SMELT BROOK FISH PASSAGE RESTORATION
SECTION 1135 PROJECT MODIFICATIONS TO IMPROVE THE ENVIRONMENT

COST ESTIMATE, RISK ANALYSIS, TPCS DEVELOPMENT SUMMARY

COST ESTIMATE

The cost estimate is based on preliminary design and quantities developed by the Civil Engineering Section. The tentatively selected plan (TSP) includes construction of a fish ladder on one side of the stilling basin and extension of the wingwalls. It should be noted that numerous alternatives, including a fish ladder across the entire stilling basin, a nature-like fish passage channel, engineered weirs along a 600-ft reach, and a keyhole slot at the base of the existing culvert, with the PDT ultimately selecting the fish ladder on one side of the stilling basin option going forward.

Assumptions

- Construction methodology: the estimate assumes a subcontractor will mobilize to the site and perform dewatering operations. The Prime will then mobilize to the site, perform surface cleaning and preparation of the concrete stilling basin, install dowels into the existing concrete, construct concrete weir walls, and concrete wall extension of the existing wingwalls. Gabion boxes filled with stone will then be installed within each of the pools created by the weir walls.
- Estimate assumes a Prime Contractor will manage the project and self-perform construction of the fish ladder and will employee a subcontractor to perform the dewatering of the work area.
- Estimate assumes both the Prime and subcontractor will be local to the site and that employees will travel to the site daily.
- Estimate assumes open competition and invitation for bid procurement method.

RISK ANALYSIS

Risk Mitigation was conducted through an Abbreviated Risk Analysis of the project as it is currently presented in addition to the acknowledgement of risk in the scope and estimated quantities. The District has mitigated this risk through a conservative approach to the project duration and equipment and crew necessary to construct the project. The values included in the project cost provide an amount that the PDT is confident will provide substantive costs to mitigate any issues. The District will continue to monitor and include all risks in continuing assessment of contingency and amend as necessary as an essential element to the continued development of the project. The

potential risk areas identified through formal risk and sensitivity analysis were General Conditions (mobilization & demobilization), dewatering, and ladder installation.

The Abbreviated Risk Analysis or ARA was developed relying on local District staff to provide expertise and information gathering. The cost engineer facilitated a risk assessment meeting on site with the PDT in addition to a qualitative analysis to produce a risk register that served as the framework for the risk analysis.

The ARA assumes the Project Development Stage/Alternative is “Feasibility (Recommended Plan)” with a “Low Risk” risk category based on the experience of the cost engineer and vetted with the PDT. The resultant contingency of 31% was then utilized in the Total Project Cost Summary. It should be noted that no Lands and Damages are anticipated for this project.

TOTAL PROJECT COST SUMMARY (TPCS)

The Total Project Cost Summary (TPCS) was then computed to summarize the construction cost, project first cost, and the Total Project Cost or the Fully Funded Cost. The TPCS was utilized to calculate the construction cost estimate applied contingency and escalated to the midpoints of the features of work and the remaining work breakdown structure to include Planning, Engineering & Design (PED) and Construction Management. The inputs of the TPCS, to include percentages for the PED phase and Construction Management were obtained from the project manager.

The resultant TPCS from the cost estimate, risk analysis, and escalation is $1,077,000 with an estimated federal cost of $808,000 and non-federal cost of $269,000 utilizing a 75%/25% federal/non-federal cost of project split. Including feasibility study costs of $452,000 with a 50%/50% split, the total estimated federal cost of the project is $1,034,000.

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: **Smelt Brook Fish Passage Restoration**
PROJECT NO: **XXXXXX**
LOCATION: **Braintree, MA**

DISTRICT: **New England District**
PREPARED: **2/8/2023**
POC: **CHIEF, COST ENGINEERING, Jeff Gaeta**

This Estimate reflects the scope and schedule in report; Report Name and date

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC):				2024					
						Effective Price Level Date:				1-Oct- 23					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	REMAINING COST ($K)	Spent Thru: 1-Oct-15 ($K)	TOTAL FIRST COST ($K)	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
06	FISH & WILDLIFE FACILITIES	$431	$134	31%	$565	2.9%	$444	$138	$581		$581	6.6%	$473	$147	$620
	#N/A		-			-						-			
	#N/A		-			-						-			
			-			-						-			
	CONSTRUCTION ESTIMATE TOTALS:	$431	$134		$565	2.9%	$444	$138	$581		$581	6.6%	$473	$147	$620
01	LANDS AND DAMAGES		-			-						-			
30	PLANNING, ENGINEERING & DESIGN	$265	$82	31%	$347	2.5%	$272	$84	$356		$356	4.1%	$283	$88	$370
31	CONSTRUCTION MANAGEMENT	$62	$19	31%	$81	2.5%	$64	$20	$83		$83	4.4%	$66	$21	$87
	PROJECT COST TOTALS:	$758	$235	31%	$994		$779	$241	$1,020		**$1,020**	5.6%	$822	$255	$1,077

	CHIEF, COST ENGINEERING, Jeff Gaeta
	PROJECT MANAGER, Jordan Macy
	CHIEF, REAL ESTATE, XXX
	CHIEF, PLANNING, XXX
	CHIEF, ENGINEERING, David Margolis
	CHIEF, OPERATIONS, XXX
	CHIEF, CONSTRUCTION, XXX
	CHIEF, CONTRACTING, XXX
	CHIEF, PM-PB, xxxx
	CHIEF, DPM, XXX

ESTIMATED TOTAL PROJECT COST:		**$1,077**
ESTIMATED FEDERAL COST:	**75%**	$808
ESTIMATED NON-FEDERAL COST:	**25%**	$269
22 - FEASIBILITY STUDY (CAP studies):		**$452**
ESTIMATED FEDERAL COST:	50%	$226
ESTIMATED NON-FEDERAL COST:	50%	$226
ESTIMATED FEDERAL COST OF PROJECT		**$1,034**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Smelt Brook Fish Passage Restoration
LOCATION: Braintree, MA
This Estimate reflects the scope and schedule in report; Report Name and date

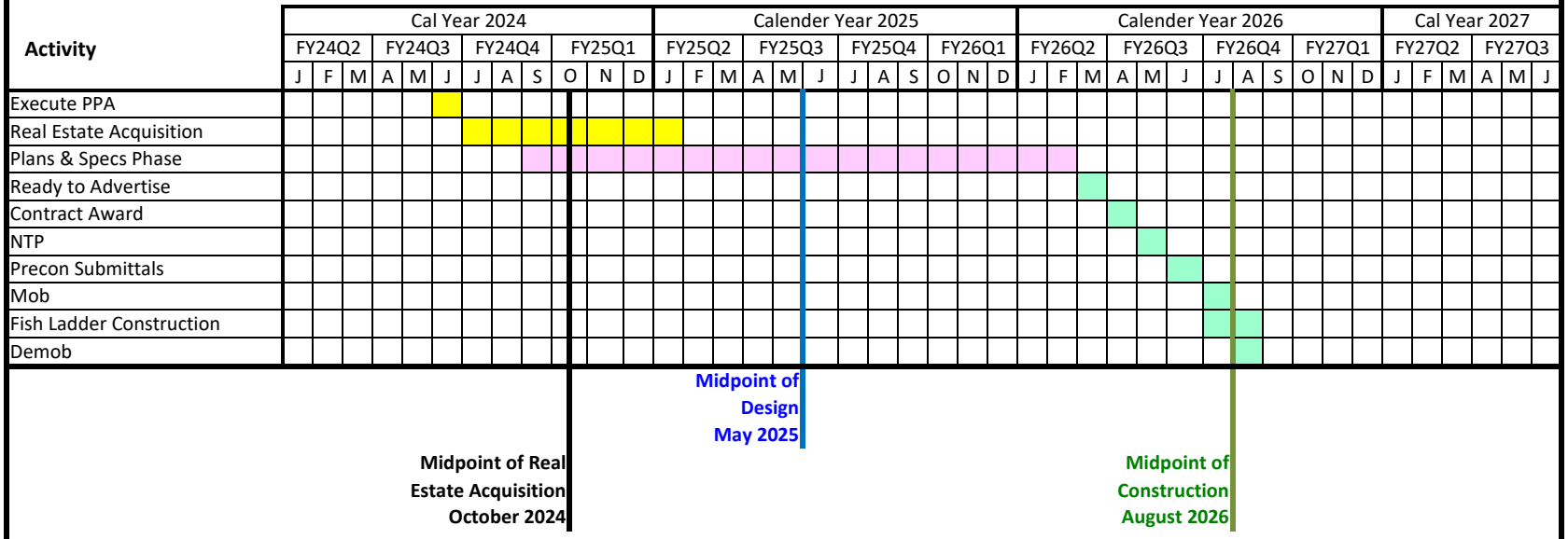
DISTRICT: New England District
POC: CHIEF, COST ENGINEERING, Jeff Gaeta

PREPARED: 2/8/2023

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 23-Jan-23 Estimate Price Level: 1-Oct-22				Program Year (Budget EC): 2024 Effective Price Level Date: 1 -Oct-23								
				RISK BASED										
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 1 or CONTRACT 1													
06	FISH & WILDLIFE FACILITIES	$431	$134	31.0%	$565	2.9%	$444	$138	$581	2026Q3	6.6%	$473	$147	$620
	CONSTRUCTION ESTIMATE TOTALS:	$431	$134	31.0%	$565		$444	$138	$581			$473	$147	$620
01	LANDS AND DAMAGES													
30	PLANNING, ENGINEERING & DESIGN													
2.5%	Project Management	$10	$3	31.0%	$13	2.5%	$10	$3	$13	2025Q3	3.8%	$11	$3	$14
1.0%	Planning & Environmental Compliance	$27	$8	31.0%	$35	2.5%	$28	$9	$36	2025Q3	3.8%	$29	$9	$38
15.0%	Engineering & Design	$116	$36	31.0%	$152	2.5%	$119	$37	$155	2025Q3	3.8%	$123	$38	$161
1.0%	Reviews, ATRs, IEPRs, VE	$28	$9	31.0%	$37	2.5%	$29	$9	$38	2025Q3	3.8%	$30	$9	$39
1.0%	Life Cycle Updates (cost, schedule, risks)	$8	$2	31.0%	$10	2.5%	$8	$2	$10	2025Q3	3.8%	$8	$2	$10
1.0%	Contracting & Reprographics	$15	$5	31.0%	$20	2.5%	$15	$5	$20	2025Q4	4.4%	$16	$5	$21
3.0%	Engineering During Construction	$10	$3	31.0%	$13	2.5%	$10	$3	$13	2025Q4	4.4%	$10	$3	$13
2.0%	Planning During Construction	$11	$3	31.0%	$14	2.5%	$11	$3	$15	2025Q3	3.8%	$12	$4	$15
3.0%	Adaptive Management & Monitoring	$35	$11	31.0%	$46	2.5%	$36	$11	$47	2027Q1	7.7%	$39	$12	$51
1.0%	Project Operations	$6	$2	31.0%	$8	2.5%	$6	$2	$8	2017Q3	-8.4%	$6	$2	$8
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	$45	$14	31.0%	$59	2.5%	$46	$14	$60	2025Q4	4.4%	$48	$15	$63
2.0%	Project Operation:	$7	$2	31.0%	$9	2.5%	$7	$2	$9	2025Q4	4.4%	$7	$2	$10
2.5%	Project Management	$10	$3	31.0%	$13	2.5%	$10	$3	$13	2025Q4	4.4%	$11	$3	$14
	CONTRACT COST TOTALS:	$758	$235		$994		$779	$241	**$1,020**			$822	$255	**$1,077**

DESIGN AND IMPLEMENTATION SCHEDULE

Smelt Brook Fish Passage Restoration, Brainetree, MA, Section 1135 Project Modifications to Improve the Environment



Smelt Brook Culvert Outfall Improvements

Estimated by	Chris Barden
Designed by	
Prepared by	Chris Barden
Preparation Date	1/23/2023
Effective Date of Pricing	1/23/2023
Estimated Construction Time	30 Days

Description	Quantity	UOM	ProjectCost
Project Cost Summary Report			**431,439**
Project Summary	**1.00**	**LS**	**431,439**

Abbreviated Risk Analysis

Project (less than $40M): **Smelt Brook Fish Passage Restoration** — **Alternative:** **Ladder One Side of Stilling Basin**

Project Development Stage/Alternative: **Feasibility (Alternatives)**

Risk Category: **Low Risk: Typical Construction, Simple** — **Meeting Date:** **N/A**

Total Estimated Construction Contract Cost = $ 431,439

	CWWBS	Feature of Work	Estimated Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ -		25%	$ -	$ -
1	06 FISH AND WILDLIFE FACILITIES	General Requirements	$ 98,435		18%	$ 18,061	$ 116,496
2	06 FISH AND WILDLIFE FACILITIES	Site Preparation and Dewatering	$ 131,386		25%	$ 32,881	$ 164,267
3	06 FISH AND WILDLIFE FACILITIES	New Construction	$ 201,618		41%	$ 83,055	$ 284,673
4			$ -		0%	$ -	$ -
5			$ -		0%	$ -	$ -
6			$ -		0%	$ -	$ -
7			$ -		0%	$ -	$ -
8			$ -		0%	$ -	$ -
9			$ -		0%	$ -	$ -
10			$ -		0%	$ -	$ -
11			$ -		0%	$ -	$ -
12	All Other	Remaining Construction Items	$ -	*0.0%*	0%	$ -	$ -
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$ 264,968		12%	$ 31,796	$ 296,764
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$ 62,000		12%	$ 7,440	$ 69,440
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)					$ -	

Totals					
Real Estate	$ -	0%	$ -	$ -	
Total Construction Estimate	$ 431,439	31%	$ 133,996	$ 565,435	
Total Planning, Engineering & Design	$ 264,968	12%	$ 31,796	$ 296,764	
Total Construction Management	$ 62,000	12%	$ 7,440	$ 69,440	
Total Excluding Real Estate	**$ 758,407**	**23%**	**$ 173,233**	**$ 931,640**	
		Base	**50%**	**80%**	
Confidence Level Range Estimate ($000's)		$758k	$862k	$932k	

* 50% based on base is at 5% CL.

Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.	

Smelt Brook Fish Passage Restoration Ladder One Side of S

Feasibility (Alternatives)
Abbreviated Risk Analysis
Meeting Date: N/A

Risk Level

	Negligible	Marginal	Moderate	Significant	Critical
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Register

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Management & Scope Growth				**Maximum Project Growth**		**40%**
PS-1	General Requirements	Potential for scope growth, such as restoration of the surrounding area - ie. tree clearing.	Current scope is limited to installation of concrete weir walls. Possibility for scope growth to include tree removal and site restoration to take advantage of a Contractor being on site.	Moderate	Possible	2
PS-2	Site Preparation and Dewatering	Potential for scope growth, such as restoration of the surrounding area - ie. tree clearing.	Current scope is limited to installation of concrete weir walls. Possibility for scope growth to include tree removal and site restoration to take advantage of a Contractor being on site.	Moderate	Possible	2
PS-3	New Construction	Condition of existing structure has not been inspected, covered in sediment, etc.	Project may require concrete repairs to the existing structure once it's visible. Impact is moderate, will only require small quantiites of concrete surface repairs. Poor condition not noted	Moderate	Likely	3
PS-12	Remaining Construction Items	No concerns.		Negligible	Unlikely	0
PS-13	Planning, Engineering, & Design	No concerns.		Negligible	Unlikely	0
PS-14	Construction Management	No concerns.		Negligible	Unlikely	0
Acquisition Strategy				**Maximum Project Growth**		**30%**
AS-1	General Requirements	The contract could go 8A.	8A would use a higher markup percentage for overhead. Prime Contractor would be less likely to self-perform, and would subcontract weir installation.	Marginal	Possible	1
AS-2	Site Preparation and Dewatering	The contract could go 8A.	8A would use a higher markup percentage for overhead. Prime Contractor would be less likely to self-perform, and would subcontract weir installation.	Marginal	Possible	1
AS-3	New Construction	The contract could go 8A.	8A would use a higher markup percentage for overhead. Prime Contractor would be less likely to self-perform, and would subcontract weir installation.	Marginal	Possible	1
AS-12	Remaining Construction Items	No concerns.		Negligible	Unlikely	0
AS-13	Planning, Engineering, & Design	No concerns.		Negligible	Unlikely	0
AS-14	Construction Management	No concerns.		Negligible	Unlikely	0
Construction Elements				**Maximum Project Growth**		**15%**

CON-1	General Requirements	No concerns.		Negligible	Unlikely	0
CE-2	Site Preparation and Dewatering	Concerned with working in the wet.	Estimate assumes sandbagging the work area and dewatering for the duration of concrete installation and curing.	Moderate	Possible	2
CE-3	New Construction	Concerned with working in the wet.	Estimate assumes sandbagging the work area and dewatering for the duration of concrete installation and curing.	Moderate	Possible	2
CE-12	Remaining Construction Items	No concerns.		Negligible	Unlikely	0
CE-13	Planning, Engineering, & Design	No concerns.		Negligible	Unlikely	0
CE-14	Construction Management	No concerns.		Negligible	Unlikely	0
Specialty Construction or Fabrication				**Maximum Project Growth**		**50%**
SC-1	General Requirements	No concerns.		Negligible	Unlikely	0
SC-2	Site Preparation and Dewatering	No concerns.		Negligible	Unlikely	0
SC-3	New Construction	Specialty concrete finishing.	Estimate does not include any special finishing of the concrete, such as stamping. If stamping is specified, this will incur higher cost.	Moderate	Unlikely	1
SC-12	Remaining Construction Items	No concerns.		Negligible	Unlikely	0
SC-13	Planning, Engineering, & Design	No concerns.		Negligible	Unlikely	0
SC-14	Construction Management	No concerns.		Negligible	Unlikely	0
Technical Design & Quantities				**Maximum Project Growth**		**20%**
T-1	General Requirements	No concerns.		Negligible	Unlikely	0
T-2	Site Preparation and Dewatering	No concerns.		Negligible	Unlikely	0
T-3	New Construction	No concerns.	Weir design is simple, high level of confidence no additional walls would or could be implemented. Simplicity of design makes quantity takeoff simple.	Negligible	Unlikely	0
T-12	Remaining Construction Items	No concerns.		Negligible	Unlikely	0
T-13	Planning, Engineering, & Design	No concerns.		Negligible	Unlikely	0
T-14	Construction Management	No concerns.		Negligible	Unlikely	0
Cost Estimate Assumptions				**Maximum Project Growth**		**25%**
EST-1	General Requirements	No concerns.		Negligible	Unlikely	0

EST-2	Site Preparation and Dewatering	Selection of dewatering method being appropriate for the work.	Cost estimate line item for dewatering is appropriate for given flow.	Marginal	Possible	1
EST-3	New Construction	Inadequate access for Contractor personnel and equipment.	Estimate assumes the Contractor can utilize the existing personnel fence gate to walk small equipment down to the inside of the outfall. If the Contractor requires access to the southeast side of the culvert outfall, this will require tree clearing and equipment that can be transported over the shallow culvert.	Significant	Possible	3
EST-12	Remaining Construction Items	No concerns.		Negligible	Unlikely	0
EST-13	Planning, Engineering, & Design	No concerns.		Negligible	Unlikely	0
EST-14	Construction Management	No concerns.		Negligible	Unlikely	0
External Project Risks				**Maximum Project Growth**		**20%**
EX-1	General Requirements			Negligible	Unlikely	0
EX-2	Site Preparation and Dewatering	Risk of heavy storm with higher than anticpated brook flow	A severe weather event could cause a delay and/or require larger/additional dewatering pump. Estimate assumes the brooks flow will be approximately the 50th percentile, or during the drier 6 months of the year.	Marginal	Possible	1
EX-3	New Construction	Risk of greater inflation due to COVID-19.	Rapid inflation has been seen since the start of the pandemic, increase could continue to be significant.	Significant	Possible	3
EX-12	Remaining Construction Items			Negligible	Unlikely	0
EX-13	Planning, Engineering, & Design			Negligible	Unlikely	0
EX-14	Construction Management			Negligible	Unlikely	0

Smelt Brook Fish Passage Restoration Ladder One Side of Stilling Basin
Feasibility (Alternatives)
Abbreviated Risk Analysis

Risk Evaluation

WBS	Potential Risk Areas	Project Management & Scope Growth	Acquisition Strategy	Construction Elements	Specialty Construction or Fabrication	Technical Design & Quantities	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
01 LANDS AND DAMAGES	**Real Estate**								$0
06 FISH AND WILDLIFE FACILITIES	**General Requirements**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	$98
06 FISH AND WILDLIFE FACILITIES	Site Preparation and Dewatering	**2**	**1**	**2**	**0**	**0**	**1**	**1**	$131
06 FISH AND WILDLIFE FACILITIES	New Construction	**3**	**1**	**2**	**1**	**0**	**3**	**3**	$202
0	0	N/A	**0**	**0**	**0**	**0**	**0**	**0**	$0
0	0	N/A	**0**	**0**	**0**	**0**	**0**	**0**	$0
0	0	N/A	**0**	**0**	**0**	**0**	**0**	**0**	$0
0	**0**	N/A	**0**	**0**	**0**	**0**	**0**	**0**	$0
0	**0**	N/A	**0**	**0**	**0**	**0**	**0**	**0**	$0
0	**0**	N/A	**0**	**0**	**0**	**0**	**0**	**0**	$0
0	**0**	N/A	**0**	**0**	**0**	**0**	**0**	**0**	$0
0	**0**	N/A	**0**	**0**	**0**	**0**	**0**	**0**	$0
All Other	Remaining Construction Items	**0**	**0**	**0**	**0**	**0**	**0**	**0**	$0
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	**0**	**0**	**0**	**0**	**0**	**0**	**0**	$265
31 CONSTRUCTION MANAGEMENT	Construction Management	**0**	**0**	**0**	**0**	**0**	**0**	**0**	$62
									$758
Risk		$ 28	$ 46	$ 63	$ 4	$ -	$ 16	$ 15	**$173**
Fixed Dollar Risk Allocation		$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$0**
	Risk	$ 28	$ 46	$ 63	$ 4	$ -	$ 16	$ 15	**$173**
								Total	**$932**