjacent Farm Access Bridge

The bridge abutments of the lower (privately owned farm access bridge) create a restriction in the channel cross section such that water has difficulty getting through this opening causing sediment to deposit in the area upstream of this bridge which continues upstream under the RR Bridge. Consideration should be given to removing the abutments on the private farm access bridge. Due to uncertainty about ownership and agreements to perform this work it is not included in the scope of work for this work area. To facilitate the movement of sediment through this stretch it is recommended that two rock vanes (pointing upstream creating a "V") be installed upstream of both of these bridges.

2.2 Impacted Area # 2 – Route 22 Bridge

Statement of the Problem – the flood flows exceeded the capacity of the bridge opening and reportedly flowed across the bridge deck. Examination of the area indicates site constraints that severely limit the options available at this location. The size of this opening is much larger than the opening under Archibald Street. The increased conveyance realized as a result of the work at Work Area 1 will help with the hydraulics at the Route 22 Bridge. Consequently, it is recommended that for purposes of this work plan that no work be prescribed at this location.

2.3 Impacted Area # 3 – Route 153 between Blind Buck Road and Main Street

Statement of the Problem – A significant out of stream overflow originates at the former potato field behind the rescue squad building on Route 153, which is located just upstream of the intersection of Route 153 and Blind Buck Road. This out of stream overflow causes flooding along Route 153 including residences, the school, churches and several other structures and businesses. In addition to flooding several structures, this overflow allows contaminated water (flows across upstream croplands) to flow directly into populated areas of the Village.

2.3.1 Work Area # 3.1 – Flood Control Berm

In order to control the out of stream flow that occurs in this area, it is recommended that a flood control berm be designed and constructed to redirect the flood flow away from the Route 153 corridor and into the White Creek corridor. The berm would be constructed along Route 153 and then along the north side of the residential properties that front on Blind Buck Road. The culvert under Route 153 near the rescue squad building would remain to handle low flows.

2.3.2 Work Area # 3.2 – Flood Control Channel

The work in this work area consists of the construction of a depressed grassed swale and lowering Blind Buck Road near the bridge crossing. During non-flood conditions this area would be dry but during flood events it would allow for the conveyance of flood flows back into the White Creek stream channel from the former Potatoe field. Due to the close proximity of residential structures on both sides of the Blind Buck Bridge and bedrock out-croppings it would be very difficult and costly to increase the

bridge opening. In addition, it is reported that flood flows breach the main stream channel upstream of the Blind Buck Road Bridge and flow towards the rescue squad building bypassing the Blind Buck Road Bridge.

2.4 Impacted Area # 4 – Route 153 between Beattie Hollow Road and Chambers Road

Statement of the Problem – Route 153 is impacted by flood flows that reportedly make this section of road impassable. The impacts range from ponding (several feet of water on the road surface) to damage to the road structure due to high velocity water that flows across the road. In addition, poor flow patterns into and out of this bridge jeopardize the structural integrity of the bridge abutments and the road embankment.

2.4.1 Work Area # 4.1 – Improve Outlet Conditions at the Beattie Hollow Bridge

On the right stream bank (looking downstream from the bridge) there are gabion baskets that intrude out into the flow stream of the bridge opening. These baskets should be removed and the bank reconstructed further away from the stream. A low profile bank area should be constructed to maintain the targeted low flow stream width and depth.

2.4.2 Work Area # 4.2 – Protect Embankment at Inlet to the Beattie Hollow Bridge

On the right stream bank (looking downstream at the bridge) protect the wing wall and the Beattie Hollow Bridge embankment by placing large diameter rock in the cavity between the bridge inlet and Route 153. Straightening out the stream channel approach to this bridge is deemed counterproductive because the existing condition retards the surge of flood waters into the Village.

2.4.3 Work Area # 4.3 – Remove Former Bridge Abutment and Install Berm

Across from Braymer Road, remove the old bridge abutment that intrudes into the stream from the left bank (looking downstream). This abutment forces the water towards Route 153 and also creates a restriction in the main flow channel. To reduce the potential for overflows immediately downstream of this area it is recommended that a small berm be constructed atop the right stream bank (looking downstream) to avoid significant flow across the triangular field which impacts Route 153 just upstream of Beattie Hollow Road.

2.4.4 Work Area # 4.4 – Construct Meander just Upstream of Gravel Deposit

Review of historical aerial imagery reveals that a meander once existed upstream of the gravel deposit between Braymer Land and McKeighan Lane. This work area involves re establishment of this meander to reduce the channel bottom slope approaching the gravel deposit. The meander should be constructed leaving the main stream flow untouched. Lastly the meander should be connected to the main stream channel and the main stream channel should be diverted into the meander.

2.4.5 Work Area # 4.5 – Remove Portions of the Gravel Deposit

Leaving the existing stream path in tact, remove some of the gravel from either side of the low flow channel. An approximate stream channel depth of 2′ – 3′ should be left in place and the gravel above this depth can be excavated. The depth of the gravel removal would be limited to approximately two (2) feet. Install pockets of soil (from construction of meander) and install plantings to help recreate vegetative cover across the gravel deposit area.

2.4.6 Work Area # 4.6 – Improvements Between the Chambers Road Bridge and the RR Bridge

Looking downstream from Chambers Road Bridge, remove the large rocks that line the left stream bank. Place smaller rocks that would protect the stream bank but would allow flow to breach the main stream channel and continue to run out of the stream channel on the left side of the former railroad bed. This will help to reduce the flow through the downstream reconstructed meander and gravel deposit area.

2.4.7 Work Area # 4.7 – Supplement Flow Capacity of Chambers Road Bridge

Install a concrete box culvert through the embankment approaching the south side of the Chambers Road Bridge. The design of the culvert would require a field survey of this area to determine the largest practical culvert that could be installed. Flow exiting the culvert would join up with the flows that breach the main stream channel as a result of the work done in Work Area # 4.7. Consideration was given to breaching the railroad embankment on the upstream side of the Chambers Road Bridge but the breached flow may jeopardize the residence that exists immediately upstream of this area (at this location the railroad bed acts as a flood control levee). Additionally, the breached flows would re-enter the main stream channel and place more stress on the

reconstructed meander. Additional hydraulic analysis is warranted before undertaking such an action.

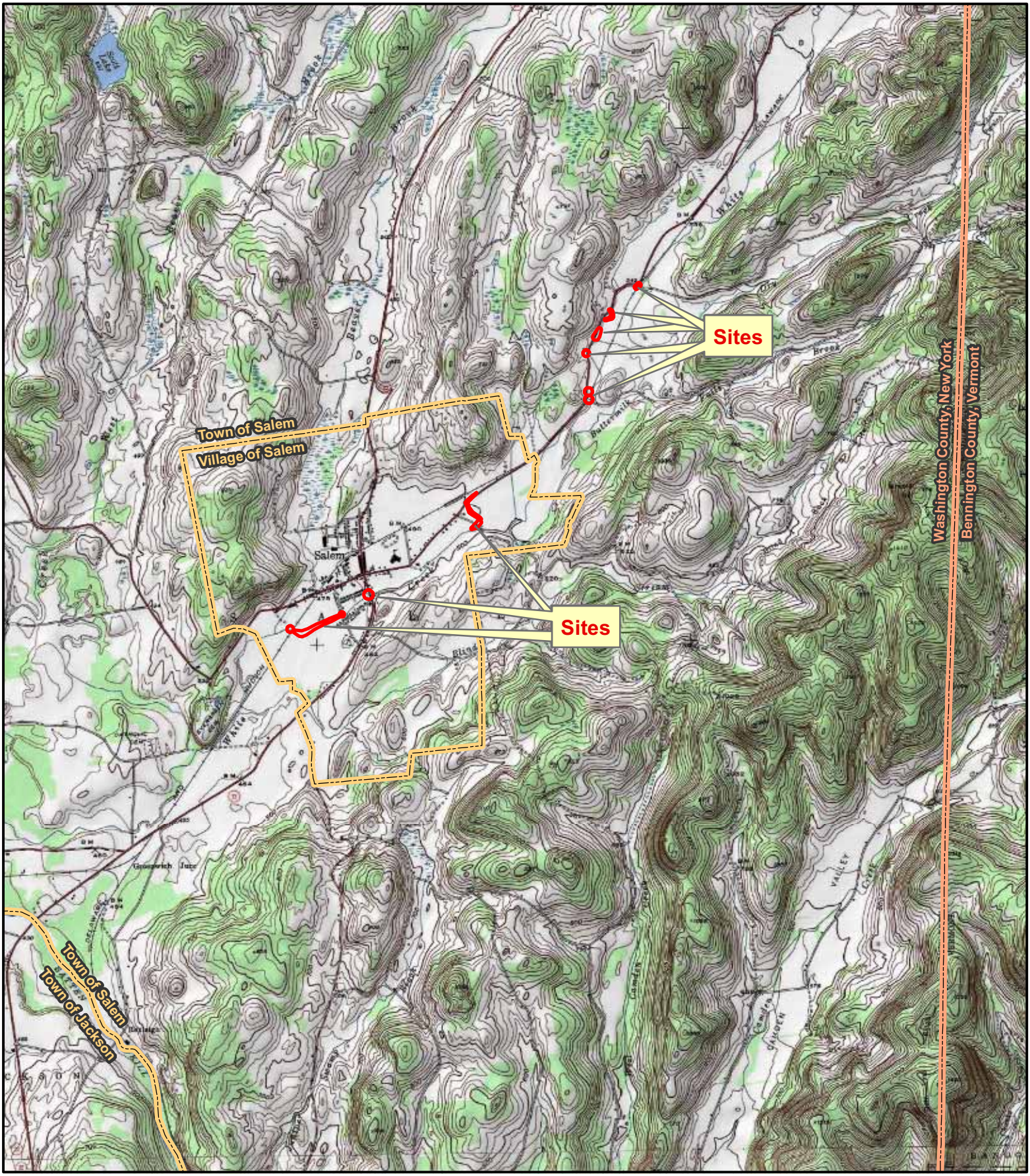
3.0 COST ESTIMATES

A budgetary construction cost estimate was developed for each of the Work Areas. The results are presented in Appendix A, "Cost Estimates". The cost estimates assume that all of the work would be done by a retained contractor. There will be some cost sharing with local forces, namely the Town of Salem, the Village of Salem and Washington County which are reflected in the grant application prepared by the Washington Soil & Water Conservation District. Added to the construction cost estimate are surveying and design fees that will likely be required to implement the proposed improvements.

4.0 SUMMARY / CONCLUSION

Implementation of the restoration efforts discussed above will help to restore the White Creek corridor to the pre Hurricane Irene and Tropical Storm Lee conditions or better. Provided that these restoration/improvement efforts are implemented, the residents in the Town and Village of Salem will be better prepared for the next significant rainfall/snowmelt event.

Figure 1
Site Location Map



N
W E
S

Legend

Village and Town Boundary

State Boundary

0 1,900 3,800 5,700 7,600 Feet

Project Number: 12.2144
Data Source: NYSGIS Clearinghouse, USA Topo Maps
Projection: NY State Plane East NAD 83 (ft.)
Date: April 9, 2012
File: Fig1_SiteLocation.mxd
GIS: CH

Figure 1: Site Location Map

Town and Village of Salem **Washington County, New York**

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Environmental Services * Geographic Information Services (GIS) *
Land Development * Land Surveying
FOUNDED IN 1910

Figure 2
Work Area Locations

0 500 1,000 2,000 Feet

1 inch = 1,000 feet

Legend

- Work Areas
- Village Boundary

Figure 2: Work Area Locations

Town and Village of Salem — **Washington County, New York**

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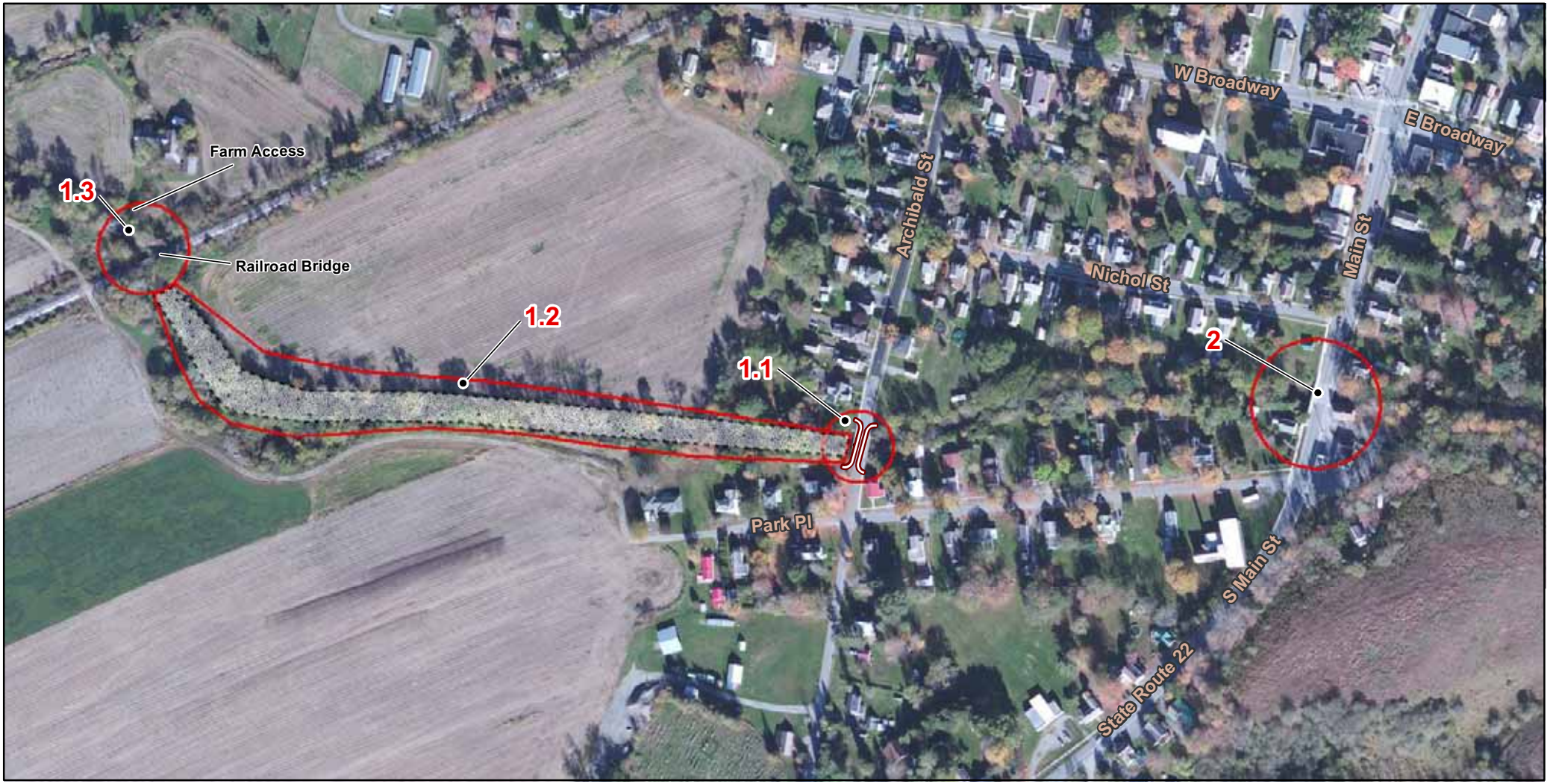
Project Number: 12.2144
Data Source: NYSGIS Clearinghouse, BING aerial
Projection: NY State Plane East NAD 83 (ft.)
Date: April 9, 2012
File: Fig2_WorkAreaLocation.mxd
GIS: CH

Figure 3
Work Areas 1.1 – 2



0 100 200 400 Feet

1 inch = 200 feet

Legend

- Bridge Deck to be Removed
- Rock/Gravel Deposit Removal
- Work Areas

Figure 3: Work Areas 1.1 - 2

Village of Salem — **Washington County, New York**

Project Number: 12.2144
Data Source: NYSGIS Clearinghouse, BING aerial
Projection: NY State Plane East NAD 83 (ft.)
Date: April 9, 2012
File: Fig3_WorkArea1.mxd
GIS: CH

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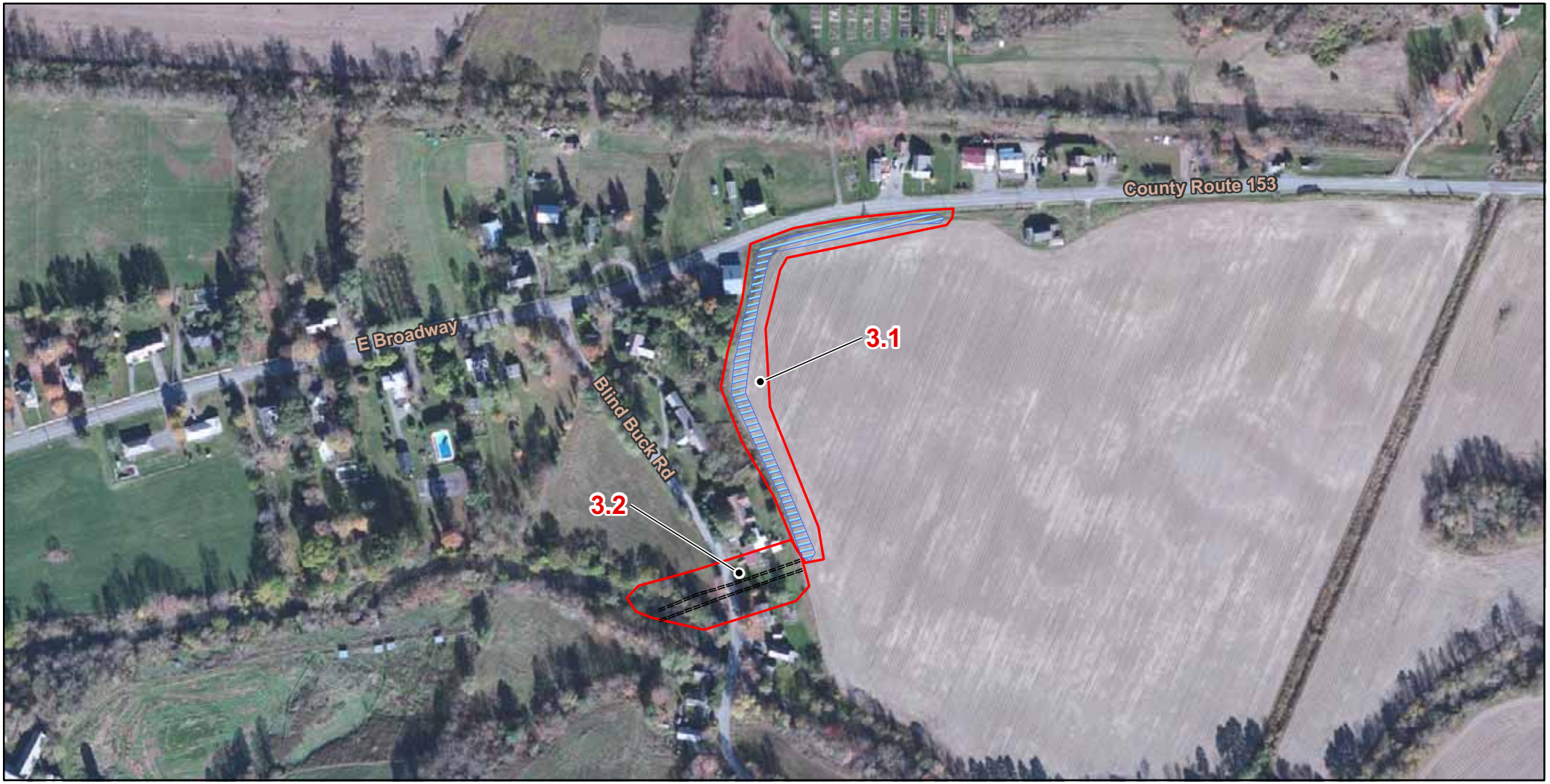
Figure 4
Work Areas 3.1 & 3.2



0 100 200 400 Feet

1 inch = 200 feet

Legend

- Flood Control Channel
- Flood Control Berm
- Work Areas

Figure 4: Work Areas 3.1 & 3.2

Village of Salem — **Washington County, New York**

Project Number: 12.2144
Data Source: NYSGIS Clearinghouse, BING aerial
Projection: NY State Plane East NAD 83 (ft.)
Date: April 6, 2012
File: Fig4_WorkArea2.mxd
GIS: CH

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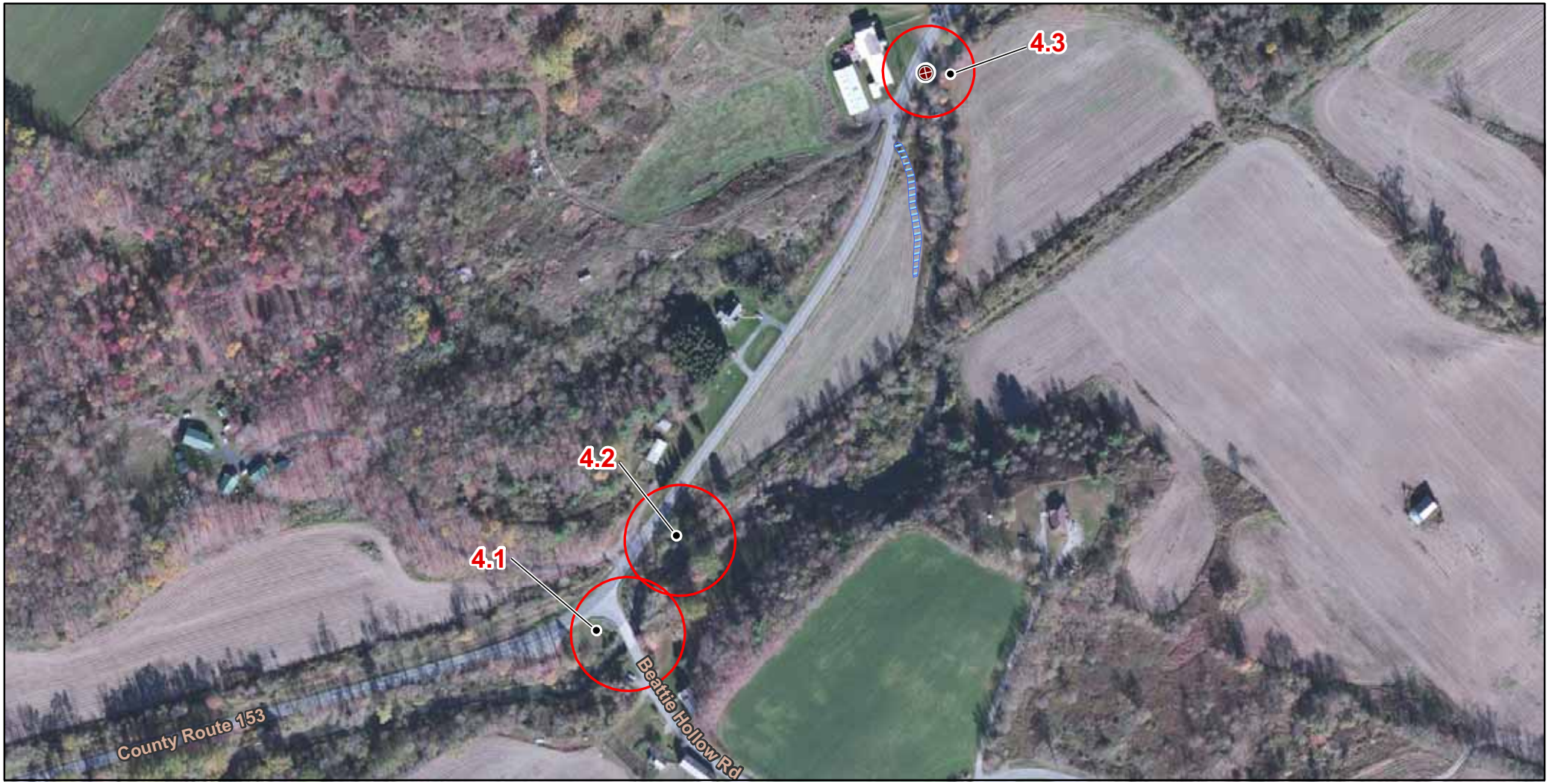
Figure 5
Work Areas 4.1 – 4.3



0 100 200 400 Feet

1 inch = 200 feet

Project Number: 12.2144
Data Source: NYSGIS Clearinghouse, BING aerial
Projection: NY State Plane East NAD 83 (ft.)
Date: April 6, 2012
File: Fig5_WorkArea3.mxd
GIS: CH

Legend

- Old Abutment to be Removed
- Flood Control Berm
- Work Areas

Figure 5: Work Areas 4.1-4.3

Town of Salem **Washington County, New York**

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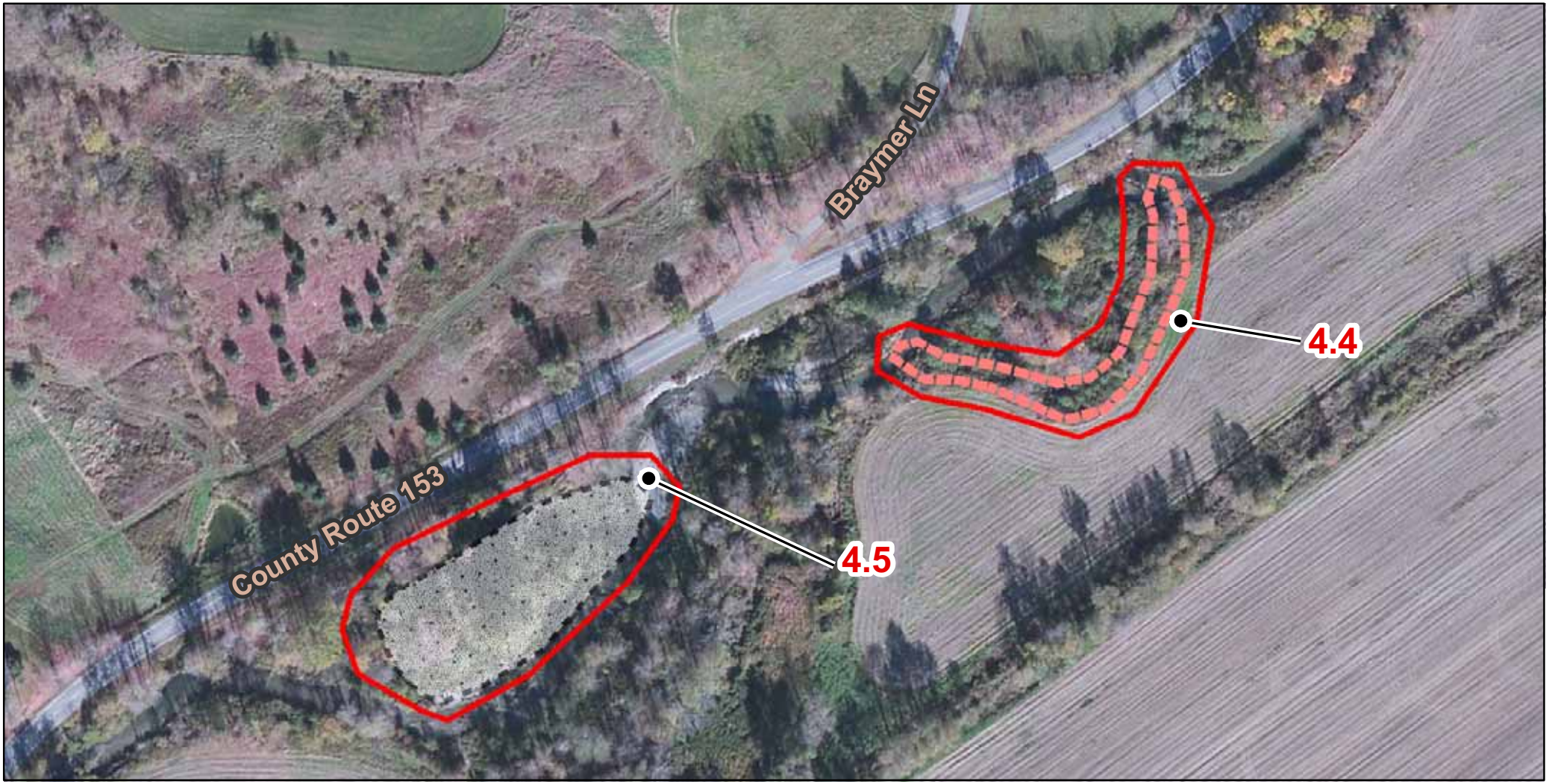
Figure 6
Work Areas 4.4 & 4.5



0 50 100 200 Feet

1 inch = 100 feet

Project Number: 12.2144
Data Source: NYSGIS Clearinghouse, BING aerial
Projection: NY State Plane East NAD 83 (ft.)
Date: April 6, 2012
File: Fig6_WorkArea4.mxd
GIS: CH

Legend

- Rock/Gravel Deposit Removal
- Reconstructed Meander
- Work Areas

Figure 6: Work Areas 4.4 & 4.5

Town of Salem **Washington County, New York**

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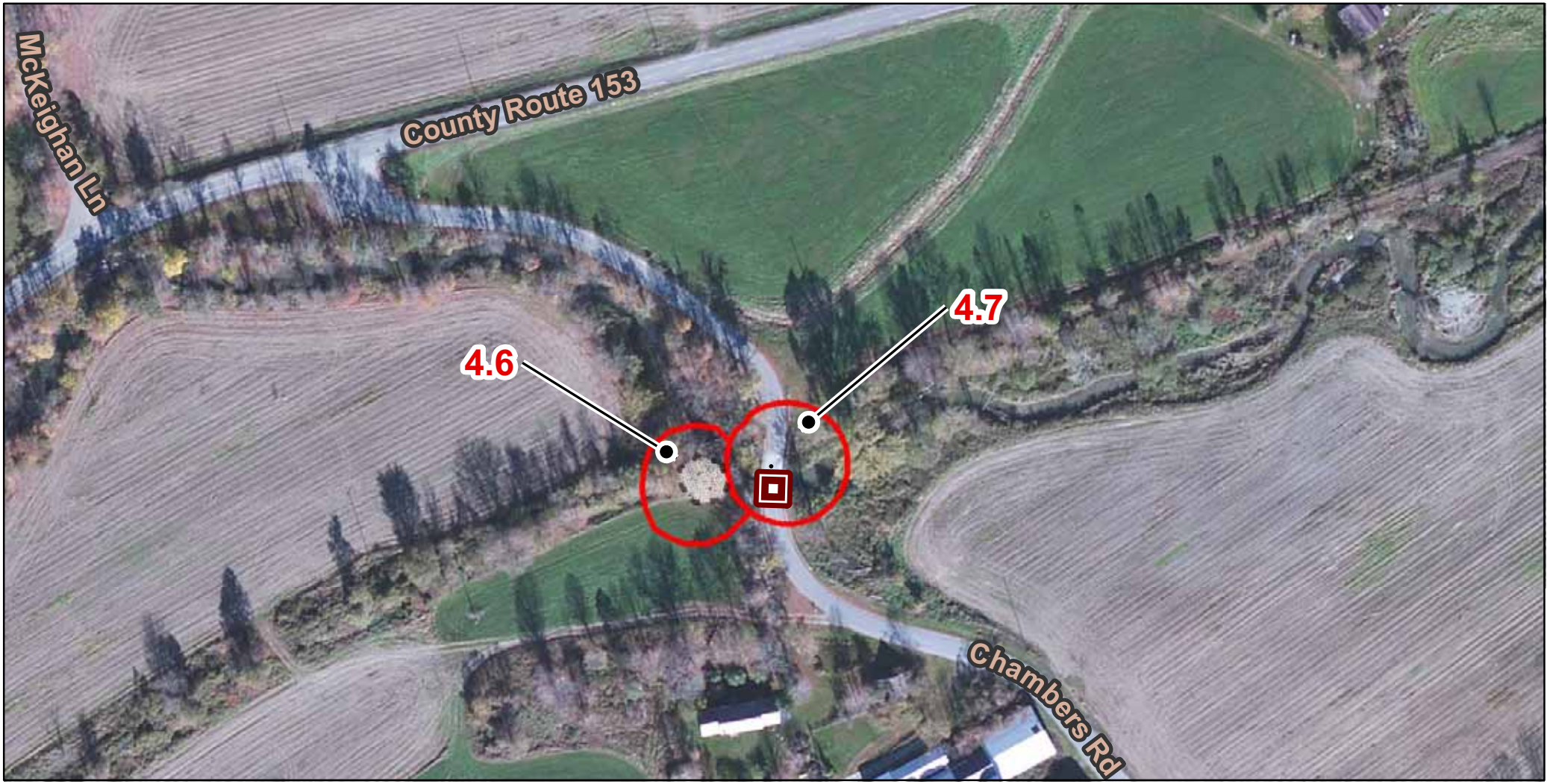
Figure 7
Work Areas 4.6 & 4.7



0 50 100 200 Feet

1 inch = 100 feet

Legend

- Concrete Box Culvert (New)
- Rock Removal
- Work Areas

Figure 7: Work Areas 4.6 & 4.7

Town of Salem **Washington County, New York**

Project Number: 12.2144
Data Source: NYSGIS Clearinghouse, BING aerial
Projection: NY State Plane East NAD 83 (ft.)
Date: April 6, 2012
File: Fig7_WorkArea5.mxd
GIS: CH

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APPENDIX A
Cost Estimates

Houston, Jim

From: Houston, Jim
Sent: Monday, April 09, 2012 12:00 PM
To: Joe Driscoll
Cc: SETH PITTS; Ann Dunigan
Subject: Salem - flood grant application; design fee estimate

Joe,

In addition to the construction costs that I sent out last Friday, I prepared the following estimates for design phase services:

Work Area 1.1 - Bridge Deck Removal; Survey - $2,000, Engineering - $7,500.
Work Area 1.2 - Gravel and Berm Reconstruction; Survey - $3,500, Engineering - $3,500.
Work Area 1.3 - Rock Vanes at Bridges; Survey $2,500, Engineering - $2,500.
Work Area 3.1 - Flood Protection Berm; Survey - $3,000, Engineering $5,000.
Work Area 3.2 - Flood Channel; Survey - $3,000, Engineering $7,500.
Work Area 4.1 - Beattie Hollow, Gabion Baskets; Survey- $2,500, Engineering - $6,500.
Work Area 4.4 - Reconstruct Meander; Survey - $3,500, Engineering - $8,000.
Work Area 4.5 - Gravel Removal; Survey - $3,500, Engineering - $5,000.
Work Area 4.7 - Chambers Road - Culvert; Survey $2,500, Engineering - $6,500.

Fee Estimate Totals: Surveying $26,000 and Engineering $52,000.

This presumes that the Washington County S&WCD will provide construction observation services.

Hope this helps - let me know if any additional information or clarification is required.

Jim Houston, PE
Senior Civil Engineer
C.T. Male Associates
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518.698.1960 (Mobile)

PROJECT: FLOODWATER REMEDIATION - COST ESTIMATE
TOWN OF SALEM, NY

DATE: APRIL 5, 2012
SHEET 1 OF 13

ITEM #	ITEM DESCRIPTION	Ref. Sh.	UNIT	QTY	# MAN-HOURS	LABOR	EQPT	MAT'L	TOTAL
	SUMMARY								
1.1	ARCHIBALD ST. BRIDGE	2	LS			16,510	17,300	2,930	36,740
1.2	ARCHIBALD ST. BRIDGE DOWN TO R.R. BRIDGE	3	LS			9,720	10,295	1,760	21,775
1.3	DOWNSTREAM RR BRIDGE AND ADJACENT FARM ACCESS BRIDGE	4	LS			5,430	5,420	10,260	21,110
3.1	FLOOD CONTROL BERM	5	LS			5,850	4,000	35,010	44,860
3.2	FLOOD CONTROL CHANNEL	6	LS			7,420	12,990	17,090	37,500
4.1	IMPROVE OUTLET CONDITIONS AT BEATTIE HOLLOW BRIDGE	7	LS			10,140	5,710	5,000	20,850
4.2	PROTECT EMBANKMENT AT INLET TO BEATTIE HOLLOW BRIDGE	8	LS			5,120	2,780	9,550	17,450
4.3	REMOVE FORMER BRIDGE ABUTMENT AND INSTALL BERM	9	LS			2,820	2,360	3,160	8,340
4.4	CONSTRUCT MEANDER JUST UPSTREAM OF GRAVEL DEPOSIT	10	LS			9,400	5,500	13,990	28,890
4.5	REMOVE PORTIONS OF ~~the~~ GRAVEL DEPOSIT	11	LS			9,610	6,600	5,440	21,650
4.6	IMPROVEMENTS BETWEEN CHAMBERS Rd BRIDGE AND RR BRIDGE	12	LS			4,650	4,420	1,660	10,730
4.7	SUPPLEMENT FLOW CAPACITY OF CHAMBERS Rd BRIDGE	13	LS			20,400	7,730	21,480	49,610
	TOTAL ESTIMATED DIRECT COST →					107,070 +	85,105 +	127,330 =	319,505

PROJECT: FLOODWATER REMEDIATION MEASURES
TOWN OF SALEM, NY

DATE: APRIL 5, 2012
SHEET 2 OF 13

ITEM #	ITEM DESCRIPTION	UNIT	QTY	# MAN-HOURS	LABOR	EQPT	MAT'L	TOTAL
1.1	**ARCHIBALD ST. BRIDGE**							
a)	**REMOVE GUIDE RAILS**							
	• LABOR 4 LABORERS x 1 day @ $418/DAY				1,670			1670
	• EQP'T 1 Loader x 425/day x 1 day					530		530
	1 Service Truck 1 day @ $100/DAY							
					1670	+ 530	+ 0	= 2,200
b)	**DEMO & REMOVE BRIDGE DECK & GIRDERS**							
	• LABOR • Saw Cut Deck 2 LNS x 1 day @ 418/DAY/EA 836							
	• Remove Deck Sections 4 Lab @ 418/D x 4 D 6690							
	• Remove Deck Girders #4 LAB x 418/D x 3 D 5016				12,540			12,540
	• EQUIPMENT • Concrete Saw 1 d x 175/D 175							
	• Mobile Crane 7 d x 1200/D 8400							
	• Triaxle Dump #4 d x $680/D 2,720							
	• Flat Bed Truck #3 d x $880 2,640							
	• Excavator #3 d x $575/D 1,725					15,660		15,660
	• MATERIAL - Concrete disposal Fee Say $30/cy x 58 cy 1730							
	- Fall Netting - Allow LS 1,000						2,730	2,730
					12,540	+ 15,660	+ 2,730 =	30,930
c)	**REINSTALL GUIDE RAILS AT EACH SIDE OF STREAM.**							
	• LABOR 3 - Lab. @ 418/EA 1,254							
	1 - Op. @ 522/EA 522 $1776/DAY x 1 day.				1780			1,780
	• EQP'T 1 Loader @ 425/DAY 425					530		530
	1 Service Truck 100						200	200
	• MAT'L 1 Lot Drilled in Anchors + Epoxy Say.				1780	+ 530	+ 200 =	2,510
d)	**RE-ARRANGE ROCKS IN STREAM BED**							
	• LABOR 1 - TRAK-HOE operator $522/d x 1 d				520			520
	• EQP'T 1 - Trak-Hoe $575/d x 1 d					580		580
					520	+ 580	+ 0	1100
	TOTAL 1.1 a) TO d) →				16,510	+ 17,300	+ 2,930 =	36,740

NOTES:

1. Scope of Work
   a) Remove Guide Rails from Bridge Deck
   b) Demolish & Remove Bridge Deck (Assume 40'L x 26'W x 1.5' TK)
   c) Reinstall Guide Rails at Limits of Road where Bridge Abutted.
   d) Re-arrange Rocks in Stream Bed

PROJECT: FLOODWATER REMEDIATION MEASURES — DATE: APRIL 5, 2012
TOWN OF SALEM, N.Y. — SHEET 3 OF 13

ITEM #	ITEM DESCRIPTION	UNIT	QTY	# MAN-HOURS	LABOR	EQPT	MAT'L	TOTAL
1.2	ARCHIBALD STREET BRIDGE DOWN TO RR BRIDGE							
a)	REMOVE CENTER PORTIONS OF ROCK VANES							
	LABOR 1 TRAKHOE op 522							
	1 LABORER 418 940/day x 1d.				940			940
b)	REMOVE & REPLACE FLOOD BERM							
	a) Labor - Removal (180 cy) 1 Excavator Op 522							
	1 Laborer 418				940			940
	- Reinstatement (180 cy) Excavator Op 522							
	1 LABORER 836				1,360			1,360
	b) EQPT - Removal TRAK-HOE 575							
	TRIAXLE 680					1,255		1,255
	- REINSTATEMENT TRAKHOE 575							
	ROLLER 400					980		980
	c) MAT'L - Imported Allow 180 cy x 7 T/cy						1260	1260
					2,300	+ 2,235	+ 1,260	5,795
c)	REMOVE GRAVEL DEPOSIT IN STREAM							
	a) Labor 1 Trak-Hoe Operator 522							
	1 LABORER 418 940/d x 5d				4,700			4,700
	b) EQP'T 2 - Triaxled dumps (operated) #2 x 680 x 5d					6800		6,800
	c) MAT'L Tipping fee - assume town has area to stockpile						0	0
	(11,500 ÷ 1,333 cy = #8 6/3/cy)				4,700	+ 6,800	+ 0	= 11,500
d)	REMOVE TREE DEBRIS IN STREAM.							
	a) Labor Allow Trak-Hoe OP #1 x 522/d = 522							
	3 Laborers #3 x 418/d 1254				1,780			1,780
	b) EQP'T TRAK-HOE 575							
	DUMP TRUCK 680					1260		1,260
	c) MAT'L: MISC (Rope, Saw Blades, etc) Allow						500	500
					1,780	+ 1,260	+ 500	= 3540
	TOTAL ITEM 1.2 a) TO d) →				9,720	+ 10,295	+ 1,760	= 21,775

SCOPE OF WORK

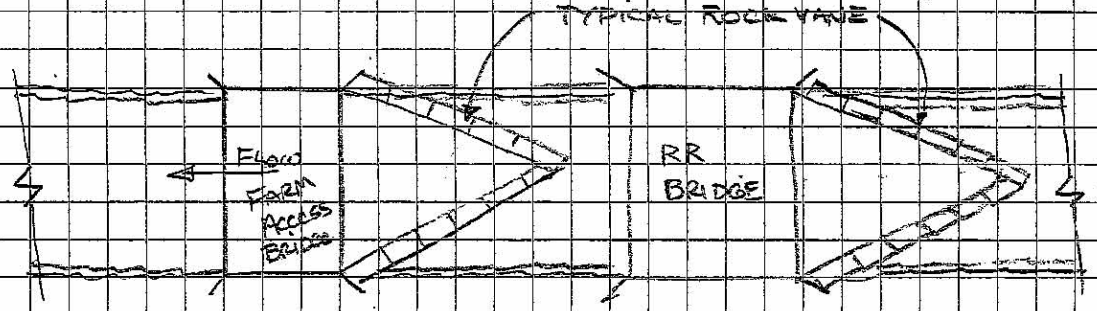
a) Remove Center Portions of Rock Vanes (place on top of banks)
b) Remove Existing Flood Berm 4'H x say 12'W x 100 LF (180 CY). Replace with new flood berm. 200 LF x 2'H x 12'W (180 CY)
c) Remove Gravel deposit in Stream 10'W x 3' dp x 1200 LF (1333 CY)
d) Remove Tree Debris in Stream - Extent unknown - Assume can do in 1 day w/crew.

PROJECT: FLOODWATER REMEDIATION MEASURES
TOWN OF SALEM, NY

DATE: APRIL 5, 2012
SHEET 4 OF 13

ITEM #	ITEM DESCRIPTION	UNIT	QTY	# MAN-HOURS	LABOR	EQPT	MAT'L	TOTAL
1.3	DOWNSTREAM RR BRIDGE AND ADJACENT FARM ACCESS BRIDGE							
a)	INSTALL 2 ROCK VANES UPSTREAM FROM EACH OF 2 BRIDGES							
	• LABOR 1 - Trak Hoe operator		522					
	2 - Laborers @ 48/A/EA:		836	1,358 x 2 A/EA x 2 EA				
					5430			5430
	• EQPT 1 - Trak Hoe		575/D					
	1 - TRIAXLE (operated)		680/D					
	1 Service Truck		100	1395/d x 4 d		5,420		5420
	• MAT'L Heavy Stone Fill		#2x107 CY x 1.6 T/CY = 342 T @ 30 $/T				10,260	10,260
	TOTAL 1.3 a) →				5,430 +	5,420 +	10,260 =	21,110

NOTES
1. TYPICAL ROCK VANE: 40' x 60' x 60'
2. EMPLOY NYS HEAVY STONE FILL - 2 layers deep
   VOL/EA: 2ay #2x(60 LF x 4 x 6') / 27 = 107 CY/EA



PROJECT: FLOODWATER REMEDIATION MEASURES
TOWN OF SALEM, NY

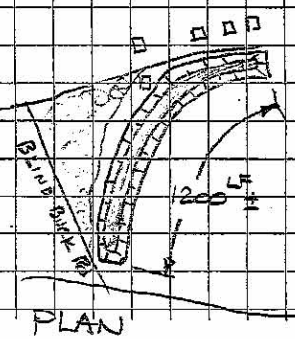
DATE: APRIL 5, 2012
SHEET 5 OF 13

ITEM #	ITEM DESCRIPTION			UNIT	QTY	# MAN-HOURS	LABOR	EQPT	MAT'L	TOTAL
3.1	**FLOOD CONTROL BERM**									
	• LABOR	1 - Dozer Op	522							
		1 - Laborer	418							
		1 - Roller Compaction Op	522	$1,462/d x 4^d			5,850			5,850
	• EQPT	1 D6N	550							
		1 Roller Compaction	350							
		1 Service Truck	100	$1000/d x 4^d				4,000		4,000
	• MAT'L	3845 cy Pit Run Gravel, delivered @ $12.00/cy							34,140	34,140
		Seed & Mulch 29 MSF x $30.00/MSF							870	870
							5,850	+ 4,000	+ 35,010	= 44,860

SCOPE OF WORK:

1) VOL. of BERM: $[\frac{1}{2}(8+24) \times 4'] \times 1200^{LF} / 27$
= 2,845 c.y. (Run of Bank)
@ 1.35 T/cy = 3,841 T ÷ 22 T/load = 175 loads

2) DURATION: Assume Dozer Spreads/Shapes 1 Load/10 min
$\therefore 450^{min} \div 10^{min}/load = 45$ loads/day
175 loads ÷ 45/day = 3.9 Say 4 days



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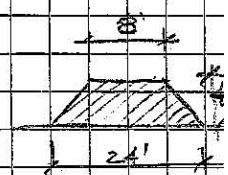
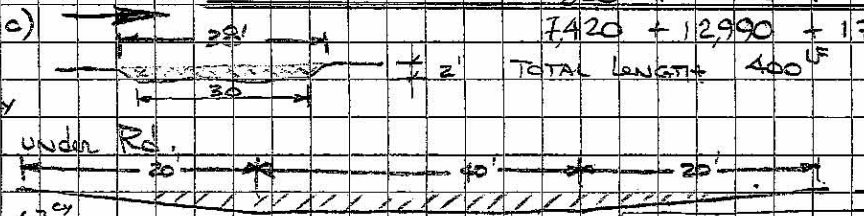


PROJECT: FLOODWATER REMEDIATION MEASURES — DATE: APRIL 5, 2012
TOWN OF SALEM, NY — SHEET 6 OF 13

ITEM #	ITEM DESCRIPTION	UNIT	QTY	# MAN-HOURS	LABOR	EQPT	MAT'L	TOTAL
3.2	**FLOOD CONTROL CHANNEL**							
a)	**CONSTRUCT DEPRESSED GRASSY SWALE**							
• LABOR	1 TRAK-HOE OP.		522					
	1 GRADE FM		418	940/d x 3d	2,820			2,820
• EQP'T	1 TRAK-HOE		575					
	4 TRIAXLES @ 680/day (operated)		2720	3295/d x 3d		9890		9,890
• MAT'L	Seed & Mulch 15.2 MSF x $30/MSF						460	460
	($13,170 ÷ 1008 cy = $13.07/cy.)				2,820	+ 9,890	+ 460	= 13,170
b)	**INSTALL #3 - 24"ø x 40' L CULVERTS UNDER ROAD**							
• LABOR	1 - TRAKHOE OP		522					
	1 LOADER OP		522					
	3 LABORERS x 418		1254	2298/day x 1d	2,300			2,300
• EQP'T	1 - TRAK HOE		575					
	1 - Loader		425					
	1 - LOT Misc (JJ, Pad Camper)		100	1100/d x 1d		1,100		1100
• MAT'L	24"ø HDPE CULVERT	120 LF	x 17 $/LF =	2040				
	24"ø ALUM. E.S. # 6 x 300 $/EA			1800				
	STONE B/F Say 1 $/LF x 120 = 120 CY x 25 $/cy			3,000				
	Misc (filter fabric etc) ALLOW			660			7500	7500
	($10,900 ÷ 120 LF = 90.83/LF)				2,300	1,100	7,500	= 10,900
c)	**DEPRESS BLIND BUCK Rd.**							
• LABOR	2 operators x 523/d/EA =		1044					
	3 Laborers x 418/ "		1254	2298/d x 1d	2,300			2,300
• EQP'T	1 - Trakhoe		575					
	1 - Loader		425					
	1 - Roller		350	$1350/d say 2000/d.		2000		2,000
• S/C	Paving 46 T @ $150/TON						6900	6900
	SUBBASE (TYPE 2) 89 CY @ 25 $/cy						2230	2230
					2300	+ 2000	+ 9130	= 13430
	TOTAL ITEM 3.2 a) TO c)				7,420	+ 12,990	+ 17,090	= 37,500

SCOPE of WORK: a) CONST. DEPRESSED GRASSY SWALE:
VOL [½ (38 + 30) x 2'] x 400 LF / 27 = 1008 cy
b) INSTALL #3 - 15"ø x 40' L CULVERTS UNDER Rd.
c) DEPRESS BLIND BUCK Rd
a) EXCAVATION 60 LF x 1' dpx 30'w / 27 = 67 CY
b) ASPHALT 2 ÷ 1½ = 3½" 0.056 x 231 yd² x 3.5 LF = 46 TONS



TOTAL LENGTH 400 LF

PROJECT: FLOODWATER REMEDIATION MEASURES — TOWN OF SALEM, NY

DATE: APRIL 5, 2012

ITEM #	ITEM DESCRIPTION	UNIT	QTY	# MAN-HOURS	LABOR	EQPT	MAT'L	TOTAL
4.1	IMPROVE OUTLET CONDITIONS AT THE BEATTIE HOLLOW BRIDGE							
a)	REMOVE AND RELOCATE DOWNSTREAM GABION BASKETS							
• LABOR	• Removal: # 1 operator (522) + 2 Laborers (418) say 1 day			1,358				
	• Reinstall: # 1 operator: # 1 × 522 = 522; # 4 Laborers: # 4 × 418 = 1672 × 2d = 4388				5,750			5,750
• EQP'T:	Trakhoe 575; Service Truck 100; $675 × 3d					2,030		2,030
• MAT'L:	• Gabion Baskets: 6'L × 3'H = 18 EA × $200						3,600	
	• Crushed Stone (#1/#2): 4 CY @ $18/CY						800	
	• Misc.						600	
							5,000	5,000
					5,750	+ 2,030	+ 5,000 =	12,780
b)	REWORK STREAMBED GRAVEL TO ENHANCE STREAM CHANNEL							
• LABOR	1 TRAKHOE operator 522							
	1 DOZER operator 522							
	1 LABORER 418				$1462/d × 3d			
					4,390			4,390
• EQP'T	1 Trakhoe 575							
	1 Dozer 550							
	1 Service Truck 100				$1,225/d × 3d			
						3,680		3,680
					4390	+ 3680	+ 0 =	8070
	TOTAL ITEM 4.1 a) & b) →				10,140	+ 5,710	+ 5,000 =	20,850

NOTES: 1. REMOVE & RELOCATE GABIONS:
- REMOVE EXISTING GABIONS w/ EXCAVATOR, SALVAGING STONE. BUY & INSTALL NEW BASKETS
- FILL w/ STONE FROM ORIGINAL BASKETS. (EXACT EXTENT OF EXISTING GABIONS UNCLEAR)
- ASSUME EXISTING IS 30'Lx 6'H x 3 TO 4'dp.

PROJECT: FLOODWATER REMEDIATION MEASURES — TOWN OF SALEM, NY

DATE: APRIL 5, 2012

ITEM #	ITEM DESCRIPTION	UNIT	QTY	# MAN-HOURS	LABOR	EQPT	MAT'L	TOTAL
4.2	PROTECT EMBANKMENT AT INLET TO BEATTIE HOLLOW BRIDGE							
	a) FILL IN EROSION AT DOWNSTREAM RIGHT ABUTMENT							
	• LABOR TRAK-HOE OPERATOR #1 @ $522/DAY = 522							
	LABORERS #2 @ 418/day = 836 1358/HR x 1d				1,360			1,360
	• EQP'T Trak-Hoe 575 + Bobcat (200)					780		780
	• MAT'L LIGHT STONE FILL 111 T x 30.00/TON = 3,300							
	GEOTEXTILE FABRIC ALLOW 100 yd² x 0.90/yd² = 90						3390	3390
					1,360	+ 780	+ 3390	= 5530
	b) PROTECT BRIDGE EMBANKMENT BY PLACING HEAVY STONE FILL BETWEEN BRIDGE AND ROUTE 153							
	• LABOR TRAK-HOE OPERATOR 522							
	LOADER OPERATOR 522							
	2 LABORERS x 418/EA 836 1880/d x 2d				3,760			3,760
	• EQP'T TRAK-HOE 575							
	LOADER 425 1000/HR x 2 d.					2,000		2,000
	• MAT'L NYS DOT HEAVY STONE FILL 200 T x 30.00/T = 6000							
	GEOTEXTILE FABRIC 100 x (15') 167 yd² x 0.95 160						6160	6160
					3760	+ 2,000	+ 6160	= 11,920
	TOTAL ITEM 4.2 a) & b) →				5,120	+ 2,780	+ 9,550	= 17,450

NOTES:

1. EROSION AT DOWNSTREAM RIGHT ABUTMENT/WING WALL. ESTIMATE TRIANGULAR PLAN AREA 20' x 20' w/ DEPTH of say 10'
   ∴ ½(20' x 20') x 10'/27 = 74 CY. USE FREE DRAINING LIGHT STONE FILL. 74 CY x 1.5 T/CY = 111 T. (5 TRIANGLE LOADS)
2. HEAVY STONE FILL PLACEMENT TO BE PLACED TO PROTECT @ 100 LF of EMBANKMENT. Say 6'W x 4'D,
   ∴ 100 LF x 6' x 4'D/27 = 89 CY x 2 = 178 CY x 1.5 T/CY = 133 CY = 200 TONS.

PROJECT: FLOODWATER REMEDIATION MEASURES — TOWN OF SALEM, NY

DATE: APRIL 6, 2012

ITEM #	ITEM DESCRIPTION				UNIT	QT'Y	# MAN-HOURS	LABOR	EQP'T	MAT'L	TOTAL
4.3	REMOVE FORMER BRIDGE ABUTMENT AND INSTALL BERM										
	a) REMOVE FORMER BRIDGE ABUTMENT										
	• LABOR	TRAK-HOE OPERATOR	# 1 x 522/d	522							
		LABORERS	# 2 x 4 18/d	836	1358/d x 1d			1360			1360
	• EQP'T	TRAK-HOE CAT 330 LC	575								
		TRIAXLE ROCK DUMP (Operated)	680								
		SERVICE TRUCK	100	1355/d x 1 d.					1360		1360
	• MAT'L	ALLOW MISC (Demo Saw Blade, drill Bits, etc.)								180	180
								1360	+ 1360	+ 180	2,900
	b) INSTALL BERM										
	• LABOR	1 DOZER OP		522							
		1 Laborer		418							
		1 ROLLER COMPACTOR OP		522	1462/d x 1d.			1460			1460
	• EQP'T	1 D6N	550								
		1 Roller Compactor	350								
		1 Service Truck	100	1000/d x 1d					1000		1,000
	• MAT'L	Imported Fill	240 TONS x 12 $/T	2,880							
		Seed & Mulch	3.2 MSF @ 30 $/MSF	160							
										2980	2980
								1460	+ 1000	+ 2980	= 5440
		TOTAL ITEM 4.3 →						2820	+ 2360	+ 3160	= 8340

NOTES:

1. REMOVAL OF FORMER BRIDGE ABUTMENT:
   - ESTIMATED SIZE 8' x 6' x 2' TK = 3.6 CY.
   - USE TRAK-HOE TO BREAK-UP & EXTRACT MASS FROM STREAM.
   - BROKEN PIECES LOADED OUT AND REUSED ELSEWHERE (eg. ITEM 4.2 b)
   - ALLOW SOME TIME FOR HOE TO WALK TO SITE (1200 FT ±).
2. BERM: APPROX 200 LF

Section ±

VOL. ≈ [½(8+16) x 2'] x 200'/27 = 178 CY imported fill

x 1.35 T/CY = 240 TONS

PROJECT: FLOODWATER REMEDIATION MEASURES — TOWN OF SALEM NY

DATE: APRIL 6 2012

ITEM #	ITEM DESCRIPTION			UNIT	QTY	# MAN-HOURS	LABOR	EQP'T	MAT'L	TOTAL
4.4	CONSTRUCT MEANDER JUST UPSTREAM OF GRAVEL DEPOSIT									
	a) BLOCK OFF FLOW FROM FORMER MEANDER (Place Rock Cutoff Berm @ 80' LG.)									
	• LABOR	• TRAK-Hoe Operator			522					
		• Loader Operator			522					
		• #2 Laborers × 418/ea			836	1880/d × 1d	1880			1880
	• EQP'T	• Trak-Hoe	575							
		• Loader	425							
		• Service Truck	100			1,100/d × 1 d.		1,100		1,100
	• MAT'L	• Stone Fill (Delivered)			285 T × 30$/T = 8550				8550	8,550
		(#11,530 ÷ 285 T = $40.46/ton)					1880 +	1,100 +	8,550 =	11,530
	b) EXCAVATE & REMOVE A DEFINED CHANNEL IN MEANDER 20'w × 4'dp × 200 LF									
	• LABOR	• TRAK-Hoe operator			522					
		• LOADER "			522					
		• 2 - Laborers			836	1880/d × 3d	5640			5640
	• EQP'T	• TRAK-Hoe	525							
		• LOADER	425							
		• Service Truck	100			1100/d × 3d.		3300		3300
	• SUB/CONT	• TRUCKING #3 days × 2 TRUCKS × 680$/DAY/EA							4080	4080
		(13,020 ÷ 1067 T = 12.20/T; ÷ 711 CY = $18.31/CY)					5640 +	3300 +	4080 =	13,020
	c) CONNECT MEANDER TO MAIN CHANNEL AT DOWNSTREAM & REMOVE CUTOFF BERM									
	• LABOR	• TRAK-Hoe Operator								
		• LOADER Operator	} 1880/d × 1 d				1,880			1880
		• 2 LABORERS								
	• EQP'T	• TRAK-Hoe + Loader + Service Truck = 1100/d × 1 d						1,100		1100
	• SUB/CONT.	• HAULAGE - ALLOW 2 TRUCKS × 680/TRUCK/DAY × 1 d.							1360	1360
							1880 +	1100 +	1360 =	4340
	TOTAL ITEMS 4.4 a) THROUGH c)						9400 +	5500 +	13,990 =	28,890

NOTES: 4.4 a

VOL = [½(8+24) × 4] × 80 LF // 27 = 190 CY × 1.5 T/CY = 285 TONS Imported Stone

ASSUME REASONABLE ACCESS FOR FILL DELIVERY. ALLOW LOADER ASSIST

4.4 b

VOL = [½(20+28) × 4'] × 200 LF // 27 = 711 CY × 1.5 T/CY = 1067 T ÷ 22 T/load = 49 loads

ASSUME REASONABLE ACCESS FOR CHANNEL GRAVEL REMOVAL. ALLOW LOADER

4.4 c

ASSUME HAUL STONE FILL OFF SITE - SCHEDULE REUSE ELSEWHERE ON SITE.

PROJECT: FLOODWATER REMEDIATION MEASURES
TOWN OF SALEM, NY

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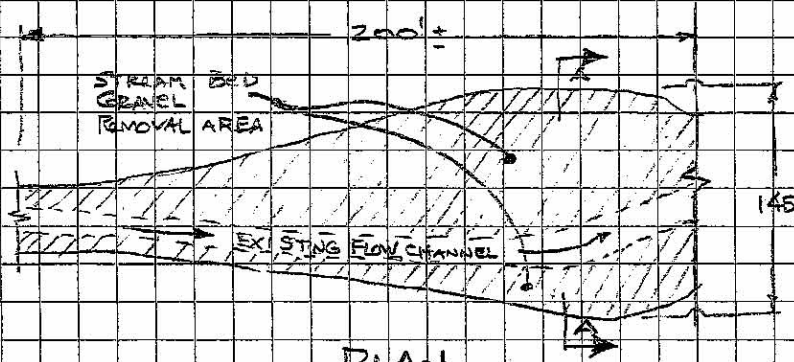
SHEET 11 OF 13

ITEM #	ITEM DESCRIPTION		UNIT	QTY	# MAN-HOURS	LABOR	EQPT	MAT'L	TOTAL
4.5	REMOVE PORTIONS OF THE GRAVEL DEPOSIT								
	• LABOR	3 - EQP'T OPERATORS @ 522/d/EA =		1,566					
		2 - LABORERS (JOURNEYMAN + GRADE FM)		836	2402/d x 4d	9610			9610
	• EQP'T	1 - DOZER (D6N)		550					
		1 - EXCAVATOR (CAT 330) W/ FLAT BLADE		575					
		1 - LOADER (CONTINGENCY)		425					
		1 - SERVICE TRUCK		100	1650/d x 4d		6,600		6,600
	• SUB-CONTRACT	#2 - TRI AXLES @ 650/d/EA x 4d						5440	5440
		(21,650 ÷ 1556 T = $13.91/T OR ÷ 1037 CY = $20.88/CY)				9,610	+ 6,600	+ 5,440	= 21,650

SCOPE OF WORK:-

APPROX. VOLUME OF REMOVAL:

- PLAN AREA ½(125' + 15') x 200'
- AVERAGE DEPTH = 2' (TYP.)
- VOL ± = [½(125' + 15') x 200 x 2'/27
  = 1037 CY
  @ 1.5 T/CY = 1556 T ÷ 22 T/L
  = 70 TRUCKLOADS
- NOTE:- WIDER AREA ACCESS NEEDED TO 2 SIDES FLOW CHANNEL.



PLAN
(N.T.S)

SECTION A-A
(N.T.S)

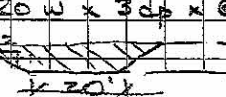
PROJECT: FLOODWATER REMEDIATION MEASURES — DATE: APRIL 6 2012
TOWN OF SALEM NY — SHEET 12 OF 13

ITEM #	ITEM DESCRIPTION	UNIT	QTY	# MAN-HOURS	LABOR	EQPT	MAT'L	TOTAL
4.6	IMPROVEMENTS BETWEEN CHAMBERS Rd BRIDGE AND RR BRIDGE							
	a) REMOVE LARGE STONE BANK PROTECTION AND RELOCATE TO RR BRIDGE ABUTMENT							
	• LABOR 1 TRAK-HOE OPERATOR		522					
	2 LABORERS @ $418/D/EA		836		1358/d x 2 d	2,720		2,720
	• EQP'T 1 - TRAK-HOE		575					
	3 - TIMBER MATS @ 100		300					
	1 - SERVICE TRUCK		100					
	1 - LOT MISC. SLINGS ETC		100		1075/d x 2d = 2150			
	1 LOW BOY 8 HRS @ 110/HR		880			3,030		3030
						2,720 + 3,030 + 0 =		5750
	b) REPLACE FORMER LARGE STONE BANK PROTECTION W/ NYS DOT HEAVY STONE FILL							
	• LABOR #2 operators x 522/EA/DAY =		1044					
	#1 Laborer x 418		418		1462/D x 1d	1,460		1,460
	• EQP'T Trak-Hoe (Cat 330)		575					
	Loader		425					
	Service Truck		100		1100/D x 1d	1,100		1,100
	• MAT'L Allow 50% MAT'L: NYS DOT Heavy Stone fill Say 44 T @ $30/T						1320	1,320
						1,460 + 1,100 +	1,320 =	3,880
	c) FORM A CHANNEL ABOVE BANK for Overflow Channel							
	• LABOR Operator		522					
	1a Laborer		418		940/d x 0.5d	470		470
	• EQP'T Cat 330				575/d x 0.5d	290		290
	• S/C TRIAXLE DUMP W/operator				4 HRS x 85/HR		340	340
						470 + 290 +	340 =	1100
	TOTAL ITEM 4.6 a) TO c) →					4,650 + 4,420 +	1,660 =	10,730

SCOPE OF WORK: a) REMOVE LARGE STONE PROTECTION ON OUTSIDE STREAM BANK (30 TO 40 LF) AND RELOCATE TO PROTECT ADJACENT RR BRIDGE ABUTMENT FROM SCOUR. ACCESS off CHAMBERS Rd TO/ACROSS RR TRACKS. ALLOW TRAVEL TO SITE.

b) REPLACE LARGE STONE BANK PROTECTION WITH NYS DOT HEAVY STONE FILL TO APPROX STRAIGHT AS ALTERNATIVE BANK PROTECTION (POSSIBLE RE-USE of material from ITEM 4.4)

c) FORM A CHANNEL ABOVE NYS DOT HEAVY STONE FILL @ 20'W x 3'dp x @ 50' LONG TO CHANNEL BANK OVERFLOW IN EVENT of A SEVERE FLOOD CONDITION.

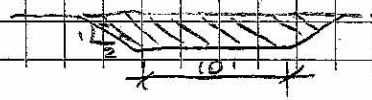


@ 50 cy x 1.35 = 68 T
± 3 TRUCKLOADS

PROJECT: FLOODWATER REMEDIATION MEASURES — DATE: APRIL 6, 2012
TOWN of SALEM, NY — SHEET 13 OF 13

ITEM #	ITEM DESCRIPTION	UNIT	QTY	# MAN-HOURS	LABOR	EQPT	MAT'L	TOTAL
4.7	SUPPLEMENT FLOW CAPACITY OF CHAMBERS Rd BRIDGE							
a)	CONSTRUCT BOX CULVERT, INC'L ROAD OPENING & REINSTATEMENT							
	• BOX CULVERT • LABOR: 2 carpenters x 438 = 876; 4 laborers x 418 = 1672; 1 Operator x 522 = 522; 1 Super x 522 = 522; 5d x 3592				17,960			17,960
	• EQP'T: 1 Mat'l Handle 350; 1 Lot Small Tools etc. 200; 1 Service Truck 100; 5d x 650					3250		3250
	1 Excav. 575; 1 Roller Comp 350; 925 x 2d					1850		1,850
	* = MAT'L + TYING (0.65/LB, 0.35/LB) • MAT'L • CONC 60 CY x 1.1 x 100 = 6600; • REBAR 60 CY x 175 LB/CY x $0.95 = 9980; • FORMWORK 630 FT² x 5.00 = 3150; • MISC: Waterstop, Curing 770						20,500	20,500
	($43,560 ÷ 60 CY = $726/CY)				17,960 +	5,100 +	20,500 =	43,560
	• REINSTATE PAVEMENT • SUB-CONTRACT	15 TONS	x 250.00/TON		1,500	1,270	980	3,750
b)	FORM SWALE CHANNEL							
	• LABOR: 1 - operator 522; 1 - Laborer 418; 940/d x 1 d.				940			940
	• EQP'T: 1 Trak Hoe 575; 1 - Service Truck 100; 675 = 680							
	• S/C: Haulage Say 1 truck x 1 days @ 680/d = 680					1360		1360
	($2,300 ÷ 178 CY = $12.92/CY)				940 +	1360 +	0 =	2300
	TOTAL ITEM 4.7 →				20,400 +	7,730 +	21,480 =	$49,610

Scope of Work: a) CONSTRUCT BOX CULVERT (10' W x 4' H x 50 LF) UNDER CHAMBERS RD, INC'L OPEN ROAD & RE-INSTATE
CONCRETE: 32 LF x 1 FT x 50'/27 = 60 CY.
PAVEMENT: 26' W x 15' L x say 6" TK. (± DWG.) = 15 T
b) FORM SWALE CHANNEL 10' W x 3' D x @ 100 LF TO ACCEPT & CHANNEL FLOW FROM NEW BOX CULVERT



178 CY ≈ 11 TRUCKLOADS