

## 2. ESTIMATED PRODUCTION RATIO WITH IMPROVEMENT PLAN



THE UNIVERSITY OF CHICAGO  
DIVISION OF THE PHYSICAL SCIENCES  
DEPARTMENT OF CHEMISTRY

Case O

### Estimated Production Ratio with Present Condition

Code Canal C9	Name of Canal		Total Command Area (ha)		Summer Crop		Winter Crop	
	Bajo		142.91		Without Management Loss	With Management Loss	Without Management Loss	With Management Loss
Return Period								
1/2					89%	77%	13%	100%
1/5					88%	75%	13%	100%
1/10					88%	75%	13%	100%
1/20					87%	74%	13%	100%
1/5 (Exceedance)					92%	79%	12%	100%
1/10 (Exceedance)					93%	81%	12%	100%
1/20 (Exceedance)					95%	82%	13%	100%
Total					90%	77%	13%	100%

### Estimated Production Ratio with Present Condition

Code Canal C10	Name of Canal		Total Command Area (ha)		Summer Crop		Winter Crop	
	Phangyul		90.81		Without Management Loss	With Management Loss	Without Management Loss	With Management Loss
Return Period								
1/2					47%	38%	9%	75%
1/5					46%	37%	9%	73%
1/10					45%	37%	9%	72%
1/20					45%	36%	8%	71%
1/5 (Exceedance)					47%	38%	9%	79%
1/10 (Exceedance)					48%	39%	9%	82%
1/20 (Exceedance)					48%	39%	10%	85%
Total					47%	38%	9%	76%

**Estimated Production Ratio with Improvement of Water Management**

Code Canal C9	Name of Canal		Total Command Area (ha)		Return			
	Bajo	142.91	Summer Crop	Winter Crop	Without Management Loss	With Management Loss	Without Management Loss	With Management Loss
Period								
1/2			87%	2%	100%	100%	100%	0%
1/5			88%	3%	100%	100%	100%	0%
1/10			88%	3%	100%	100%	100%	0%
1/20			87%	3%	100%	100%	100%	0%
1/5 (Exceedance)			92%	2%	100%	100%	100%	0%
1/10 (Exceedance)			93%	2%	100%	100%	100%	0%
1/20 (Exceedance)			95%	3%	100%	100%	100%	0%
Total			90%	3%	100%	100%	100%	0%

**Estimated Production Ratio with Improvement of Water Management**

Code Canal C10	Name of Canal		Total Command Area (ha)		Return			
	Phangyut	90.81	Summer Crop	Winter Crop	Without Management Loss	With Management Loss	Without Management Loss	With Management Loss
Period								
1/2			47%	4%	75%	71%	71%	4%
1/5			46%	4%	73%	69%	69%	4%
1/10			45%	4%	72%	68%	68%	4%
1/20			45%	4%	71%	68%	68%	4%
1/5 (Exceedance)			47%	4%	79%	74%	74%	5%
1/10 (Exceedance)			48%	4%	82%	77%	77%	5%
1/20 (Exceedance)			48%	4%	85%	80%	80%	5%
Total			47%	4%	76%	71%	71%	4%

Estimated Production Ratio with Improvement of Canal

Code	Name of Canal	Total Command Area (ha)	Summer Crop			Winter Crop		
			Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Canal C9	Bajo	142.91						
Return								
Period								
1/2			100%	87%	13%	100%	100%	0%
1/5			100%	86%	14%	100%	100%	0%
1/10			100%	85%	15%	100%	100%	0%
1/20			100%	85%	15%	100%	100%	0%
1/5 (Exceedance)			100%	89%	11%	100%	100%	0%
1/10 (Exceedance)			100%	89%	11%	100%	100%	0%
1/20 (Exceedance)			100%	90%	10%	100%	100%	0%
Total			100%	87%	13%	100%	100%	0%

Estimated Production Ratio with Improvement of Canal

Code	Name of Canal	Total Command Area (ha)	Summer Crop			Winter Crop		
			Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Canal C10	Phangyul	90.81						
Return								
Period								
1/2			61%	50%	10%	99%	76%	23%
1/5			60%	49%	11%	98%	75%	24%
1/10			60%	49%	11%	98%	74%	24%
1/20			60%	49%	11%	98%	74%	24%
1/5 (Exceedance)			62%	52%	10%	100%	78%	21%
1/10 (Exceedance)			63%	52%	11%	100%	80%	20%
1/20 (Exceedance)			63%	52%	11%	100%	81%	19%
Total			61%	51%	10%	99%	76%	22%

**Estimated Production Ratio with Improvement of Water Management & Canal Improvement**

Code Canal C9 Return	Name of Canal Bajo		Total Command Area (ha) 142.91		Summer Crop		Winter Crop	
	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	
1/2	100%	97%	3%	100%	100%	0%	100%	
1/5	100%	96%	4%	100%	100%	0%	100%	
1/10	100%	96%	4%	100%	100%	0%	100%	
1/20	100%	96%	4%	100%	100%	0%	100%	
1/5 (Exceedance)	100%	98%	2%	100%	100%	0%	100%	
1/10 (Exceedance)	100%	99%	1%	100%	100%	0%	100%	
1/20 (Exceedance)	100%	99%	1%	100%	100%	0%	100%	
Total	100%	97%	3%	100%	100%	0%	100%	

**Estimated Production Ratio with Improvement of Water Management & Canal Improvement**

Code Canal C10 Return	Name of Canal Phangyul		Total Command Area (ha) 90.81		Summer Crop		Winter Crop	
	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	
1/2	61%	57%	3%	99%	98%	1%	100%	
1/5	60%	57%	3%	98%	97%	1%	100%	
1/10	60%	56%	3%	98%	97%	1%	100%	
1/20	60%	56%	3%	98%	97%	1%	100%	
1/5 (Exceedance)	62%	58%	4%	100%	98%	1%	100%	
1/10 (Exceedance)	63%	59%	4%	100%	99%	1%	100%	
1/20 (Exceedance)	63%	60%	4%	100%	99%	1%	100%	
Total	61%	57%	3%	99%	98%	1%	100%	

Case C

**Estimated Production Ratio with Improvement of Water Resources**

Code Canal C9	Name of Canal		Total Command Area (ha)		Summer Crop				Winter Crop				
	Bajo		142.91		Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Return													
Period													
1/2					89%	77%	13%	100%	100%	0%	100%	100%	0%
1/5					88%	75%	13%	100%	100%	0%	100%	100%	0%
1/10					88%	75%	13%	100%	100%	0%	100%	100%	0%
1/20					87%	74%	13%	100%	100%	0%	100%	100%	0%
1/5 (Exceedance)					92%	79%	12%	100%	100%	0%	100%	100%	0%
1/10 (Exceedance)					93%	81%	12%	100%	100%	0%	100%	100%	0%
1/20 (Exceedance)					95%	82%	13%	100%	100%	0%	100%	100%	0%
Total					90%	77%	13%	100%	100%	0%	100%	100%	0%

**Estimated Production Ratio with Improvement of Water Resources**

Code Canal C10	Name of Canal		Total Command Area (ha)		Summer Crop				Winter Crop				
	Phangyul		90.81		Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Return													
Period													
1/2					57%	46%	11%	96%	96%	27%	69%	69%	27%
1/5					56%	45%	11%	96%	96%	28%	68%	68%	28%
1/10					56%	45%	11%	96%	96%	29%	67%	67%	29%
1/20					56%	44%	11%	96%	96%	29%	67%	67%	29%
1/5 (Exceedance)					58%	47%	10%	97%	97%	26%	71%	71%	26%
1/10 (Exceedance)					58%	48%	11%	97%	97%	25%	73%	73%	25%
1/20 (Exceedance)					59%	48%	11%	98%	98%	24%	74%	74%	24%
Total					57%	46%	11%	96%	96%	27%	69%	69%	27%

**Estimated Production Ratio with Improvement of Water Management & Water Resources**

Code		Name of Canal		Total Command Area (ha)		
Canal C9		Bajo		142.91		
Return	Summer Crop			Winter Crop		
	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
1/2	89%	87%	2%	100%	100%	0%
1/5	88%	85%	3%	100%	100%	0%
1/10	88%	85%	3%	100%	100%	0%
1/20	87%	84%	3%	100%	100%	0%
1/5 (Exceedance)	92%	89%	2%	100%	100%	0%
1/10 (Exceedance)	93%	91%	2%	100%	100%	0%
1/20 (Exceedance)	95%	92%	3%	100%	100%	0%
Total	90%	87%	3%	100%	100%	0%

**Estimated Production Ratio with Improvement of Water Management & Water Resources**

Code		Name of Canal		Total Command Area (ha)		
Canal C10		Phangyul		90.81		
Return	Summer Crop			Winter Crop		
	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
1/2	57%	53%	3%	96%	95%	1%
1/5	56%	53%	4%	96%	95%	1%
1/10	56%	52%	4%	96%	94%	1%
1/20	56%	52%	4%	96%	94%	2%
1/5 (Exceedance)	58%	54%	3%	97%	96%	1%
1/10 (Exceedance)	58%	55%	3%	97%	96%	1%
1/20 (Exceedance)	59%	56%	3%	98%	97%	1%
Total	57%	53%	3%	96%	95%	1%

**Estimated Production Ratio with Improvement of Water Resources & Canal**

Code		Name of Canal		Total Command Area (ha)		
Canal C9		Bajo		142.91		
Return		Summer Crop		Winter Crop		
Period	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
1/2	100%	87%	13%	100%	100%	0%
1/5	100%	86%	14%	100%	100%	0%
1/10	100%	85%	15%	100%	100%	0%
1/20	100%	85%	15%	100%	100%	0%
1/5 (Exceedance)	100%	89%	11%	100%	100%	0%
1/10 (Exceedance)	100%	89%	11%	100%	100%	0%
1/20 (Exceedance)	100%	90%	10%	100%	100%	0%
Total	100%	87%	13%	100%	100%	0%

**Estimated Production Ratio with Improvement of Water Resources & Canal**

Code		Name of Canal		Total Command Area (ha)		
Canal C10		Phangyul		90.81		
Return		Summer Crop		Winter Crop		
Period	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
1/2	77%	59%	18%	100%	94%	6%
1/5	75%	57%	18%	100%	93%	7%
1/10	75%	57%	18%	100%	93%	7%
1/20	75%	56%	18%	100%	93%	7%
1/5 (Exceedance)	78%	60%	18%	100%	96%	4%
1/10 (Exceedance)	79%	61%	19%	100%	96%	4%
1/20 (Exceedance)	80%	61%	19%	100%	97%	3%
Total	77%	59%	18%	100%	95%	5%

**Estimated Production Ratio with Improvement of Water Management, Canal & Water Resources**

Code		Name of Canal		Total Command Area (ha)		
Canal C9		Bajo		142.91		
Return	Summer Crop			Winter Crop		
	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
1/2	100%	97%	3%	100%	100%	0%
1/5	100%	96%	4%	100%	100%	0%
1/10	100%	96%	4%	100%	100%	0%
1/20	100%	96%	4%	100%	100%	0%
1/5 (Exceedance)	100%	98%	2%	100%	100%	0%
1/10 (Exceedance)	100%	99%	1%	100%	100%	0%
1/20 (Exceedance)	100%	99%	1%	100%	100%	0%
Total	100%	97%	3%	100%	100%	0%

**Estimated Production Ratio with Improvement of Water Management, Canal & Water Resources**

Code		Name of Canal		Total Command Area (ha)		
Canal C10		Phangvul		90.81		
Return	Summer Crop			Winter Crop		
	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
1/2	77%	72%	5%	100%	100%	0%
1/5	75%	71%	5%	100%	100%	0%
1/10	75%	70%	5%	100%	100%	0%
1/20	75%	70%	5%	100%	100%	0%
1/5 (Exceedance)	78%	73%	5%	100%	100%	0%
1/10 (Exceedance)	79%	74%	5%	100%	100%	0%
1/20 (Exceedance)	80%	75%	5%	100%	100%	0%
Total	77%	72%	5%	100%	100%	0%

**Estimated Production Ratio with 5% Diversification**

Code	Name of Canal	Total Command Area (ha)	Summer Crop			Winter Crop		
			Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Canal C9	Bajo	142.91						
Return								
Period								
1/2			92%	79%	13%	100%	100%	0%
1/5			90%	77%	13%	100%	100%	0%
1/10			90%	76%	13%	100%	100%	0%
1/20			89%	76%	14%	100%	100%	0%
1/5 (Exceedance)			94%	81%	13%	100%	100%	0%
1/10 (Exceedance)			96%	83%	13%	100%	100%	0%
1/20 (Exceedance)			97%	84%	13%	100%	100%	0%
Total			92%	79%	13%	100%	100%	0%

**Estimated Production Ratio with 5% Diversification**

Code	Name of Canal	Total Command Area (ha)	Summer Crop			Winter Crop		
			Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Canal C10	Phangyut	90.81						
Return								
Period								
1/2			47%	38%	9%	75%	51%	24%
1/5			47%	38%	9%	73%	49%	24%
1/10			46%	37%	9%	72%	49%	23%
1/20			46%	37%	9%	71%	48%	23%
1/5 (Exceedance)			48%	39%	9%	79%	53%	26%
1/10 (Exceedance)			49%	40%	9%	82%	54%	27%
1/20 (Exceedance)			49%	40%	10%	85%	55%	29%
Total			48%	39%	9%	76%	51%	25%

**Estimated Production Ratio with Improvement of Water Management & 5% Diversification**

Code	Name of Canal	Total Command Area (ha)	Summer Crop			Winter Crop		
			Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Canal C9	Bajo	142.91						
Return								
Period								
1/2			92%	89%	3%	100%	100%	0%
1/5			90%	88%	2%	100%	100%	0%
1/10			90%	87%	2%	100%	100%	0%
1/20			89%	87%	3%	100%	100%	0%
1/5 (Exceedance)			94%	92%	3%	100%	100%	0%
1/10 (Exceedance)			96%	93%	3%	100%	100%	0%
1/20 (Exceedance)			97%	94%	3%	100%	100%	0%
Total			92%	90%	3%	100%	100%	0%

**Estimated Production Ratio with Improvement of Water Management & 5% Diversification**

Code	Name of Canal	Total Command Area (ha)	Summer Crop			Winter Crop		
			Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Canal C10	Phangyul	90.81						
Return								
Period								
1/2			47%	43%	4%	75%	71%	4%
1/5			47%	42%	4%	73%	69%	4%
1/10			46%	42%	4%	72%	68%	4%
1/20			46%	41%	4%	71%	68%	3%
1/5 (Exceedance)			48%	45%	4%	79%	75%	4%
1/10 (Exceedance)			49%	45%	4%	82%	77%	5%
1/20 (Exceedance)			49%	45%	4%	85%	80%	5%
Total			48%	43%	4%	76%	72%	4%

**Estimated Production Ratio with Improvement of Canal & 5% Diversification**

Code	Name of Canal		Total Command Area (ha)		Summer Crop		Winter Crop	
	Canal C9	Bajo	142.91		Without Management Loss	With Management Loss	Without Management Loss	With Management Loss
Return								
Period								
1/2					100%	88%	100%	100%
1/5					100%	87%	100%	100%
1/10					100%	87%	100%	100%
1/20					100%	86%	100%	100%
1/5 (Exceedance)					100%	90%	100%	100%
1/10 (Exceedance)					100%	91%	100%	100%
1/20 (Exceedance)					100%	92%	100%	100%
Total					100%	89%	100%	100%

**Estimated Production Ratio with Improvement of Canal & 5% Diversification**

Code	Name of Canal		Total Command Area (ha)		Summer Crop		Winter Crop	
	Canal C10	Phangyul	90.81		Without Management Loss	With Management Loss	Without Management Loss	With Management Loss
Return								
Period								
1/2					62%	52%	99%	77%
1/5					61%	51%	99%	75%
1/10					61%	50%	98%	75%
1/20					61%	50%	98%	74%
1/5 (Exceedance)					63%	53%	100%	79%
1/10 (Exceedance)					64%	53%	100%	80%
1/20 (Exceedance)					65%	54%	100%	82%
Total					62%	52%	99%	77%

**Estimated Production Ratio with Improvement of Water Management, Canal & 5% Diversification**

Code		Name of Canal		Total Command Area (ha)			
Canal C9		Bajo		142.91			
Return	Period	Summer Crop		Winter Crop			
		Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
	1/2	100%	98%	2%	100%	100%	0%
	1/5	100%	98%	2%	100%	100%	0%
	1/10	100%	98%	2%	100%	100%	0%
	1/20	100%	97%	3%	100%	100%	0%
	1/5 (Exceedance)	100%	99%	1%	100%	100%	0%
	1/10 (Exceedance)	100%	99%	1%	100%	100%	0%
	1/20 (Exceedance)	100%	100%	0%	100%	100%	0%
	Total	100%	99%	1%	100%	100%	0%

**Estimated Production Ratio with Improvement of Water Management, Canal & 5% Diversification**

Code		Name of Canal		Total Command Area (ha)			
Canal C10		Phangyut		90.81			
Return	Period	Summer Crop		Winter Crop			
		Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
	1/2	62%	59%	4%	99%	98%	1%
	1/5	61%	58%	4%	99%	98%	1%
	1/10	61%	57%	4%	98%	97%	1%
	1/20	61%	57%	3%	98%	97%	1%
	1/5 (Exceedance)	63%	60%	4%	100%	99%	1%
	1/10 (Exceedance)	64%	61%	4%	100%	99%	1%
	1/20 (Exceedance)	65%	61%	4%	100%	99%	1%
	Total	62%	59%	4%	99%	98%	1%

Case D-2

**Estimated Production Ratio wit 10% Diversification**

Code	Name of Canal	Command Area (ha)	Summer Crop			Winter Crop		
			Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Canal C9	Bajo	142.91						
Return								
Period								
1/2			94%	81%	14%	100%	100%	0%
1/5			93%	79%	14%	100%	100%	0%
1/10			92%	78%	14%	100%	100%	0%
1/20			92%	78%	14%	100%	100%	0%
1/5 (Exceedance)			97%	83%	13%	100%	100%	0%
1/10 (Exceedance)			99%	85%	14%	100%	100%	0%
1/20 (Exceedance)			100%	86%	14%	100%	100%	0%
Total			95%	81%	14%	100%	100%	0%

**Estimated Production Ratio wit 10% Diversification**

Code	Name of Canal	Command Area (ha)	Summer Crop			Winter Crop		
			Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Canal C10	Phangyui	90.81						
Return								
Period								
1/2			48%	39%	9%	75%	51%	24%
1/5			48%	39%	9%	73%	49%	23%
1/10			47%	38%	9%	72%	49%	23%
1/20			47%	38%	9%	71%	48%	23%
1/5 (Exceedance)			49%	40%	9%	79%	53%	26%
1/10 (Exceedance)			50%	41%	9%	82%	55%	27%
1/20 (Exceedance)			50%	41%	10%	85%	56%	29%
Total			49%	39%	9%	76%	51%	24%

**Estimated Production Ratio with Improvement of Water Management & 10% Diversification**

Code		Name of Canal		Total Command Area (ha)		
Canal C9		Bajo		142.91		
Return	Period	Summer Crop			Winter Crop	
		Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss
	1/2	94%	91%	3%	100%	0%
	1/5	93%	90%	3%	100%	0%
	1/10	92%	89%	3%	100%	0%
	1/20	92%	89%	3%	100%	0%
	1/5 (Exceedance)	97%	94%	3%	100%	0%
	1/10 (Exceedance)	99%	95%	4%	100%	0%
	1/20 (Exceedance)	100%	96%	4%	100%	0%
	Total	95%	92%	3%	100%	0%

**Estimated Production Ratio with Improvement of Water Management & 10% Diversification**

Code		Name of Canal		Total Command Area (ha)		
Canal C10		Phangyul		90.81		
Return	Period	Summer Crop			Winter Crop	
		Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss
	1/2	45%	45%	4%	75%	4%
	1/5	48%	43%	4%	73%	3%
	1/10	47%	43%	4%	72%	3%
	1/20	47%	43%	4%	71%	3%
	1/5 (Exceedance)	49%	46%	4%	79%	4%
	1/10 (Exceedance)	50%	46%	4%	82%	5%
	1/20 (Exceedance)	50%	47%	4%	85%	5%
	Total	49%	45%	4%	76%	4%

**Estimated Production Ratio with Improvement of Canal & 10% Diversification**

Code Canal C9	Name of Canal Banjo		Total Command Area (ha) 142.91		Summer Crop			Winter Crop		
	Return	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Period										
1/2		100%	90%	10%	100%	100%	10%	100%	100%	0%
1/5		100%	89%	11%	100%	100%	11%	100%	100%	0%
1/10		100%	88%	12%	100%	100%	12%	100%	100%	0%
1/20		100%	88%	12%	100%	100%	12%	100%	100%	0%
1/5 (Exceedance)		100%	91%	9%	100%	100%	9%	100%	100%	0%
1/10 (Exceedance)		100%	92%	8%	100%	100%	8%	100%	100%	0%
1/20 (Exceedance)		100%	94%	6%	100%	100%	6%	100%	100%	0%
Total		100%	90%	10%	100%	100%	10%	100%	100%	0%

**Estimated Production Ratio with Improvement of Canal & 10% Diversification**

Code Canal C10	Name of Canal Phangyul		Total Command Area (ha) 99.81		Summer-Crop			Winter Crop		
	Return	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Period										
1/2		64%	53%	11%	100%	99%	1%	100%	77%	23%
1/5		63%	52%	11%	100%	99%	1%	99%	75%	24%
1/10		62%	51%	11%	100%	99%	1%	99%	75%	24%
1/20		62%	51%	11%	100%	99%	1%	99%	74%	24%
1/5 (Exceedance)		65%	54%	11%	100%	100%	0%	100%	79%	21%
1/10 (Exceedance)		66%	55%	11%	100%	100%	0%	100%	80%	20%
1/20 (Exceedance)		67%	55%	12%	100%	100%	0%	100%	82%	18%
Total		64%	53%	11%	100%	99%	1%	100%	77%	22%

**Estimated Production Ratio with Improvement of Canal, Water Management & 10% Diversification**

Code Canal C9		Name of Canal Bajjo		Total Command Area (ha) 142.91	
Return Period	Summer Crop			Winter Crop	
	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss
1/2	100%	99%	1%	100%	0%
1/5	100%	99%	1%	100%	0%
1/10	100%	99%	1%	100%	0%
1/20	100%	99%	1%	100%	0%
1/5 (Exceedance)	100%	100%	0%	100%	0%
1/10 (Exceedance)	100%	100%	0%	100%	0%
1/20 (Exceedance)	100%	100%	0%	100%	0%
Total	100%	99%	1%	100%	0%

**Estimated Production Ratio with Improvement of Canal, Water Management & 10% Diversification**

Code Canal C10		Name of Canal Phangyul		Total Command Area (ha) 90.81	
Return Period	Summer Crop			Winter Crop	
	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss
1/2	64%	60%	4%	100%	1%
1/5	63%	59%	4%	99%	1%
1/10	62%	59%	4%	99%	1%
1/20	62%	58%	4%	99%	1%
1/5 (Exceedance)	65%	61%	4%	100%	1%
1/10 (Exceedance)	66%	62%	4%	100%	1%
1/20 (Exceedance)	67%	63%	4%	100%	1%
Total	64%	60%	4%	100%	1%

**Estimated Production Ratio with 15% Diversification**

Code	Name of Canal	Total Command Area (ha)	Summer Crop			Winter Crop		
			Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Canal C9	Bajo	142.91						
Return								
Period								
1/2			97%	83%	14%	100%	100%	0%
1/5			95%	81%	15%	100%	100%	0%
1/10			95%	80%	15%	100%	100%	0%
1/20			94%	80%	15%	100%	100%	0%
1/5 (Exceedance)			100%	86%	14%	100%	100%	0%
1/10 (Exceedance)			100%	87%	13%	100%	100%	0%
1/20 (Exceedance)			100%	88%	12%	100%	100%	0%
Total			97%	83%	14%	100%	100%	0%

**Estimated Production Ratio with 15% Diversification**

Code	Name of Canal	Total Command Area (ha)	Summer Crop			Winter Crop		
			Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Canal C10	Phangyul	90.81						
Return								
Period								
1/2			50%	40%	9%	75%	51%	24%
1/5			49%	39%	9%	73%	49%	23%
1/10			48%	39%	9%	72%	49%	23%
1/20			48%	39%	9%	71%	48%	23%
1/5 (Exceedance)			51%	41%	9%	79%	53%	26%
1/10 (Exceedance)			51%	42%	10%	82%	55%	27%
1/20 (Exceedance)			52%	42%	10%	85%	56%	28%
Total			50%	40%	9%	76%	51%	24%

### Estimated Production Ratio with Improvement of Water Management & 15% Diversification

Code		Name of Canal		Total Command Area (ha)	
Canal C9		Bajo		142.91	
Return		Summer Crop		Winter Crop	
Period	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss
1/2	97%	93%	3%	100%	0%
1/5	95%	92%	3%	100%	0%
1/10	95%	92%	3%	100%	0%
1/20	94%	91%	3%	100%	0%
1/5 (Exceedance)	100%	96%	4%	100%	0%
1/10 (Exceedance)	100%	97%	3%	100%	0%
1/20 (Exceedance)	100%	98%	2%	100%	0%
Total	97%	94%	3%	100%	0%

### Estimated Production Ratio with Improvement of Water Management & 15% Diversification

Code		Name of Canal		Total Command Area (ha)	
Canal C10		Phangyui		90.81	
Return		Summer Crop		Winter Crop	
Period	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss
1/2	50%	46%	4%	75%	4%
1/5	49%	45%	4%	73%	3%
1/10	48%	44%	4%	72%	3%
1/20	48%	44%	4%	71%	3%
1/5 (Exceedance)	51%	47%	4%	79%	4%
1/10 (Exceedance)	51%	48%	4%	82%	5%
1/20 (Exceedance)	52%	48%	4%	85%	5%
Total	50%	46%	4%	76%	4%

### Estimated Production Ratio with Improvement of Canal & 15% Diversification

Code		Name of Canal		Total Command Area (ha)			
Canal C9		Bajo		142.91			
Return	Period	Summer Crop		Winter Crop			
		Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
	1/2	100%	87%	13%	100%	100%	0%
	1/5	100%	86%	14%	100%	100%	0%
	1/10	100%	85%	15%	100%	100%	0%
	1/20	100%	84%	16%	100%	100%	0%
	1/5 (Exceedance)	100%	89%	11%	100%	100%	0%
	1/10 (Exceedance)	100%	90%	10%	100%	100%	0%
	1/20 (Exceedance)	100%	91%	9%	100%	100%	0%
	Total	100%	87%	13%	100%	100%	0%

### Estimated Production Ratio with Improvement of Canal & 15% Diversification

Code		Name of Canal		Total Command Area (ha)			
Canal C10		Phangyul		90.81			
Return	Period	Summer Crop		Winter Crop			
		Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
	1/2	65%	53%	12%	100%	77%	23%
	1/5	64%	52%	13%	99%	76%	24%
	1/10	64%	51%	13%	99%	75%	24%
	1/20	63%	50%	13%	99%	75%	24%
	1/5 (Exceedance)	67%	54%	13%	100%	79%	21%
	1/10 (Exceedance)	68%	55%	13%	100%	80%	20%
	1/20 (Exceedance)	69%	55%	14%	100%	82%	18%
	Total	65%	53%	13%	100%	77%	23%

**Estimated Production Ratio with Improvement of Water Management, Canal & 15% Diversification**

Code Canal C9	Name of Canal		Total Command Area (ha)		Summer Crop				Winter Crop				
	Bajo		142.91		Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Return													
Period													
1/2					100%	98%	2%	100%	100%	0%			
1/5					100%	97%	3%	100%	100%	0%			
1/10					100%	96%	4%	100%	100%	0%			
1/20					100%	96%	4%	100%	100%	0%			
1/5 (Exceedance)					100%	99%	1%	100%	100%	0%			
1/10 (Exceedance)					100%	99%	1%	100%	100%	0%			
1/20 (Exceedance)					100%	100%	0%	100%	100%	0%			
Total					100%	98%	2%	100%	100%	0%			

**Estimated Production Ratio with Improvement of Water Management, Canal & 15% Diversification**

Code Canal C10	Name of Canal		Total Command Area (ha)		Summer Crop				Winter Crop				
	Phangyut		90.81		Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Return													
Period													
1/2					65%	61%	4%	100%	99%	1%			
1/5					64%	60%	4%	99%	98%	1%			
1/10					64%	60%	4%	99%	98%	1%			
1/20					63%	60%	4%	99%	98%	1%			
1/5 (Exceedance)					67%	63%	4%	100%	99%	1%			
1/10 (Exceedance)					68%	64%	4%	100%	99%	1%			
1/20 (Exceedance)					69%	65%	4%	100%	100%	0%			
Total					65%	62%	4%	100%	99%	1%			

## Estimated Production Ratio with 20% Diversification

Code Canal C9	Name of Canal		Total Command Area (ha)		Summer Crop			Winter Crop		
	Bajo		142.91		Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Return Period										
1/2					99%	85%	15%	100%	100%	0%
1/5					98%	83%	15%	100%	100%	0%
1/10					97%	82%	15%	100%	100%	0%
1/20					97%	81%	15%	100%	100%	0%
1/5 (Exceedance)					100%	88%	12%	100%	100%	0%
1/10 (Exceedance)					100%	89%	11%	100%	100%	0%
1/20 (Exceedance)					100%	90%	10%	100%	100%	0%
Total					99%	85%	14%	100%	100%	0%

## Estimated Production Ratio with 20% Diversification

Code Canal C10	Name of Canal		Total Command Area (ha)		Summer Crop			Winter Crop		
	Phangyui		90.81		Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Return Period										
1/2					51%	41%	9%	75%	51%	24%
1/5					50%	40%	10%	73%	49%	23%
1/10					50%	40%	10%	72%	49%	23%
1/20					49%	40%	10%	71%	48%	23%
1/5 (Exceedance)					52%	43%	9%	79%	53%	26%
1/10 (Exceedance)					53%	43%	10%	82%	55%	27%
1/20 (Exceedance)					53%	43%	10%	84%	56%	28%
Total					51%	41%	9%	76%	51%	25%

**Estimated Production Ratio with Improvement of Water Management & 20% Diversification**

Code Canal C9	Name of Canal		Total Command Area (ha)		Summer Crop			Winter Crop		
	Bajo		142.91		Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
1/2					99%	96%	4%	100%	100%	0%
1/5					98%	94%	4%	100%	100%	0%
1/10					97%	94%	4%	100%	100%	0%
1/20					97%	93%	4%	100%	100%	0%
1/5 (Exceedance)					100%	98%	2%	100%	100%	0%
1/10 (Exceedance)					100%	99%	1%	100%	100%	0%
1/20 (Exceedance)					100%	99%	1%	100%	100%	0%
Total					99%	96%	3%	100%	100%	0%

**Estimated Production Ratio with Improvement of Water Management & 20% Diversification**

Code Canal C10	Name of Canal		Total Command Area (ha)		Summer Crop			Winter Crop		
	Phangyul		90.81		Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
1/2					51%	47%	4%	75%	71%	4%
1/5					50%	46%	4%	73%	69%	3%
1/10					50%	45%	4%	72%	69%	3%
1/20					49%	45%	4%	71%	68%	3%
1/5 (Exceedance)					52%	48%	4%	79%	75%	4%
1/10 (Exceedance)					53%	49%	4%	82%	77%	5%
1/20 (Exceedance)					53%	50%	4%	84%	80%	5%
Total					51%	47%	4%	76%	72%	4%

Case BD-4

**Estimated Production Ratio with Improvement of Canal & 20% Diversification**

Code	Name of Canal	Total Command Area (ha)	Summer Crop			Winter Crop		
			Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Canal C9	Bajo	142.91						
Return Period								
1/2			100%	93%	7%	100%	100%	0%
1/5			100%	92%	8%	100%	100%	0%
1/10			100%	91%	9%	100%	100%	0%
1/20			100%	91%	9%	100%	100%	0%
1/5 (Exceedance)			100%	94%	6%	100%	100%	0%
1/10 (Exceedance)			100%	95%	5%	100%	100%	0%
1/20 (Exceedance)			100%	96%	4%	100%	100%	0%
Total			100%	93%	7%	100%	100%	0%

**Estimated Production Ratio with Improvement of Canal & 20% Diversification**

Code	Name of Canal	Total Command Area (ha)	Summer Crop			Winter Crop		
			Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss	Management Loss
Canal C10	Phangyul	90.81						
Return Period								
1/2			67%	56%	11%	100%	77%	23%
1/5			66%	55%	11%	100%	75%	24%
1/10			65%	54%	11%	99%	75%	25%
1/20			65%	53%	12%	99%	74%	25%
1/5 (Exceedance)			69%	57%	12%	100%	79%	21%
1/10 (Exceedance)			70%	58%	12%	100%	80%	20%
1/20 (Exceedance)			71%	58%	13%	100%	82%	18%
Total			67%	56%	11%	100%	77%	23%

**Estimated Production Ratio with Improvement of Water Management, Canal & 20% Diversification**

Code		Name of Canal		Total Command Area (ha)	
Canal C9		Bajo		142.91	
Return Period	Summer Crop			Winter Crop	
	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss
1/2	100%	100%	0%	100%	0%
1/5	100%	100%	0%	100%	0%
1/10	100%	100%	0%	100%	0%
1/20	100%	100%	0%	100%	0%
1/5 (Exceedance)	100%	100%	0%	100%	0%
1/10 (Exceedance)	100%	100%	0%	100%	0%
1/20 (Exceedance)	100%	100%	0%	100%	0%
Total	100%	100%	0%	100%	0%

**Estimated Production Ratio with Improvement of Water Management, Canal & 20% Diversification**

Code		Name of Canal		Total Command Area (ha)	
Canal C10		Phangyul		90.81	
Return Period	Summer Crop			Winter Crop	
	Without Management Loss	With Management Loss	Management Loss	Without Management Loss	With Management Loss
1/2	67%	63%	4%	100%	99%
1/5	66%	62%	4%	100%	98%
1/10	65%	61%	4%	99%	98%
1/20	65%	61%	4%	99%	98%
1/5 (Exceedance)	69%	65%	4%	100%	99%
1/10 (Exceedance)	70%	66%	4%	100%	100%
1/20 (Exceedance)	71%	67%	4%	100%	100%
Total	67%	63%	4%	100%	99%

Case E-1

Code	Name of Canal		Total Command Area (ha)		Winter Crop		Summer Crop		Winter Crop		Second Paddy		Winter Crop	
	Canal C9	Bayo	142.91		Without	With	Without	With	Without	With	Without	With	Without	With
Return Period	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss
<b>Case E-1 : Estimated Production Ratio with 20% Double Cropping</b>														
1/2	95%	82%	13%	100%	100%	100%	0%	98%	92%	6%	100%	100%	0%	100%
1/5	94%	80%	14%	100%	100%	100%	0%	98%	91%	7%	100%	100%	0%	100%
1/10	94%	80%	14%	100%	100%	100%	0%	98%	91%	7%	100%	100%	0%	100%
1/20	93%	79%	14%	100%	100%	100%	0%	97%	90%	7%	100%	99%	1%	100%
1/5 (Ex.)	98%	84%	13%	100%	100%	100%	0%	99%	94%	6%	100%	100%	0%	100%
1/10 (Ex.)	99%	86%	14%	100%	100%	100%	0%	100%	94%	5%	100%	100%	0%	100%
1/20 (Ex.)	100%	87%	13%	100%	100%	100%	0%	100%	95%	5%	100%	100%	0%	100%
Total	96%	82%	14%	100%	100%	100%	0%	98%	92%	6%	100%	100%	0%	100%
<b>Case AE-1 : Estimated Production Ratio with Improvement of Water Management (20% Double Cropping)</b>														
1/2	95%	92%	3%	100%	100%	100%	0%	97%	95%	2%	100%	100%	0%	100%
1/5	94%	90%	4%	100%	100%	100%	0%	96%	94%	2%	100%	100%	0%	100%
1/10	93%	89%	4%	100%	100%	100%	0%	96%	93%	3%	100%	100%	0%	100%
1/20	93%	89%	4%	100%	100%	100%	0%	95%	93%	2%	100%	100%	0%	100%
1/5 (Ex.)	98%	94%	3%	100%	100%	100%	0%	98%	96%	2%	100%	100%	0%	100%
1/10 (Ex.)	99%	95%	4%	100%	100%	100%	0%	99%	97%	2%	100%	100%	0%	100%
1/20 (Ex.)	100%	97%	3%	100%	100%	100%	0%	100%	98%	2%	100%	100%	0%	100%
Total	96%	92%	4%	100%	100%	100%	0%	97%	95%	2%	100%	100%	0%	100%
<b>Case BE-1 : Estimated Production Ratio with 20% Double Cropping &amp; Canal Improvement</b>														
1/2	100%	87%	13%	100%	100%	100%	0%	100%	94%	6%	100%	100%	0%	100%
1/5	100%	85%	15%	100%	100%	100%	0%	100%	94%	6%	100%	100%	0%	100%
1/10	100%	85%	15%	100%	100%	100%	0%	100%	93%	7%	100%	100%	0%	100%
1/20	99%	85%	15%	100%	100%	100%	0%	100%	93%	7%	100%	100%	0%	100%
1/5 (Ex.)	100%	89%	11%	100%	100%	100%	0%	100%	96%	4%	100%	100%	0%	100%
1/10 (Ex.)	100%	90%	10%	100%	100%	100%	0%	100%	96%	4%	100%	100%	0%	100%
1/20 (Ex.)	100%	91%	9%	100%	100%	100%	0%	100%	96%	4%	100%	100%	0%	100%
Total	100%	87%	13%	100%	100%	100%	0%	100%	95%	5%	100%	100%	0%	100%
<b>Case ABE-1 : Estimated Production Ratio with Improvement of Water Management (20% Double Cropping) &amp; Canal Improvement</b>														
1/2	100%	97%	3%	100%	100%	100%	0%	100%	98%	2%	100%	100%	0%	100%
1/5	100%	96%	4%	100%	100%	100%	0%	100%	98%	2%	100%	100%	0%	100%
1/10	100%	95%	4%	100%	100%	100%	0%	100%	97%	3%	100%	100%	0%	100%
1/20	99%	95%	4%	100%	100%	100%	0%	100%	97%	3%	100%	100%	0%	100%
1/5 (Ex.)	100%	98%	2%	100%	100%	100%	0%	100%	99%	1%	100%	100%	0%	100%
1/10 (Ex.)	100%	99%	1%	100%	100%	100%	0%	100%	99%	1%	100%	100%	0%	100%
1/20 (Ex.)	100%	99%	1%	100%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%
Total	100%	97%	3%	100%	100%	100%	0%	100%	98%	2%	100%	100%	0%	100%

Code	Name of Canal		Total Command Area (ha)		Winter Crop				First Paddy				Second Paddy				Winter Crop			
	Bayo		142.91		Without	With	M.Loss	M.Loss	Without	With	M.Loss	M.Loss	Without	With	M.Loss	M.Loss	Without	With	M.Loss	M.Loss
Canal C9	Without	With	M.Loss	M.Loss	Case E-2 : Estimated Production Ratio with 40% Double Cropping															
Return	Without	With	M.Loss	M.Loss	0%	100%	0%	100%	95%	95%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
Period	M.Loss	M.Loss	M.Loss	M.Loss	Case E-2 : Estimated Production Ratio with 40% Double Cropping															
	100%	87%	13%	100%	0%	100%	0%	100%	94%	94%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	86%	14%	100%	0%	100%	0%	100%	93%	93%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	85%	15%	100%	0%	100%	0%	100%	93%	93%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	99%	85%	15%	100%	0%	100%	0%	100%	93%	93%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	89%	11%	100%	0%	100%	0%	100%	96%	96%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	90%	10%	100%	0%	100%	0%	100%	96%	96%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	91%	9%	100%	0%	100%	0%	100%	97%	97%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	87%	13%	100%	0%	100%	0%	100%	95%	95%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	Case AE-2 : Estimated Production Ratio with Improvement of Water Management (40% Double Cropping)																			
	100%	97%	3%	100%	0%	100%	0%	100%	98%	98%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	96%	4%	100%	0%	100%	0%	100%	98%	98%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	96%	4%	100%	0%	100%	0%	100%	97%	97%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	99%	95%	4%	100%	0%	100%	0%	100%	99%	99%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	99%	1%	100%	0%	100%	0%	100%	99%	99%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	99%	1%	100%	0%	100%	0%	100%	100%	100%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	99%	1%	100%	0%	100%	0%	100%	100%	100%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	97%	3%	100%	0%	100%	0%	100%	98%	98%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	Case BE-2 : Estimated Production Ratio with 40% Double Cropping & Canal Improvement																			
	100%	87%	13%	100%	0%	100%	0%	100%	95%	95%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	86%	14%	100%	0%	100%	0%	100%	94%	94%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	85%	15%	100%	0%	100%	0%	100%	93%	93%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	99%	85%	15%	100%	0%	100%	0%	100%	93%	93%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	89%	11%	100%	0%	100%	0%	100%	96%	96%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	90%	10%	100%	0%	100%	0%	100%	96%	96%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	91%	9%	100%	0%	100%	0%	100%	97%	97%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	87%	13%	100%	0%	100%	0%	100%	95%	95%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	Case ABE-2 : Estimated Production Ratio with Improvement of Water Management (40% Double Cropping) & Canal Improvement																			
	100%	97%	3%	100%	0%	100%	0%	100%	98%	98%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	96%	4%	100%	0%	100%	0%	100%	98%	98%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	96%	4%	100%	0%	100%	0%	100%	97%	97%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	99%	95%	4%	100%	0%	100%	0%	100%	99%	99%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	99%	1%	100%	0%	100%	0%	100%	99%	99%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	99%	1%	100%	0%	100%	0%	100%	100%	100%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	99%	1%	100%	0%	100%	0%	100%	100%	100%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%
	100%	97%	3%	100%	0%	100%	0%	100%	98%	98%	100%	100%	0%	100%	0%	100%	100%	100%	0%	100%

Case E-3

Code	Name of Canal		Total Command Area (ha)		Winter Crop		First Paddy		Second Paddy		Winter Crop	
	Without	With	M.Loss	M.Loss	Without	With	Without	With	Without	With	Without	With
Canal C9	Bajo		142.91									
Return Period	Without	With	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss	M.Loss
	100%	91%	9%	100%	98%	2%	100%	95%	5%	100%	100%	100%
	100%	90%	10%	100%	98%	2%	100%	94%	6%	100%	100%	100%
	100%	90%	10%	100%	98%	2%	100%	93%	7%	100%	100%	100%
	100%	89%	11%	100%	98%	2%	100%	93%	7%	100%	100%	100%
	100%	93%	7%	100%	99%	1%	100%	97%	3%	100%	100%	100%
	100%	95%	5%	100%	99%	1%	100%	98%	2%	100%	100%	100%
	100%	95%	5%	100%	99%	1%	100%	98%	2%	100%	100%	100%
	100%	92%	8%	100%	98%	2%	100%	95%	5%	100%	100%	100%
<b>Case A-E-3 : Estimated Production Ratio with Improvement of Water Management (60% Double Cropping)</b>												
	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	100%
	100%	99%	1%	100%	100%	0%	100%	100%	0%	100%	100%	100%
	100%	99%	1%	100%	100%	0%	100%	100%	0%	100%	100%	100%
	100%	99%	1%	100%	100%	0%	100%	100%	0%	100%	100%	100%
	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	100%
	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	100%
	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	100%
	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	100%
<b>Case BE-3 : Estimated Production Ratio with 60% Double Cropping &amp; Canal Improvement</b>												
	100%	87%	13%	100%	95%	5%	100%	89%	11%	100%	100%	100%
	100%	85%	15%	100%	95%	5%	100%	87%	13%	100%	99%	1%
	100%	84%	16%	100%	95%	5%	100%	87%	13%	100%	98%	2%
	99%	83%	16%	100%	95%	5%	100%	86%	13%	100%	98%	2%
	100%	89%	11%	100%	96%	4%	100%	91%	9%	100%	100%	100%
	100%	91%	9%	100%	97%	3%	100%	92%	8%	100%	100%	100%
	100%	92%	8%	100%	97%	3%	100%	94%	6%	100%	100%	100%
	100%	87%	13%	100%	95%	5%	100%	89%	11%	100%	99%	1%
<b>Case ABE-3 : Estimated Production Ratio with Improvement of Water Management (60% Double Cropping) &amp; Canal Improvement</b>												
	100%	97%	3%	100%	100%	0%	100%	98%	2%	100%	100%	100%
	100%	96%	4%	100%	100%	0%	100%	98%	2%	100%	100%	100%
	100%	96%	4%	100%	100%	0%	100%	97%	3%	100%	100%	100%
	99%	95%	4%	100%	100%	0%	100%	97%	3%	100%	100%	100%
	100%	99%	1%	100%	100%	0%	100%	99%	1%	100%	100%	100%
	100%	99%	1%	100%	100%	0%	100%	100%	0%	100%	100%	100%
	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	100%
	100%	97%	3%	100%	100%	0%	100%	98%	2%	100%	100%	100%

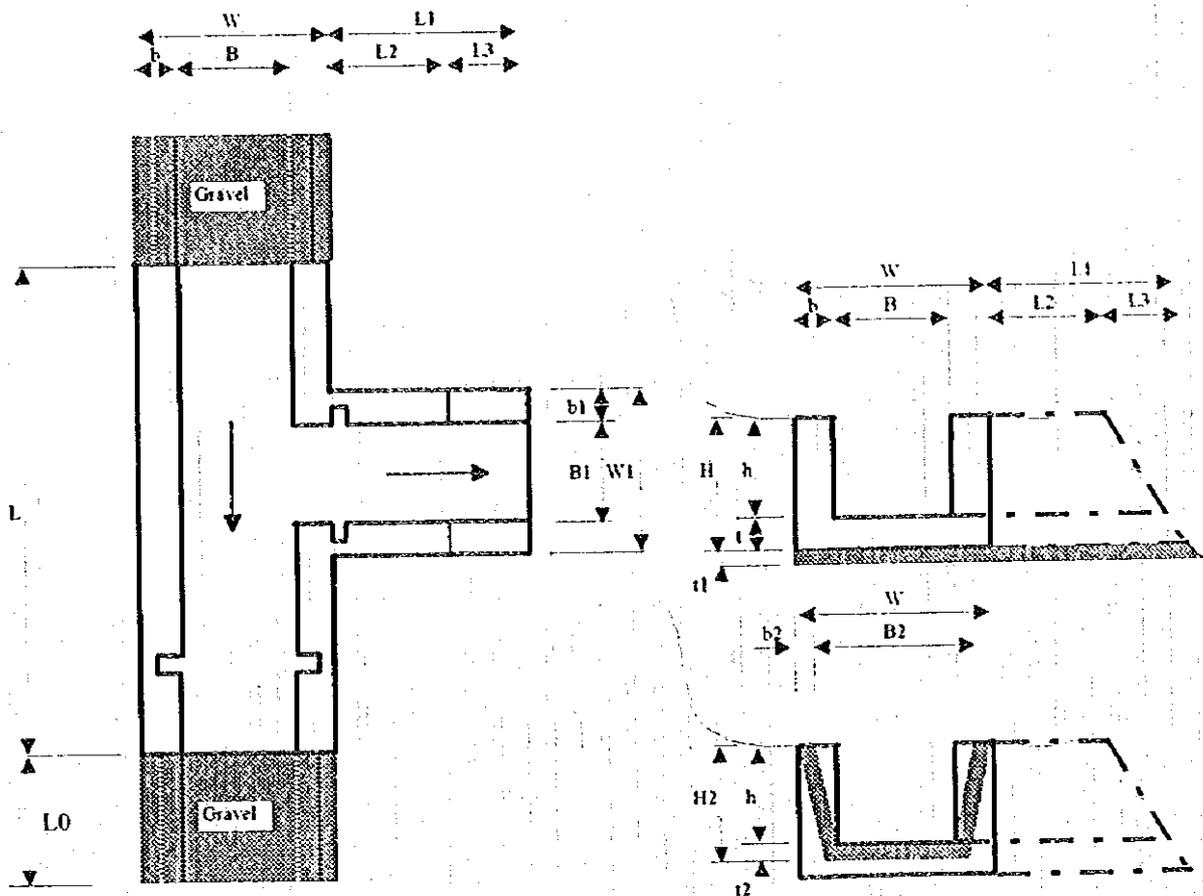
Code Canal C/	Name of Canal Bajo	Total Command Area (ha)		Summer Crop			Winter Crop			First Paddy			Second Paddy			Winter Crop				
		Without	With	M.Loss	M.Loss	M.Loss	Without	With	M.Loss	Without	With	M.Loss	Without	With	M.Loss	Without	With	M.Loss	M.Loss	
						142.91														
Case E-4 : Estimated Production Ratio with 100% Double Cropping																				
1/2		100%	98%	2%	100%	93%	7%	100%	91%	9%	100%	98%	2%	100%	100%	100%	0%	100%	100%	0%
1/5		100%	96%	4%	100%	92%	8%	100%	90%	10%	100%	98%	2%	100%	100%	100%	0%	100%	100%	0%
1/10		100%	96%	4%	100%	92%	8%	100%	90%	10%	100%	97%	3%	100%	100%	100%	0%	100%	100%	0%
1/20		100%	95%	5%	100%	92%	8%	100%	90%	10%	100%	97%	3%	100%	100%	100%	0%	100%	100%	0%
1/5 (Ex.)		100%	100%	0%	100%	94%	6%	100%	92%	8%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
1/10 (Ex.)		100%	100%	0%	100%	94%	6%	100%	93%	7%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
1/20 (Ex.)		100%	100%	0%	100%	94%	6%	100%	93%	7%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
Total		100%	98%	2%	100%	93%	7%	100%	91%	9%	100%	99%	1%	100%	100%	100%	0%	100%	100%	0%
Case AE-1 : Estimated Production Ratio with Improvement of Water Management (100% Double Cropping)																				
1/2		100%	100%	0%	100%	99%	1%	100%	98%	2%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
1/5		100%	100%	0%	100%	99%	1%	100%	98%	2%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
1/10		100%	100%	0%	100%	99%	1%	100%	98%	2%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
1/20		100%	100%	0%	100%	99%	1%	100%	97%	3%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
1/5 (Ex.)		100%	100%	0%	100%	99%	1%	100%	99%	1%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
1/10 (Ex.)		100%	100%	0%	100%	100%	0%	100%	99%	1%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
1/20 (Ex.)		100%	100%	0%	100%	100%	0%	100%	99%	1%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
Total		100%	100%	0%	100%	99%	1%	100%	98%	2%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
Case BE-1 : Estimated Production Ratio with 100% Double Cropping & Canal Improvement																				
1/2		100%	97%	3%	100%	92%	8%	100%	90%	10%	100%	98%	2%	100%	100%	100%	0%	100%	100%	0%
1/5		100%	95%	5%	100%	92%	8%	100%	89%	11%	100%	97%	3%	100%	100%	100%	0%	100%	100%	0%
1/10		100%	95%	5%	100%	91%	9%	100%	89%	11%	100%	97%	3%	100%	100%	100%	0%	100%	100%	0%
1/20		100%	94%	6%	100%	91%	9%	100%	88%	12%	100%	97%	3%	100%	100%	100%	0%	100%	100%	0%
1/5 (Ex.)		100%	99%	1%	100%	93%	7%	100%	91%	9%	100%	99%	1%	100%	100%	100%	0%	100%	100%	0%
1/10 (Ex.)		100%	100%	0%	100%	93%	7%	100%	92%	8%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
1/20 (Ex.)		100%	100%	0%	100%	94%	6%	100%	92%	8%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
Total		100%	97%	3%	100%	92%	8%	100%	90%	10%	100%	98%	2%	100%	100%	100%	0%	100%	100%	0%
Case ABE-1 : Estimated Production Ratio with Improvement of Water Management (100% Double Cropping) & Canal Improvement																				
1/2		100%	100%	0%	100%	99%	1%	100%	97%	3%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
1/5		100%	100%	0%	100%	98%	2%	100%	97%	3%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
1/10		100%	100%	0%	100%	98%	2%	100%	97%	3%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
1/20		100%	100%	0%	100%	98%	2%	100%	96%	3%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
1/5 (Ex.)		100%	100%	0%	100%	99%	1%	100%	98%	2%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
1/10 (Ex.)		100%	100%	0%	100%	99%	1%	100%	99%	1%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
1/20 (Ex.)		100%	100%	0%	100%	100%	0%	100%	99%	1%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%
Total		100%	100%	0%	100%	99%	1%	100%	97%	3%	100%	100%	0%	100%	100%	100%	0%	100%	100%	0%

### 3. PRELIMINARY DESIGN OF IRRIGATION FACILITIES

1950



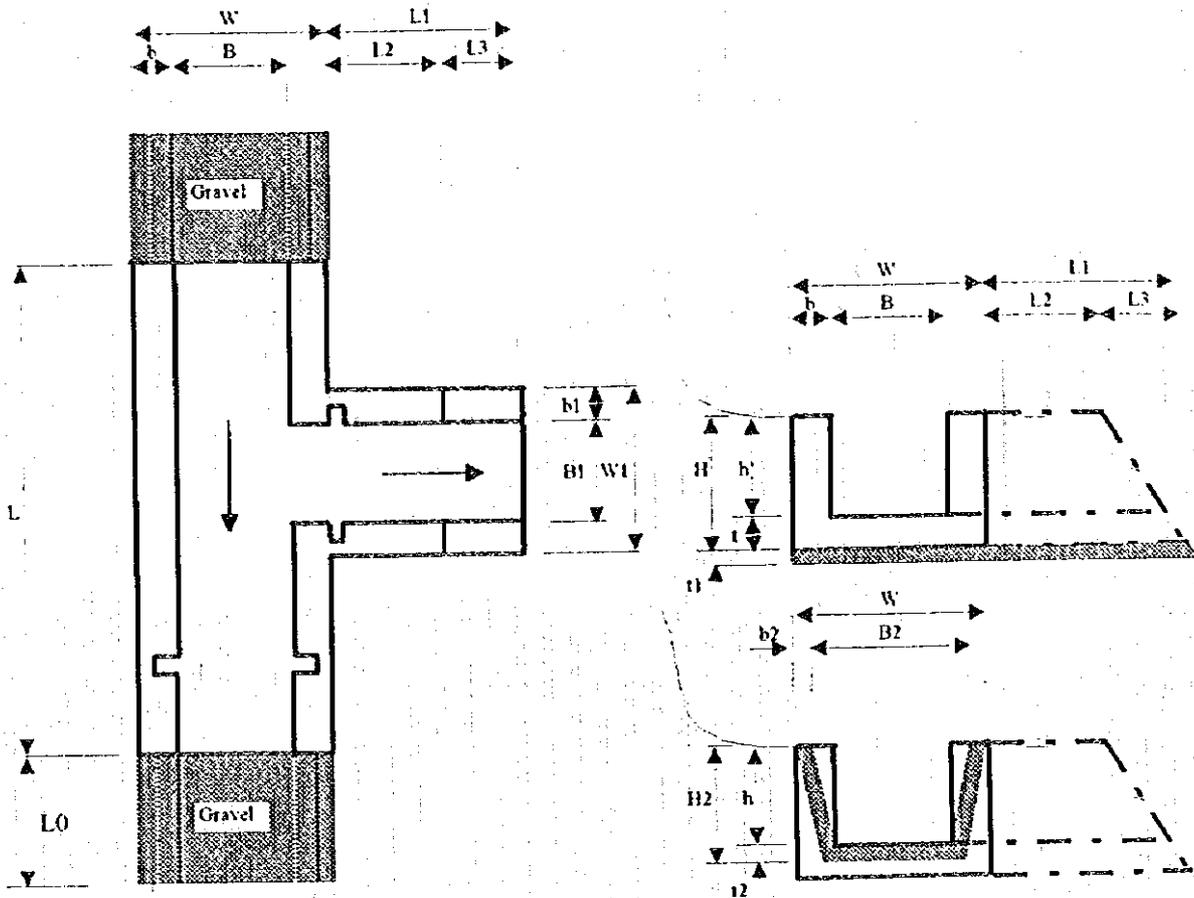
# (1) Typical Structure of Offtake Works and Dimensions



Dimensions of Diversion Works (m)

Type	L	L0	L1	L2	L3	W	W1	B	B1	B2	Canal Capacity Q (m <sup>3</sup> /s)	Remark
Type O1	3.40	0.40	3.00	2.00	1.00	2.40	2.40	1.80	1.80	2.10	0.80 ~ 1.00	
	b	b1	b2	H	H2	h	t	t1	t2			
	0.30	0.30	0.15	1.50	1.35	1.20	0.30	0.30	0.15			
Type O2	3.10	0.40	3.00	2.00	1.00	2.10	2.10	1.50	1.50	1.80	0.50 ~ 0.80	
	b	b1	b2	H	H2	h	t	t1	t2			
	0.30	0.30	0.15	1.40	1.25	1.10	0.30	0.30	0.15			
Type O3	2.80	0.40	3.00	2.00	1.00	1.80	1.80	1.20	1.20	1.50	0.30 ~ 0.50	
	b	b1	b2	H	H2	h	t	t1	t2			
	0.30	0.30	0.15	1.20	1.05	0.90	0.30	0.30	0.15			
Type O4	2.60	0.40	3.00	2.00	1.00	1.60	1.60	1.00	1.00	1.30	0.20 ~ 0.30	
	b	b1	b2	H	H2	h	t	t1	t2			
	0.30	0.30	0.15	1.00	0.85	0.70	0.30	0.30	0.15			
Type O5	2.40	0.40	3.00	2.00	1.00	1.40	1.40	0.80	0.80	1.10	0.10 ~ 0.20	
	b	b1	b2	H	H2	h	t	t1	t2			
	0.30	0.30	0.15	0.90	0.75	0.60	0.30	0.30	0.15			

# (1) Typical Structure of Offtake Works and Dimensions



Dimensions of Diversion Works (m)

Type	L	L <sub>0</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	W	W <sub>1</sub>	B	B <sub>1</sub>	B <sub>2</sub>	Canal Capacity Q (m <sup>3</sup> /s)	Remark
Type O6	2.20	0.40	3.00	2.00	1.00	1.20	1.20	0.60	0.60	1.00	0.05 ~ 0.10	
	b	b <sub>1</sub>	b <sub>2</sub>	H	H <sub>2</sub>	h	t	t <sub>1</sub>	t <sub>2</sub>			
	0.30	0.30	0.10	0.80	0.60	0.50	0.30	0.30	0.10			
Type O7	1.90	0.40	3.00	2.00	1.00	0.90	0.90	0.50	0.50	0.70	0.03 ~ 0.05	
	b	b <sub>1</sub>	b <sub>2</sub>	H	H <sub>2</sub>	h	t	t <sub>1</sub>	t <sub>2</sub>			
	0.20	0.20	0.10	0.70	0.50	0.40	0.30	0.30	0.10			
Type O8	1.80	0.40	3.00	2.00	1.00	0.80	0.80	0.40	0.40	0.60	0.00 ~ 0.03	
	b	b <sub>1</sub>	b <sub>2</sub>	H	H <sub>2</sub>	h	t	t <sub>1</sub>	t <sub>2</sub>			
	0.20	0.20	0.10	0.60	0.40	0.30	0.30	0.30	0.10			

### BQ of Offtake Works (1/4)

Offtake Works Type O1 Q=0.8 ~ 1.0 m <sup>3</sup> /s									
Dimensions									
L	L0	L1	L2	L3	W	W1	B	B1	B2
3.4	0.4	3.0	2.0	1.0	2.4	2.4	1.8	1.8	2.1
b	b1	b2	H	H2	h	t	t1	t2	
0.3	0.3	0.2	1.5	1.4	1.2	0.3	0.3	0.2	
Item	Unit	Quantity	Equations						
Excavation	m <sup>3</sup>	14.688	W*L*(H-t1)						
	m <sup>3</sup>	-7.344	-B*L*h						
	m <sup>3</sup>	10.800	W1*(L2-L3 2)*(H-t1)						
	m <sup>3</sup>	0.378	(B*t2-b2*H2)*L0*2						
	<b>Total</b>	<b>m<sup>3</sup></b>	<b>18.522</b>						
Masonry	m <sup>3</sup>	4.896	(W*H-B*h)*L						
	m <sup>3</sup>	2.160	W1*t*L1						
	m <sup>3</sup>	1.800	(L1-L2) 2*h*b1*2						
	<b>Total</b>	<b>m<sup>3</sup></b>	<b>8.856</b>						
Gravel	m <sup>3</sup>	4.608	(W*L-W1*L1)*t1						
	m <sup>3</sup>	0.378	(B*t2-b2*H2)*L0*2						
	<b>Total</b>	<b>m<sup>3</sup></b>	<b>4.986</b>						
Gravel Surfacing	m <sup>2</sup>	1.440	B*L0*2						
	m <sup>2</sup>	1.935	((B2-B) 2)-h <sup>2</sup> )*L0*4						
	m <sup>2</sup>	0.240	b2*L0*4						
	<b>Total</b>	<b>m<sup>2</sup></b>	<b>3.615</b>						
Wooden Board	m <sup>2</sup>	4.560	((B-.1)-(B1-.1))*h						

Offtake Works Type O2 Q=0.5 ~ 0.8 m <sup>3</sup> /s									
Dimensions									
L	L0	L1	L2	L3	W	W1	B	B1	B2
3.1	0.4	3.0	2.0	1.0	2.1	2.1	1.5	1.5	1.8
b	b1	b2	H	H2	h	t	t1	t2	
0.3	0.3	0.2	1.4	1.3	1.1	0.3	0.3	0.2	
Item	Unit	Quantity	Equations						
Excavation	m <sup>3</sup>	11.067	W*L*(H-t1)						
	m <sup>3</sup>	-5.115	-B*L*h						
	m <sup>3</sup>	8.925	W1*(L2-L3 2)*(H-t1)						
	m <sup>3</sup>	0.330	(B*t2-b2*H2)*L0*2						
	<b>Total</b>	<b>m<sup>3</sup></b>	<b>15.207</b>						
Masonry	m <sup>3</sup>	3.999	(W*H-B*h)*L						
	m <sup>3</sup>	1.890	W1*t*L1						
	m <sup>3</sup>	1.650	(L1-L2) 2*h*b1*2						
	<b>Total</b>	<b>m<sup>3</sup></b>	<b>7.539</b>						
Gravel	m <sup>3</sup>	3.843	(W*L-W1*L1)*t1						
	m <sup>3</sup>	0.330	(B*t2-b2*H2)*L0*2						
	<b>Total</b>	<b>m<sup>3</sup></b>	<b>4.173</b>						
Gravel Surfacing	m <sup>2</sup>	1.200	B*L0*2						
	m <sup>2</sup>	1.776	((B2-B) 2)-h <sup>2</sup> )*L0*4						
	m <sup>2</sup>	0.240	b2*L0*4						
	<b>Total</b>	<b>m<sup>2</sup></b>	<b>3.216</b>						
Wooden Board	m <sup>2</sup>	3.520	((B-.1)-(B1-.1))*h						

### BQ of Offtake Works (2/4)

Offtake Works Type O3 Q=0.3 ~ 0.5 m3/s									
Dimensions									
L	L0	L1	L2	L3	W	W1	B	B1	B2
2.8	0.4	3.0	2.0	1.0	1.8	1.8	1.2	1.2	1.5
b	b1	b2	H	H2	h	t	t1	t2	0.0
0.3	0.3	0.2	1.2	1.1	0.9	0.3	0.3	0.2	0.0
Item	Unit	Quantity	Equations						
Excavation	m <sup>3</sup>	7.560	W*L*(H-t1)						
	m <sup>3</sup>	-3.024	-B*L*h						
	m <sup>3</sup>	6.750	W1*(L2-L3 2)*(H-t1)						
	m <sup>3</sup>	0.270	(B*t2-b2*H2)*L0*2						
Total	m <sup>3</sup>	11.556							
Masonry	m <sup>3</sup>	3.024	(W*H-B*h)*L						
	m <sup>3</sup>	1.620	W1*t*L1						
	m <sup>3</sup>	1.350	(L1-L2) 2*h*b1*2						
Total	m <sup>3</sup>	5.994							
Gravel	m <sup>3</sup>	3.132	(W*L-W1*L1)*t1						
	m <sup>3</sup>	0.270	(B*t2-b2*H2)*L0*2						
	Total	m <sup>3</sup>	3.402						
Gravel Surfacing	m <sup>2</sup>	0.960	B*L0*2						
	m <sup>2</sup>	1.460	((B2-B) 2) <sup>2</sup> -h <sup>2</sup> )*L0*4						
	m <sup>2</sup>	0.240	b2*L0*4						
	Total	m <sup>2</sup>	2.660						
Wooden Board	m <sup>2</sup>	2.340	((B-.1)-(B1-.1))*h						

Offtake Works Type O4 Q=0.2 ~ 0.3 m3/s									
Dimensions									
L	L0	L1	L2	L3	W	W1	B	B1	B2
2.6	0.4	3.0	2.0	1.0	1.6	1.6	1.0	1.0	1.3
b	b1	b2	H	H2	h	t	t1	t2	
0.3	0.3	0.2	1.0	0.9	0.7	0.3	0.3	0.2	
Item	Unit	Quantity	Equations						
Excavation	m <sup>3</sup>	5.408	W*L*(H-t1)						
	m <sup>3</sup>	-1.820	-B*L*h						
	m <sup>3</sup>	5.200	W1*(L2-L3 2)*(H-t1)						
	m <sup>3</sup>	0.222	(B*t2-b2*H2)*L0*2						
Total	m <sup>3</sup>	9.010							
Masonry	m <sup>3</sup>	2.340	(W*H-B*h)*L						
	m <sup>3</sup>	1.440	W1*t*L1						
	m <sup>3</sup>	1.050	(L1-L2) 2*h*b1*2						
Total	m <sup>3</sup>	4.830							
Gravel	m <sup>3</sup>	2.688	(W*L-W1*L1)*t1						
	m <sup>3</sup>	0.222	(B*t2-b2*H2)*L0*2						
	Total	m <sup>3</sup>	2.910						
Gravel Surfacing	m <sup>2</sup>	0.800	B*L0*2						
	m <sup>2</sup>	1.145	((B2-B) 2) <sup>2</sup> -h <sup>2</sup> )*L0*4						
	m <sup>2</sup>	0.240	b2*L0*4						
	Total	m <sup>2</sup>	2.185						
Wooden Board	m <sup>2</sup>	1.540	((B-.1)-(B1+.1))*h						

### BQ of Offtake Works (3/4)

Offtake Works Type O5 Q=0.1 ~ 0.2 m3/s									
Dimensions									
L	L0	L1	L2	L3	W	W1	B	B1	B2
2.4	0.4	3.0	2.0	1.0	1.4	1.4	0.8	0.8	1.1
b	b1	b2	H	H2	h	t	t1	t2	
0.3	0.3	0.2	0.9	0.8	0.6	0.3	0.3	0.2	
Item	Unit	Quantity	Equations						
Excavation	m <sup>3</sup>	4.032	W*L*(H-t1)						
	m <sup>3</sup>	-1.152	-B*L*h						
	m <sup>3</sup>	4.200	W1*(L2-L3 2)*(H-t1)						
	m <sup>3</sup>	0.186	(B*t2-b2*H2)*L0*2						
Total	m <sup>3</sup>	7.266							
Masonry	m <sup>3</sup>	1.872	(W*H-B*h)*L						
	m <sup>3</sup>	1.260	W1*t*L1						
	m <sup>3</sup>	0.900	(L1-L2) 2*h*b1*2						
Total	m <sup>3</sup>	4.032							
Gravel	m <sup>3</sup>	2.268	(W*L-W1*L1)*t1						
	m <sup>3</sup>	0.186	(B*t2-b2*H2)*L0*2						
Total	m <sup>3</sup>	2.454							
Gravel Surfacing	m <sup>2</sup>	0.640	B*L0*2						
	m <sup>2</sup>	0.990	((B2-B) 2) <sup>2</sup> -h <sup>2</sup> ) <sup>0.5</sup> *L0*4						
	m <sup>2</sup>	0.240	b2*L0*4						
Total	m <sup>2</sup>	1.870							
Wooden Board	m <sup>2</sup>	1.080	((B-.1)-(B1-.1))*h						

Offtake Works Type O6 Q=0.05 ~ 0.1 m3/s									
Dimensions									
L	L0	L1	L2	L3	W	W1	B	B1	B2
2.2	0.4	3.0	2.0	1.0	1.2	1.2	0.6	0.6	1.0
b	b1	b2	H	H2	h	t	t1	t2	
0.3	0.3	0.1	0.8	0.6	0.5	0.3	0.3	0.1	
Item	Unit	Quantity	Equations						
Excavation	m <sup>3</sup>	2.904	W*L*(H-t1)						
	m <sup>3</sup>	-0.660	-B*L*h						
	m <sup>3</sup>	3.300	W1*(L2-L3 2)*(H-t1)						
	m <sup>3</sup>	0.096	(B*t2-b2*H2)*L0*2						
Total	m <sup>3</sup>	5.640							
Masonry	m <sup>3</sup>	1.452	(W*H-B*h)*L						
	m <sup>3</sup>	1.080	W1*t*L1						
	m <sup>3</sup>	0.750	(L1-L2) 2*h*b1*2						
Total	m <sup>3</sup>	3.282							
Gravel	m <sup>3</sup>	1.872	(W*L-W1*L1)*t1						
	m <sup>3</sup>	0.096	(B*t2-b2*H2)*L0*2						
Total	m <sup>3</sup>	1.968							
Gravel Surfacing	m <sup>2</sup>	0.480	B*L0*2						
	m <sup>2</sup>	0.862	((B2-B) 2) <sup>2</sup> -h <sup>2</sup> ) <sup>0.5</sup> *L0*4						
	m <sup>2</sup>	0.160	b2*L0*4						
Total	m <sup>2</sup>	1.502							
Wooden Board	m <sup>2</sup>	0.700	((B-.1)*(B1+.1))*h						

### BQ of Offtake Works (4/4)

Offtake Works Type O7 Q=0.03 ~ 0.05 m3/s									
Dimensions									
L	L0	L1	L2	L3	W	W1	B	B1	B2
1.9	0.4	3.0	2.0	1.0	0.9	0.9	0.5	0.5	0.7
b	b1	b2	H	H2	h	t	t1	t2	
0.2	0.2	0.1	0.7	0.5	0.4	0.3	0.3	0.1	
Item	Unit	Quantity	Equations						
Excavation	m <sup>3</sup>	1.710	W*L*(H-t1)						
	m <sup>3</sup>	-0.380	-B*L*h						
	m <sup>3</sup>	2.250	W1*(L2-L3 2)*(H-t1)						
	m <sup>3</sup>	0.080	(B*t2-b2*H2)*L0*2						
	Total	m <sup>3</sup>	3.660						
Masonry	m <sup>3</sup>	0.817	(W*H-B*h)*L						
	m <sup>3</sup>	0.810	W1*t*L1						
	m <sup>3</sup>	0.400	(L1-L2) 2*h*b1*2						
	Total	m <sup>3</sup>	2.027						
Gravel	m <sup>3</sup>	1.323	(W*L-W1*L1)*t1						
	m <sup>3</sup>	0.080	(B*t2-b2*H2)*L0*2						
	Total	m <sup>3</sup>	1.403						
Gravel Surfacing	m <sup>2</sup>	0.400	B*L0*2						
	m <sup>2</sup>	0.660	((B2-B) 2) <sup>2</sup> +h <sup>2</sup> ) <sup>0.5</sup> *L0*4						
	m <sup>2</sup>	0.160	b2*L0*4						
	Total	m <sup>2</sup>	1.220						
Wooden Board	m <sup>2</sup>	0.480	((B-.1)-(B1-.1))*h						

Offtake Works Type O8 Q=0.00 ~ 0.03 m3/s									
Dimensions									
L	L0	L1	L2	L3	W	W1	B	B1	B2
1.8	0.4	3.0	2.0	1.0	0.8	0.8	0.4	0.4	0.6
b	b1	b2	H	H2	h	t	t1	t2	
0.2	0.2	0.1	0.6	0.4	0.3	0.3	0.3	0.1	
Item	Unit	Quantity	Equations						
Excavation	m <sup>3</sup>	1.296	W*L*(H-t1)						
	m <sup>3</sup>	-0.216	-B*L*h						
	m <sup>3</sup>	1.800	W1*(L2-L3 2)*(H-t1)						
	m <sup>3</sup>	0.064	(B*t2-b2*H2)*L0*2						
	Total	m <sup>3</sup>	2.944						
Masonry	m <sup>3</sup>	0.648	(W*H-B*h)*L						
	m <sup>3</sup>	0.720	W1*t*L1						
	m <sup>3</sup>	0.300	(L1-L2) 2*h*b1*2						
	Total	m <sup>3</sup>	1.668						
Gravel	m <sup>3</sup>	1.152	(W*L-W1*L1)*t1						
	m <sup>3</sup>	0.064	(B*t2-b2*H2)*L0*2						
	Total	m <sup>3</sup>	1.216						
Gravel Surfacing	m <sup>2</sup>	0.320	B*L0*2						
	m <sup>2</sup>	0.506	((B2-B) 2) <sup>2</sup> +h <sup>2</sup> ) <sup>0.5</sup> *L0*4						
	m <sup>2</sup>	0.160	b2*L0*4						
	Total	m <sup>2</sup>	0.986						
Wooden Board	m <sup>2</sup>	0.300	((B-.1)-(B1-.1))*h						

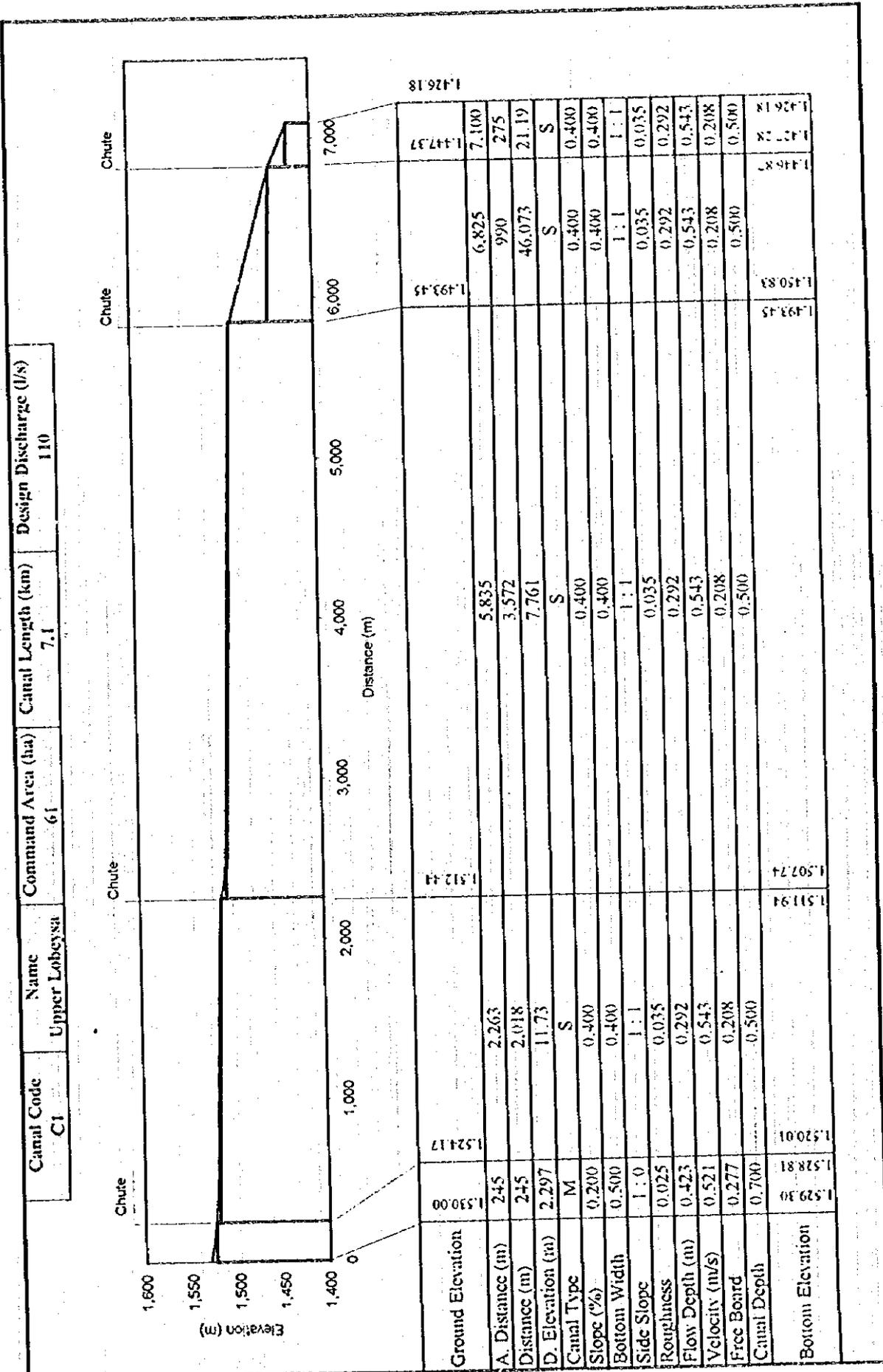
**Cost Estimation of Offtake Works (1/2, unit : Nu.)**

Offtake Works Type O1 Q=0.8 ~ 1.0 m3/s					
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	18.522	30.61	567	E-1
Masonry	m3	8.856	917.08	8,122	C-6
Gravel	m3	4.986	206.60	1,030	E-9
Gravel Surfacing	m2	3.615	367.96	1,330	E-8
Wooden Board	m2	4.560	231.33	1,055	T-1
Others	L.S			2,421	
Transportation	L.S			2,179	
<b>Total</b>				<b>16,703</b>	
Offtake Works Type O2 Q=0.5 ~ 0.8 m3/s					
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	15.207	30.61	465	
Masonry	m3	7.539	917.08	6,914	
Gravel	m3	4.173	206.60	862	
Gravel Surfacing	m2	3.216	367.96	1,183	
Wooden Board	m2	3.520	231.33	814	
Others	L.S			2,048	
Transportation	L.S			1,843	
<b>Total</b>				<b>14,130</b>	
Offtake Works Type O3 Q=0.3 ~ 0.5 m3/s					
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	11.556	30.61	354	
Masonry	m3	5.994	917.08	5,497	
Gravel	m3	3.402	206.60	703	
Gravel Surfacing	m2	2.660	367.96	979	
Wooden Board	m2	2.340	231.33	541	
Others	L.S			1,615	
Transportation	L.S			4,844	
<b>Total</b>				<b>14,532</b>	
Offtake Works Type O4 Q=0.2 ~ 0.3 m3/s					
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	9.010	30.61	276	
Masonry	m3	4.830	917.08	4,429	
Gravel	m3	2.910	206.60	601	
Gravel Surfacing	m2	2.185	367.96	804	
Wooden Board	m2	1.540	231.33	356	
Others	L.S			1,293	
Transportation	L.S			1,164	
<b>Total</b>				<b>8,924</b>	

**Cost Estimation of Offtake Works (2/2, unit : Nu.)**

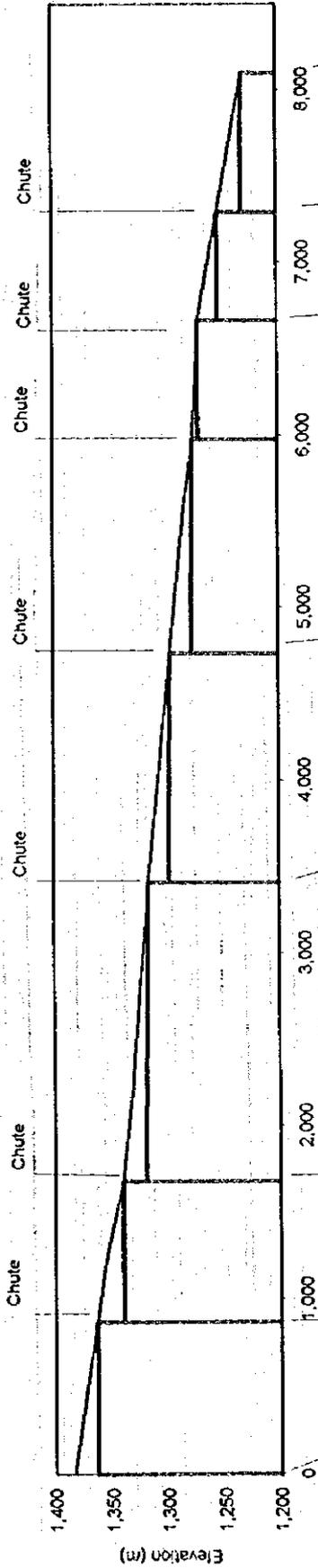
Offtake Works Type O5 Q=0.1 ~ 0.2 m3/s					
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	7.266	30.61	222	
Masonry	m3	4.032	917.08	3,698	
Gravel	m3	2.454	206.60	507	
Gravel Surfacing	m2	1.870	367.96	688	
Wooden Board	m2	1.080	231.33	250	
Others	L.S			1,073	
Transportation	L.S			966	
<b>Total</b>				<b>7,403</b>	
Offtake Works Type O6 Q=0.05 ~ 0.1 m3/s					
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	5.640	30.61	173	
Masonry	m3	3.282	917.08	3,010	
Gravel	m3	1.968	206.60	407	
Gravel Surfacing	m2	1.502	367.96	553	
Wooden Board	m2	0.700	231.33	162	
Others	L.S			861	
Transportation	L.S			775	
<b>Total</b>				<b>5,939</b>	
Offtake Works Type O7 Q=0.03 ~ 0.05 m3/s					
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	3.660	30.61	112	
Masonry	m3	2.027	917.08	1,859	
Gravel	m3	1.403	206.60	290	
Gravel Surfacing	m2	1.220	367.96	449	
Wooden Board	m2	0.480	231.33	111	
Others	L.S			564	
Transportation	L.S			508	
<b>Total</b>				<b>3,893</b>	
Offtake Works Type O8 Q=0.00 ~ 0.03 m3/s					
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	2.944	30.61	90	
Masonry	m3	1.668	917.08	1,530	
Gravel	m3	1.216	206.60	251	
Gravel Surfacing	m2	0.986	367.96	363	
Wooden Board	m2	0.300	231.33	69	
Others	L.S			461	
Transportation	L.S			415	
<b>Total</b>				<b>3,178</b>	

(2) Preliminary Canal Improvement Plan (1/10)



(2) Preliminary Canal Improvement Plan (2/10)

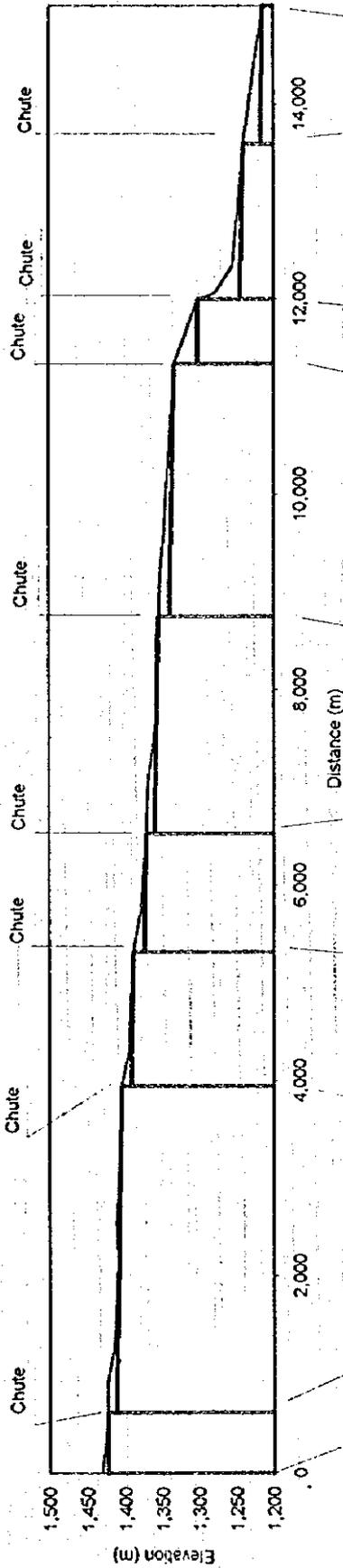
Canal Code C2	Name Lower Lobeyva	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 540
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	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000
Ground Elevation	1,384.00	1,399.88	1,315.36	1,295.08	1,276.76	1,274.69	1,269.42	1,253.48
A. Distance (m)	871	1,676	3,411	4,736	5,976	6,666	7,291	8,100
Distance (m)	871	805	1,735	1,325	1,240	690	625	809
D. Elevation (m)	20.51	23.62	23.51	20.28	20.39	5.17	17.05	22.07
Canal Type	M	M	S	S	S	M	M	M
Slope (%)	0.100	0.100	0.167	0.167	0.167	0.100	0.100	0.100
Bottom Width	1,000	1,000	0.500	0.500	0.500	1,000	1,000	1,000
Side Slope	1:0	1:0	1:1	1:1	1:1	1:0	1:0	1:0
Roughness	0.025	0.025	0.035	0.035	0.035	0.025	0.025	0.025
Flow Depth (m)	0.908	0.908	0.743	0.743	0.743	0.908	0.908	0.908
Velocity (m/s)	0.595	0.595	0.585	0.585	0.585	0.595	0.595	0.595
Free Board	0.192	0.192	0.257	0.257	0.257	0.192	0.192	0.192
Canal Depth	1,100	1,100	1,000	1,000	1,000	1,100	1,100	1,100
Bottom Elevation	1,382.03	1,338.78	1,318.25	1,297.29	1,276.76	1,274.69	1,269.42	1,253.48

(2) Preliminary Canal Improvement Plan (3/10)

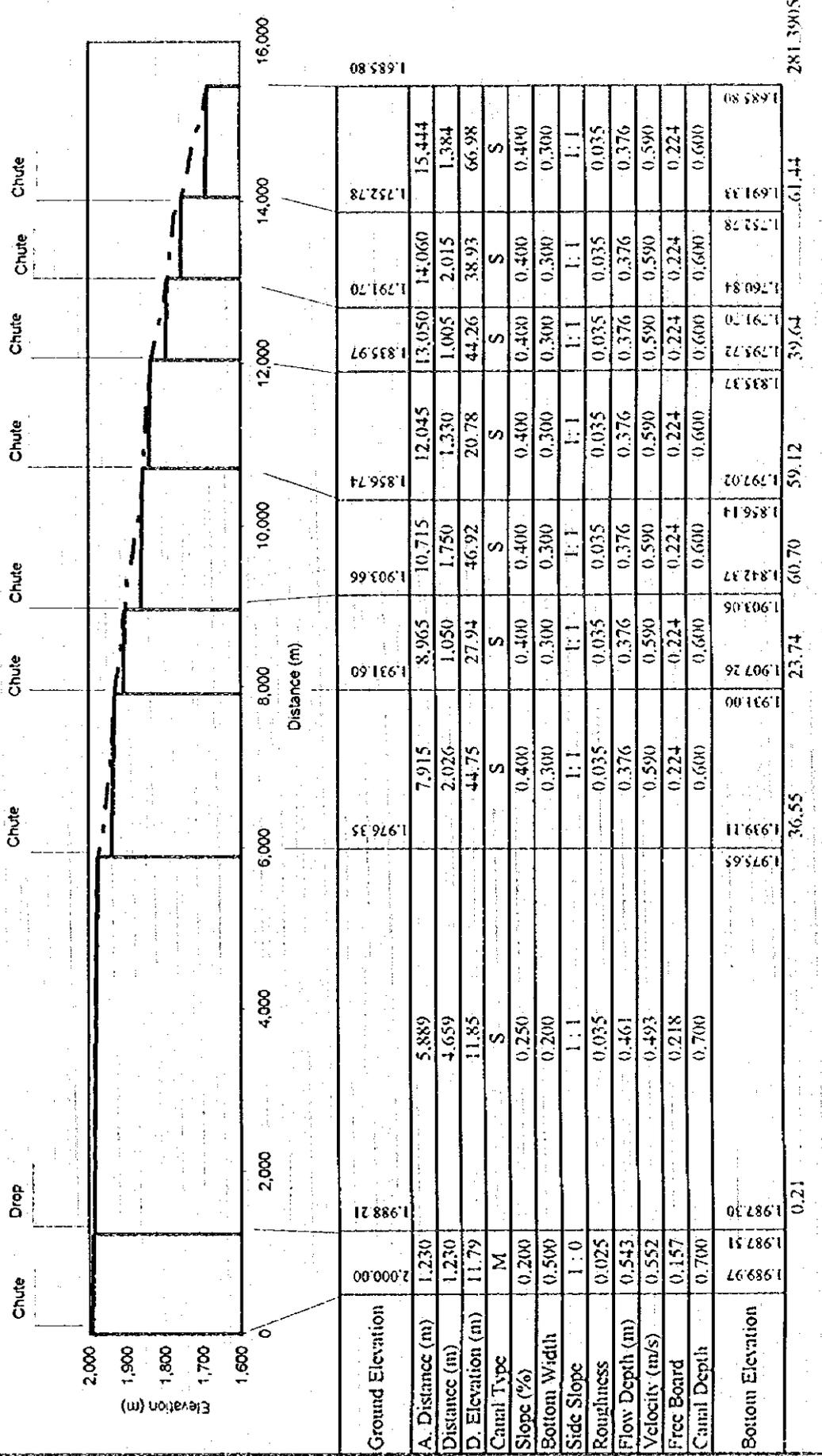
Canal Code	Name	Command Area (ha)	Canal Length (km)	Design Discharge (l/s)
C9	Bajo Canal	143	15	260



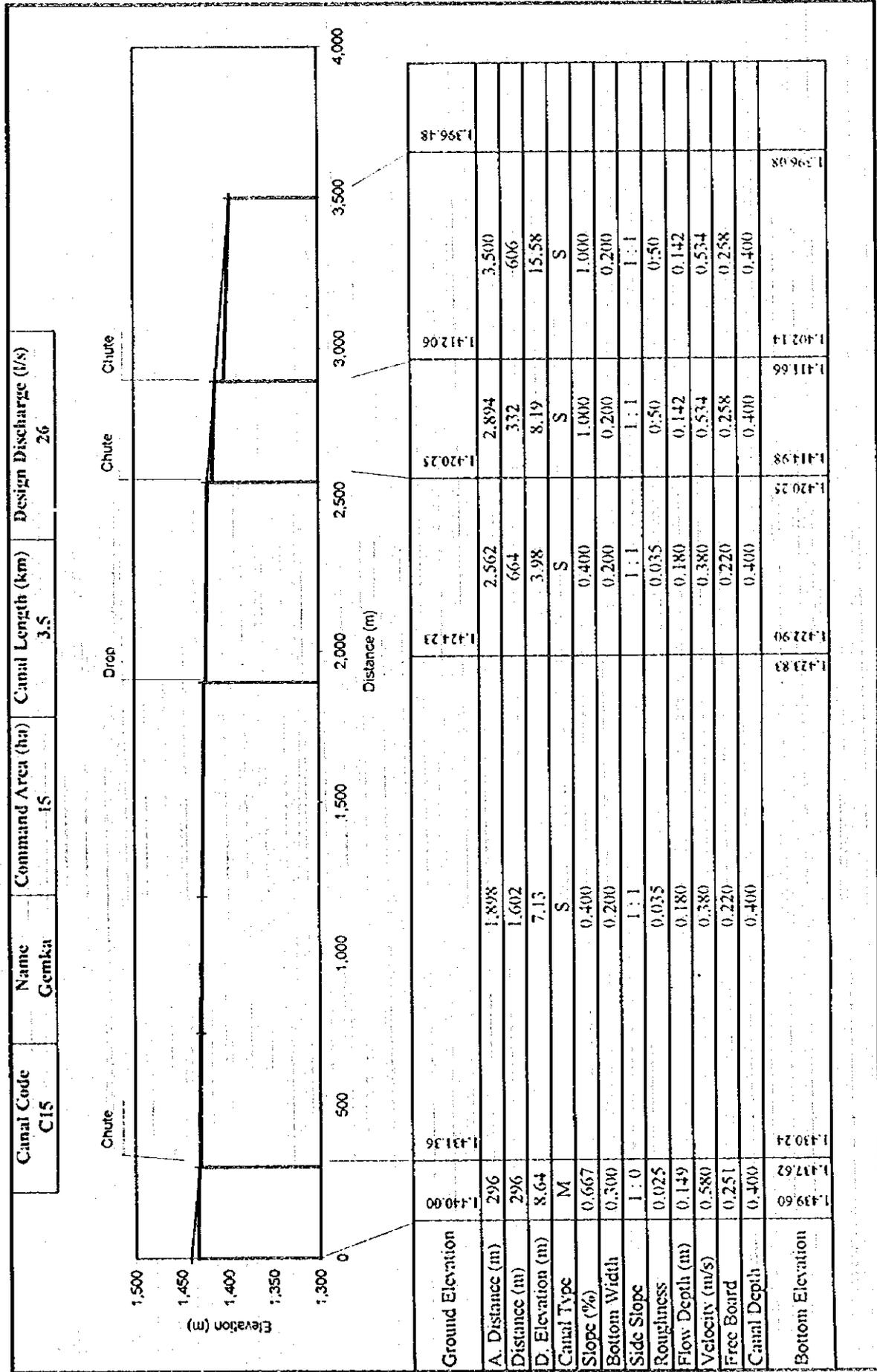
Ground Elevation	1,431.58	1,423.22	1,404.03	1,388.59	1,370.27	1,354.43	1,333.38	1,301.78	1,240.88	1,214.04
A. Distance (m)	614	3,947	5,316	6,531	8,757	11,337	11,997	13,592	15,000	
Distance (m)	614	3,333	1,369	1,215	2,226	2,580	660	1,595	1,408	
D. Elevation (m)	8.34	19.19	15.44	7.761	16	21.05	31.60	60.91	26.83	
Canal Type	M	S	S	S	S	S	S	S	S	S
Slope (%)	0.143	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	
Bottom Width	0.800	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	
Side Slope	1:0	1:1	1:1	1:1	1:1	1:1	1:1	1:1	1:1	
Roughness	0.025	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	
Flow Depth (m)	0.566	0.472	0.472	0.472	0.472	0.472	0.472	0.472	0.472	
Velocity (m/s)	0.575	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.567	
Free Board	0.231	0.228	0.228	0.228	0.228	0.228	0.228	0.228	0.228	
Canal Depth	0.800	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	
Bottom Elevation	1,430.76	1,411.66	1,391.31	1,373.10	1,359.99	1,354.43	1,333.38	1,301.78	1,240.18	1,214.04
		18.22	12.02	14.78	10.07	14.60	29.95	57.62	22.61	179.9

(2) Preliminary Canal Improvement Plan (4/10)

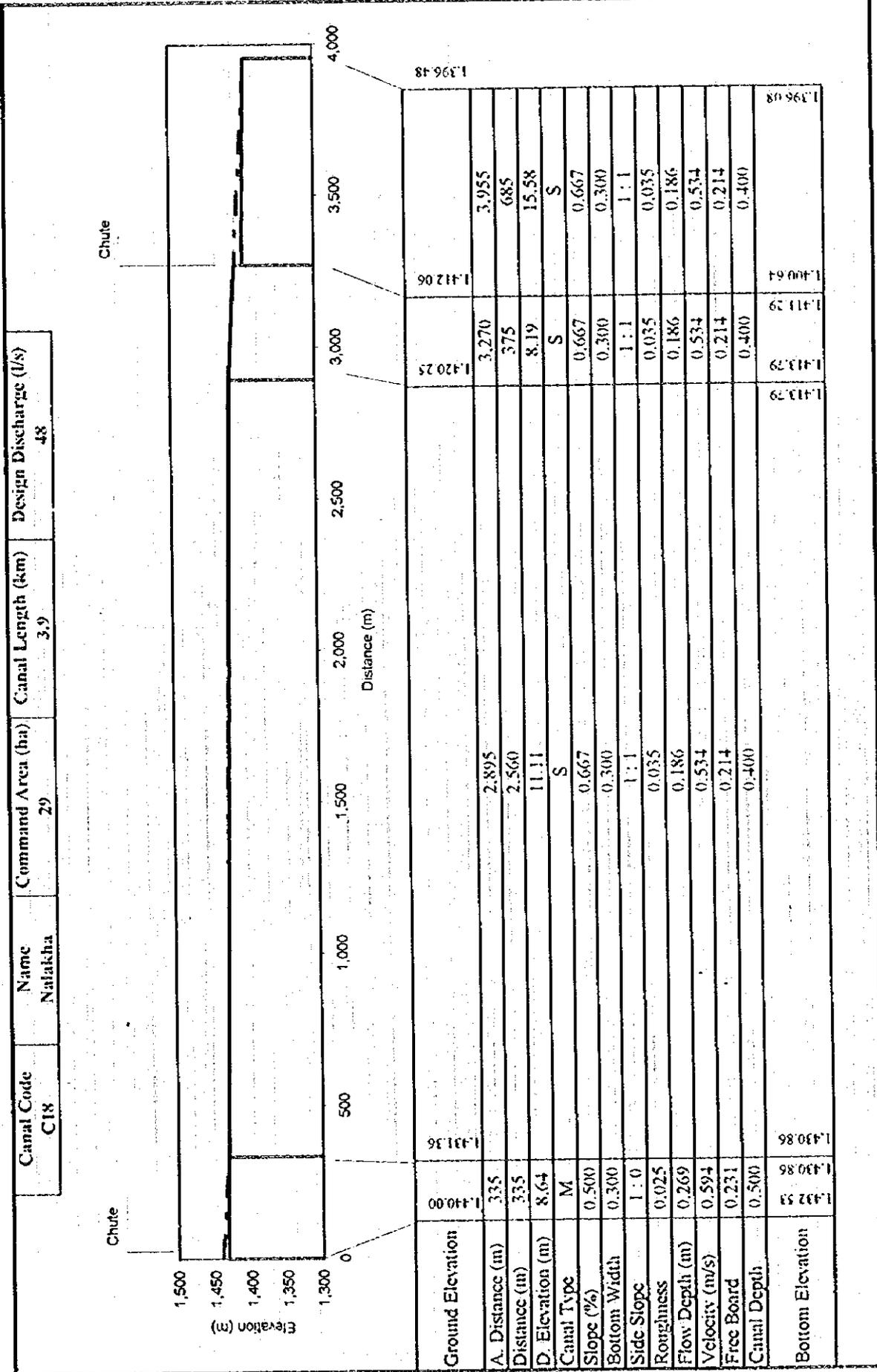
Canal Code C10	Name Phangul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 150
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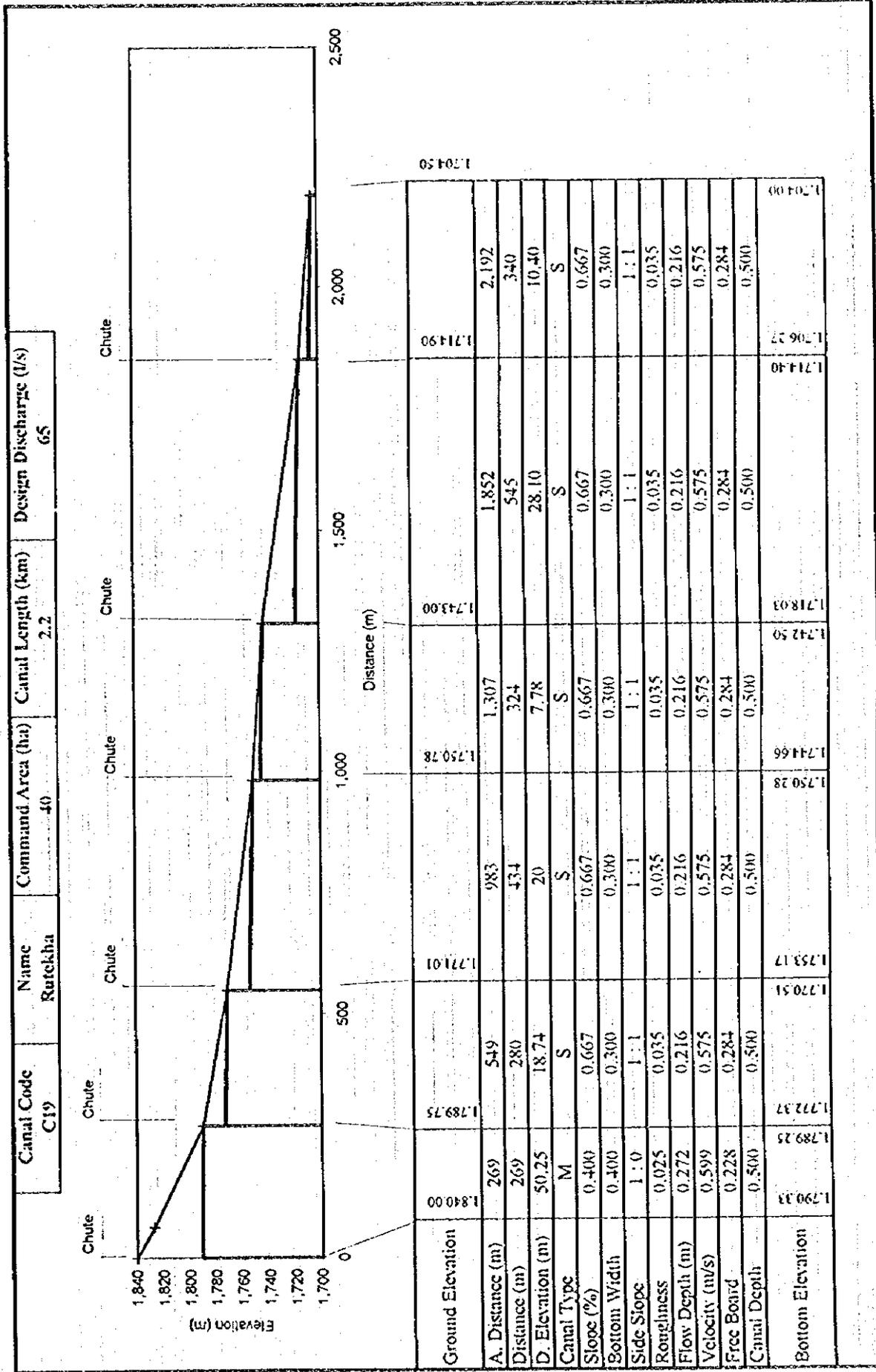
(2) Preliminary Canal Improvement Plan (5)



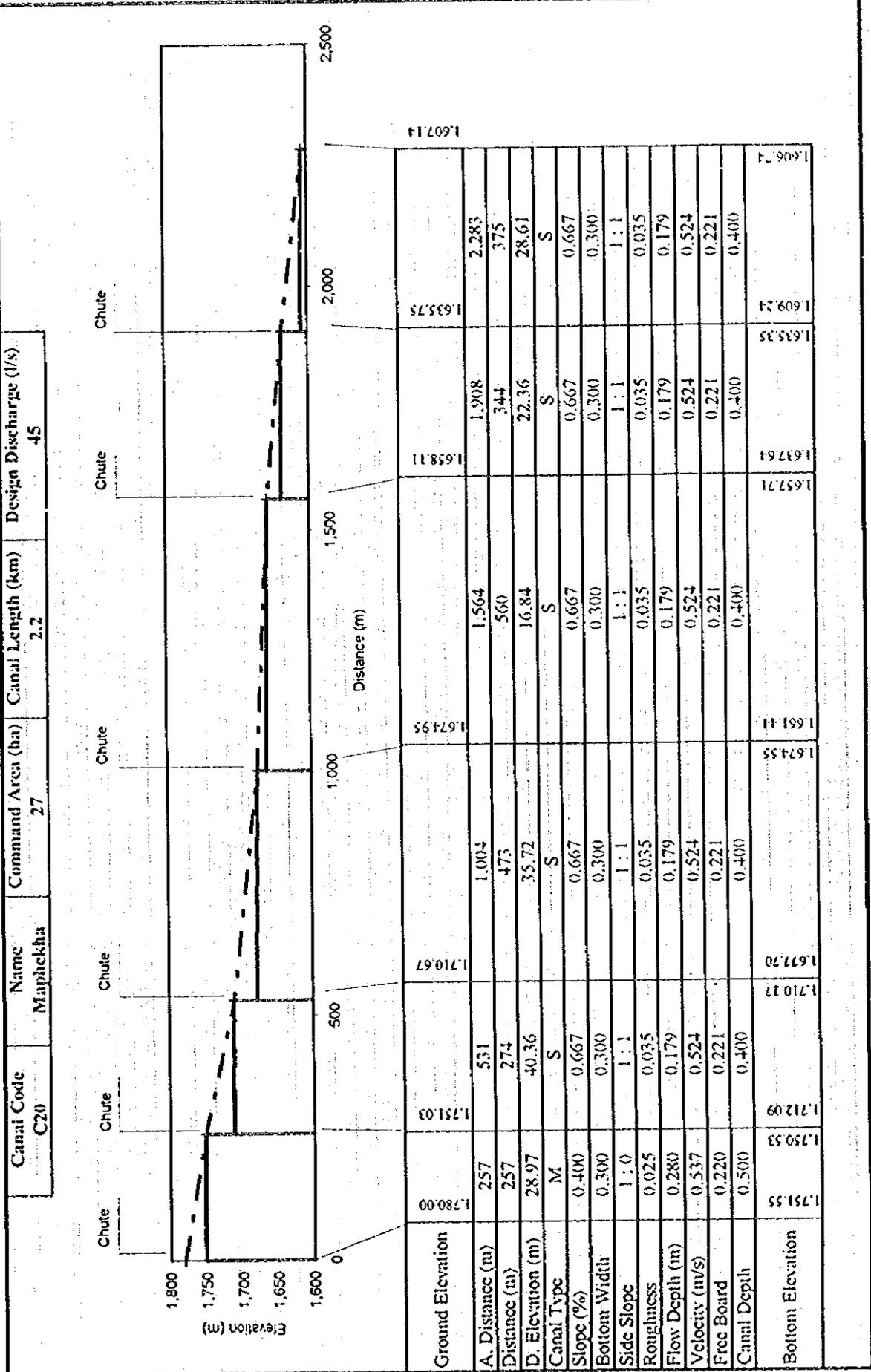
(2) Preliminary Canal Improvement Plan (6)



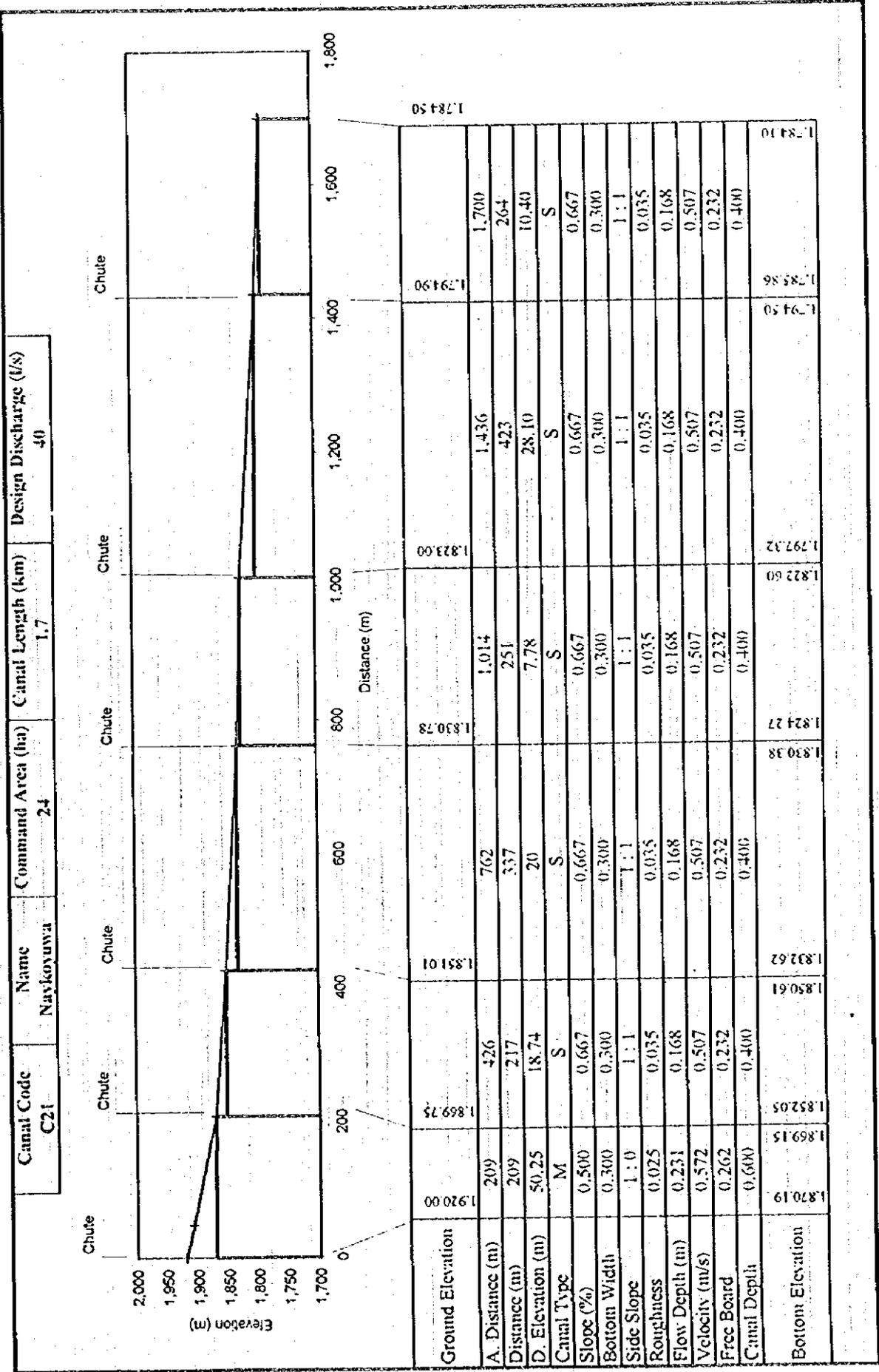
(2) Preliminary Canal Improvement Plan (7/10)



(2) Preliminary Canal Improvement Plan (8/10)

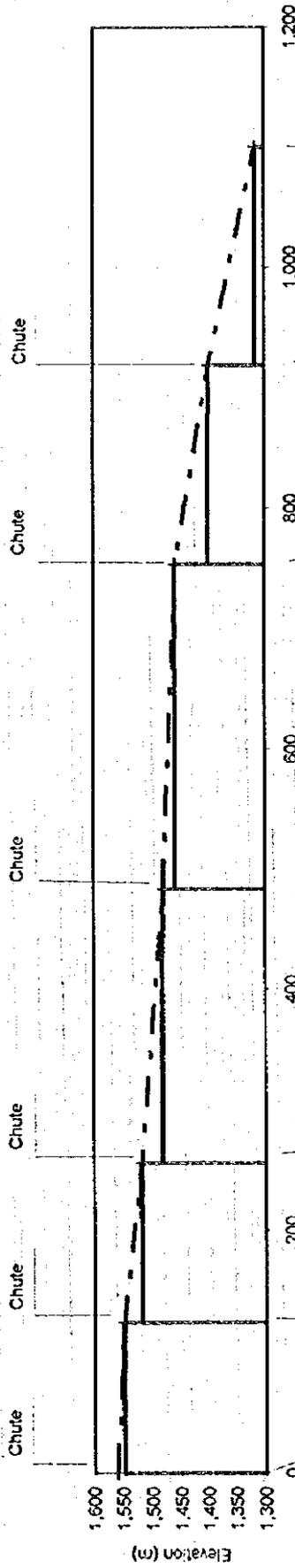


(2) Preliminary Canal Improvement Plan (9/10)



(2) Preliminary Canal Improvement Plan (10/10)

Canal Code C22	Name Maphékha	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 50
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	0	200	400	600	800	1,000	1,200
Ground Elevation	1,560.00	1,518.81	1,481.75	1,482.15	1,459.49	1,399.74	1,315.81
A. Distance (m)	124	256	484	754	919	1,100	
B. Distance (m)	124	132	228	270	166	181	
D. Elevation (m)	11.17	30.15	36.53	22.66	59.75	83.93	
Canal Type	M	S	S	S	S	S	S
Slope (%)	0.500	0.667	0.667	0.667	0.667	0.667	0.667
Bottom Width	0.300	0.300	0.300	0.300	0.300	0.300	0.300
Side Slope	1:0	1:1	1:1	1:1	1:1	1:1	1:1
Roughness	0.025	0.035	0.035	0.035	0.035	0.035	0.035
Flow Depth (m)	0.278	0.190	0.190	0.190	0.190	0.190	0.190
Velocity (m/s)	0.599	0.539	0.539	0.539	0.539	0.539	0.539
Free Board	0.222	0.210	0.210	0.210	0.210	0.210	0.210
Canal Depth	0.500	0.400	0.400	0.400	0.400	0.400	0.400
Bottom Elevation	1,548.95	1,519.16	1,483.27	1,481.75	1,459.09	1,399.34	1,315.41

### Applying Portion of Protection Works (for Additional Cost)

Vulnerability Index	Over 60	55	50	45	40	35
Protection Work Type PA	6.00%	3.00%	1.00%			
Protection Work Type PB			3.00%	1.00%		
Protection Work Type PC			3.00%	1.00%		
Protection Work Type PD				4.00%	3.00%	2.00%
Steel Flume Aqueduct	0.80%	0.60%	0.40%	0.20%		
Pipe Canal Work	2.00%	1.00%	0.60%	0.20%		

### Estimated BQ of Protection Works (1/2)

#### Code C1 Upper Lobeysa

Vulnerability Index	Over 60	55	50	45	40	35	Length (m)
Protection Work Type PA	0.00	0.00	7.00	0.00	0.00	0.00	7.00
Protection Work Type PB	0.00	0.00	21.00	4.00	0.00	0.00	25.00
Protection Work Type PC	0.00	0.00	21.00	4.00	0.00	0.00	25.00
Protection Work Type PD	0.00	0.00	0.00	16.00	55.20	62.00	133.20
Steel Flume Aqueduct	0.00	0.00	2.80	0.80	0.00	0.00	3.60
Pipe Canal Work	0.00	0.00	4.20	0.80	0.00	0.00	5.00

#### Code C2 Lower Lobeysa

Vulnerability Index	Over 60	55	50	45	40	35	Length (m)
Protection Work Type PA	7.80	7.20	6.50	0.00	0.00	0.00	21.50
Protection Work Type PB	0.00	0.00	19.50	3.60	0.00	0.00	23.10
Protection Work Type PC	0.00	0.00	19.50	3.60	0.00	0.00	23.10
Protection Work Type PD	0.00	0.00	0.00	14.40	61.80	73.20	149.40
Steel Flume Aqueduct	1.04	1.44	2.60	0.72	0.00	0.00	5.80
Pipe Canal Work	2.60	2.40	3.90	0.72	0.00	0.00	9.62

#### Code C9 Bajo

Vulnerability Index	Over 60	55	50	45	40	35	Length (m)
Protection Work Type PA	159.00	63.60	13.30	0.00	0.00	0.00	235.90
Protection Work Type PB	0.00	0.00	39.90	0.00	0.00	0.00	39.90
Protection Work Type PC	0.00	0.00	39.90	0.00	0.00	0.00	39.90
Protection Work Type PD	0.00	0.00	0.00	0.00	135.30	41.40	176.70
Steel Flume Aqueduct	21.20	12.72	5.32	0.00	0.00	0.00	39.24
Pipe Canal Work	53.00	21.20	7.98	0.00	0.00	0.00	82.18

#### Code C10 Phangyul

Vulnerability Index	Over 60	55	50	45	40	35	Length (m)
Protection Work Type PA	52.20	30.60	19.40	0.00	0.00	0.00	102.20
Protection Work Type PB	0.00	0.00	58.20	14.10	0.00	0.00	72.30
Protection Work Type PC	0.00	0.00	58.20	14.10	0.00	0.00	72.30
Protection Work Type PD	0.00	0.00	0.00	56.40	82.20	88.60	227.20
Steel Flume Aqueduct	6.96	6.12	7.76	2.82	0.00	0.00	23.66
Pipe Canal Work	17.40	10.20	11.64	2.82	0.00	0.00	42.06

### Estimated BQ of Protection Works (2/2)

#### Code C15                      Gemkha

Vulnerability Index	Over 60	55	50	45	40	35	Length (m)
Protection Work Type PA	0.00	5.10	0.00	0.00	0.00	0.00	5.10
Protection Work Type PB	0.00	0.00	0.00	17.90	0.00	0.00	17.90
Protection Work Type PC	0.00	0.00	0.00	17.90	0.00	0.00	17.90
Protection Work Type PD	0.00	0.00	0.00	71.60	14.70	15.80	102.10
Steel Flume Aqueduct	0.00	1.02	0.00	3.58	0.00	0.00	4.60
Pipe Canal Work	0.00	1.70	0.00	3.58	0.00	0.00	5.28

#### Code C18                      Nalakha

Vulnerability Index	Over 60	55	50	45	40	35	Length (m)
Protection Work Type PA	16.20	22.50	0.00	0.00	0.00	0.00	38.70
Protection Work Type PB	0.00	0.00	0.00	15.10	0.00	0.00	15.10
Protection Work Type PC	0.00	0.00	0.00	15.10	0.00	0.00	15.10
Protection Work Type PD	0.00	0.00	0.00	60.40	20.70	9.60	90.70
Steel Flume Aqueduct	2.16	4.50	0.00	3.02	0.00	0.00	9.68
Pipe Canal Work	5.40	7.50	0.00	3.02	0.00	0.00	15.92

#### Code C19                      Rutekha

Vulnerability Index	Over 60	55	50	45	40	35	Length (m)
Protection Work Type PA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Protection Work Type PB	0.00	0.00	0.00	1.50	0.00	0.00	1.50
Protection Work Type PC	0.00	0.00	0.00	1.50	0.00	0.00	1.50
Protection Work Type PD	0.00	0.00	0.00	6.00	0.00	29.80	35.80
Steel Flume Aqueduct	0.00	0.00	0.00	0.30	0.00	0.00	0.30
Pipe Canal Work	0.00	0.00	0.00	0.30	0.00	0.00	0.30

#### Code C20                      Maphekha

Vulnerability Index	Over 60	55	50	45	40	35	Length (m)
Protection Work Type PA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Protection Work Type PB	0.00	0.00	0.00	2.10	0.00	0.00	2.10
Protection Work Type PC	0.00	0.00	0.00	2.10	0.00	0.00	2.10
Protection Work Type PD	0.00	0.00	0.00	8.40	18.00	8.20	34.60
Steel Flume Aqueduct	0.00	0.00	0.00	0.42	0.00	0.00	0.42
Pipe Canal Work	0.00	0.00	0.00	0.42	0.00	0.00	0.42

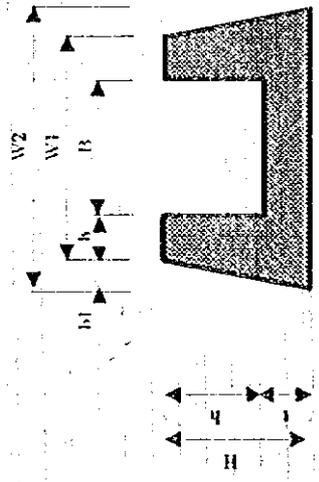
#### Code C21                      Naykoyuwa

Vulnerability Index	Over 60	55	50	45	40	35	Length (m)
Protection Work Type PA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Protection Work Type PB	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Protection Work Type PC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Protection Work Type PD	0.00	0.00	0.00	0.00	0.00	6.60	6.60
Steel Flume Aqueduct	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Canal Work	0.00	0.00	0.00	0.00	0.00	0.00	0.00

#### Code C22                      Rumina

Vulnerability Index	Over 60	55	50	45	40	35	Length (m)
Protection Work Type PA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Protection Work Type PB	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Protection Work Type PC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Protection Work Type PD	0.00	0.00	0.00	0.00	6.60	7.60	14.20
Steel Flume Aqueduct	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Canal Work	0.00	0.00	0.00	0.00	0.00	0.00	0.00

(3) Typical Section of Masonry Canal and Dimensions



Dimensions

Type Code	Type Code M2	Type Code M3	Type Code M4	Type Code M5	Type Code M6	Type Code M7
Design						
Discharge (l/s)						
270 ~ 540	140 ~ 290	75 ~ 150	0.036 ~ 0.072	0.036 ~ 0.072	0.027 ~ 0.054	0.018 ~ 0.036
B	B	B	B	B	B	B
b	b	b	b	b	b	b
b1						
W1						
W2						
H	H	H	H	H	H	H
h	h	h	h	h	h	h
t	t	t	t	t	t	t

## Bill of Quantity of Masonry Canal (unit/m)

Masonry Canal Type M1 (Q=270 ~ 540 l/s)							
Dimensions							
B	b	b1	W1	W2	H	h	t
1.000	0.300	0.200	1.600	2.000	1.400	1.100	0.300
Description	unit	Quantity	Equations				
Excavation	m <sup>3</sup>	1.700	$W2 \cdot H - B \cdot h$				
Backfill	m <sup>3</sup>	0.280	$b1 \cdot H$				
Wet Masonry	m <sup>3</sup>	1.420	$(W1 + W2) / 2 \cdot H - B \cdot h$				
Masonry Canal Type M2 (Q=140 ~ 290 l/s)							
Dimensions							
B	b	b1	W1	W2	H	h	t
0.800	0.300	0.150	1.400	1.700	1.100	0.800	0.300
Description	unit	Quantity	Equations				
Excavation	m <sup>3</sup>	1.230	$W2 \cdot H - B \cdot h$				
Backfill	m <sup>3</sup>	0.165	$b1 \cdot H$				
Wet Masonry	m <sup>3</sup>	1.065	$(W1 + W2) / 2 \cdot H - B \cdot h$				
Masonry Canal Type M3 (Q=75 ~ 150 l/s)							
Dimensions							
B	b	b1	W1	W2	H	h	t
0.500	0.300	0.100	1.100	1.300	1.000	0.700	0.300
Description	unit	Quantity	Equations				
Excavation	m <sup>3</sup>	0.950	$W2 \cdot H - B \cdot h$				
Backfill	m <sup>3</sup>	0.100	$b1 \cdot H$				
Wet Masonry	m <sup>3</sup>	0.850	$(W1 + W2) / 2 \cdot H - B \cdot h$				
Masonry Canal Type M4 (Q=36 ~ 72 l/s)							
Dimensions							
B	b	b1	W1	W2	H	h	t
0.400	0.300	0.150	1.000	1.300	0.800	0.500	0.300
Description	unit	Quantity	Equations				
Excavation	m <sup>3</sup>	0.840	$W2 \cdot H - B \cdot h$				
Backfill	m <sup>3</sup>	0.120	$b1 \cdot H$				
Wet Masonry	m <sup>3</sup>	0.720	$(W1 + W2) / 2 \cdot H - B \cdot h$				
Masonry Canal Type M5 (Q=36 ~ 72 l/s)							
Dimensions							
B	b	b1	W1	W2	H	h	t
0.300	0.300	0.150	0.900	1.200	0.900	0.600	0.300
Description	unit	Quantity	Equations				
Excavation	m <sup>3</sup>	0.900	$W2 \cdot H - B \cdot h$				
Backfill	m <sup>3</sup>	0.135	$b1 \cdot H$				
Wet Masonry	m <sup>3</sup>	0.765	$(W1 + W2) / 2 \cdot H - B \cdot h$				
Masonry Canal Type M6 (Q=27 ~ 54 l/s)							
Dimensions							
B	b	b1	W1	W2	H	h	t
0.300	0.300	0.150	0.900	1.200	0.800	0.500	0.300
Description	unit	Quantity	Equations				
Excavation	m <sup>3</sup>	0.810	$W2 \cdot H - B \cdot h$				
Backfill	m <sup>3</sup>	0.120	$b1 \cdot H$				
Wet Masonry	m <sup>3</sup>	0.690	$(W1 + W2) / 2 \cdot H - B \cdot h$				
Masonry Canal Type M7 (Q=18 ~ 36 l/s)							
Dimensions							
B	b	b1	W1	W2	H	h	t
0.300	0.300	0.150	0.900	1.200	0.700	0.400	0.300
Description	unit	Quantity	Equations				
Excavation	m <sup>3</sup>	0.720	$W2 \cdot H - B \cdot h$				
Backfill	m <sup>3</sup>	0.105	$b1 \cdot H$				
Wet Masonry	m <sup>3</sup>	0.615	$(W1 + W2) / 2 \cdot H - B \cdot h$				

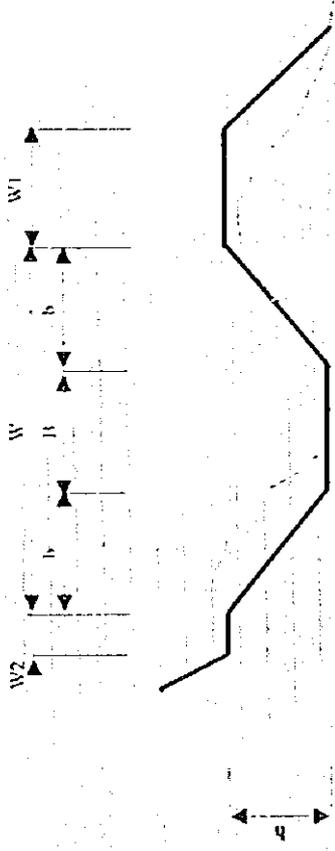
**Unit Construction Cost of Masonry Canal (1/2, unit : Nu./m)**

<b>Masonry Canal Type M1 (Q=270 ~ 540 l/s)</b>					
Description	unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	1.7	30.61	52	E-1
Backfill	m3	0.28	15.38	4	E-3
Wet Masonry	m3	1.42	917.08	1,302	C-6
Others	L.S			272	
Transportation	L.S			245	
<b>Total</b>				<b>1,875</b>	
<b>Masonry Canal Type M2 (Q=140 ~ 290 l/s)</b>					
Description	unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	1.23	30.61	38	
Backfill	m3	0.165	15.38	3	
Wet Masonry	m3	1.065	917.08	977	
Others	L.S			203	
Transportation	L.S			183	
<b>Total</b>				<b>1,403</b>	
<b>Masonry Canal Type M3 (Q=75 ~ 150 l/s)</b>					
Description	unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	0.95	30.61	29	
Backfill	m3	0.1	15.38	2	
Wet Masonry	m3	0.85	917.08	780	
Others	L.S			162	
Transportation	L.S			486	
<b>Total</b>				<b>1,458</b>	
<b>Masonry Canal Type M4 (Q=36 ~ 72 l/s)</b>					
Description	unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	0.84	30.61	26	
Backfill	m3	0.12	15.38	2	
Wet Masonry	m3	0.72	917.08	660	
Others	L.S			138	
Transportation	L.S			124	
<b>Total</b>				<b>949</b>	
<b>Masonry Canal Type M5 (Q=36 ~ 72 l/s)</b>					
Description	unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	0.9	30.61	28	
Backfill	m3	0.135	15.38	2	
Wet Masonry	m3	0.765	917.08	702	
Others	L.S			146	
Transportation	L.S			132	
<b>Total</b>				<b>1,009</b>	

**Unit Construction Cost of Masonry Canal (2/2, unit : Nu./m)**

Masonry Canal Type M6 (Q=27 ~ 54 l/s)					
Description	unit	Quantity	Unit Price	Amount	Remark
Excavation	m <sup>3</sup>	0.81	30.61	25	
Backfill	m <sup>3</sup>	0.12	15.38	2	
Wet Masonry	m <sup>3</sup>	0.69	917.08	633	
Others	L.S			132	
Transportation	L.S			119	
<b>Total</b>				<b>910</b>	
Masonry Canal Type M7 (Q=18 ~ 36 l/s)					
Description	unit	Quantity	Unit Price	Amount	Remark
Excavation	m <sup>3</sup>	0.72	30.61	22	
Backfill	m <sup>3</sup>	0.105	15.38	2	
Wet Masonry	m <sup>3</sup>	0.615	917.08	564	
Others	L.S			118	
Transportation	L.S			106	
<b>Total</b>				<b>811</b>	

(4) Typical Section of Earth Lining Canal and Dimensions



Dimensions

Type Code S1	Type Code S2	Type Code S3	Type Code S4	Type Code S5	Type Code S6	Type Code S7	Type Code S8	Type Code S9
Design Discharge (l/s)								
312 ~ 624	150 ~ 300	63 ~ 126	120 ~ 240	84 ~ 168	54 ~ 108	30 ~ 60	105 ~ 210	24 ~ 48
B 0.500	B 0.500	B 0.400	B 0.300	B 0.300	B 0.300	B 0.300	B 0.200	B 0.200
b 1.000	b 0.700	b 0.500	b 0.600	b 0.600	b 0.500	b 0.400	b 0.700	b 0.400
W 2.500	W 1.900	W 1.400	W 1.500	W 1.500	W 1.300	W 1.100	W 1.600	W 1.000
W1 0.600								
W2 0.300								
h 1.000	h 0.700	h 0.500	h 0.700	h 0.600	h 0.500	h 0.400	h 0.700	h 0.400

## BQ of Earth Lining Canal (1/2)

Earth Lining Canal Type S1 (Q=320 ~ 624 l/s)					
Dimensions					
B	b	W	W1	W2	h
0.500	1.000	2.500	0.600	0.300	1.000
Description	unit	Quantity	Equations		
Excavation	m3	0.750	$(W+B)/2 * h * 0.5$		
Embankment	m3	0.300	$W1 * h / 2$		
Lining	m2	3.328	$B + 2 * b * 2$		
Earth Lining Canal Type S2 (Q=150 ~ 300 l/s)					
Dimensions					
B	b	W	W1	W2	h
0.500	0.700	1.900	0.600	0.300	0.700
Description	unit	Quantity	Equations		
Excavation	m3	0.420	$(W+B)/2 * h * 0.5$		
Embankment	m3	0.210	$W1 * h / 2$		
Lining	m2	2.480	$B + 20.5 * b * 2$		
Earth Lining Canal Type S3 (Q=63 ~ 126 l/s)					
Dimensions					
B	b	W	W1	W2	h
0.400	0.500	1.400	0.600	0.300	0.500
Description	unit	Quantity	Equations		
Excavation	m3	0.225	$(W+B)/2 * h * 0.5$		
Embankment	m3	0.150	$W1 * h / 2$		
Lining	m2	1.814	$B + 20.5 * b * 2$		
Earth Lining Canal Type S4 (Q=120 ~ 240 l/s)					
Dimensions					
B	b	W	W1	W2	h
0.300	0.600	1.500	0.600	0.300	0.700
Description	unit	Quantity	Equations		
Excavation	m3	0.315	$(W+B)/2 * h * 0.5$		
Embankment	m3	0.210	$W1 * h / 2$		
Lining	m2	1.997	$B + 20.5 * b * 2$		
Earth Lining Canal Type S5 (Q=84 ~ 168 l/s)					
Dimensions					
B	b	W	W1	W2	h
0.300	0.600	1.500	0.600	0.300	0.600
Description	unit	Quantity	Equations		
Excavation	m3	0.270	$(W+B)/2 * h * 0.5$		
Embankment	m3	0.180	$W1 * h / 2$		
Lining	m2	1.997	$B + 20.5 * b * 2$		
Earth Lining Canal Type S6 (Q=54 ~ 108 l/s)					
Dimensions					
B	b	W	W1	W2	h
0.300	0.500	1.300	0.600	0.300	0.500
Description	unit	Quantity	Equations		
Excavation	m3	0.200	$(W+B)/2 * h * 0.5$		
Embankment	m3	0.150	$W1 * h / 2$		
Lining	m2	1.714	$B + 20.5 * b * 2$		

### BQ of Earth Lining Canal (2/2)

Earth Lining Canal Type S7 (Q=30 ~ 60 l/s)					
Dimensions					
B	b	W	W1	W2	h
0.300	0.400	1.100	0.600	0.300	0.400
Description	unit	Quantity	Equations		
Excavation	m3	0.140	$(W+B)/2 * h * 0.5$		
Embankment	m3	0.120	$W1 * h / 2$		
Lining	m2	1.431	$B + 20.5 * b * 2$		
Earth Lining Canal Type S8 (Q=105 ~ 210 l/s)					
Dimensions					
B	b	W	W1	W2	h
0.200	0.700	1.600	0.600	0.300	0.700
Description	unit	Quantity	Equations		
Excavation	m3	0.315	$(W+B)/2 * h * 0.5$		
Embankment	m3	0.210	$W1 * h / 2$		
Lining	m2	2.180	$B + 20.5 * b * 2$		
Earth Lining Canal Type S9 (Q=24 ~ 48 l/s)					
Dimensions					
B	b	W	W1	W2	h
0.200	0.400	1.000	0.600	0.300	0.400
Description	unit	Quantity	Equations		
Excavation	m3	0.120	$(W+B)/2 * h * 0.5$		
Embankment	m3	0.120	$W1 * h / 2$		
Lining	m2	1.331	$B + 20.5 * b * 2$		
Earth Lining Canal Type S10 (Q=15 ~ 30 l/s)					
Dimensions					
B	b	W	W1	W2	h
0.400	0.300	1.000	0.600	0.300	0.300
Description	unit	Quantity	Equations		
Excavation	m3	0.105	$(W+B)/2 * h * 0.5$		
Embankment	m3	0.090	$W1 * h / 2$		
Lining	m2	1.249	$B + 20.5 * b * 2$		

**Unit Construction Cost of Earth Lining Canal (1/2, unit : Nu./m)**

Earth Lining Canal Type S1 (Q=320 ~ 624 l/s)					
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	0.750	30.61	23	E-1
Embankment	m3	0.300	34.56	10	E-5
Lining	m2	3.328	8.75	29	E-7
Others	L.S			12	
Transportation	L.S			11	
<b>Total</b>				<b>86</b>	
Earth Lining Canal Type S2 (Q=150 ~ 300 l/s)					
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	0.420	30.61	13	
Embankment	m3	0.210	34.56	7	
Lining	m2	2.480	8.75	22	
Others	L.S			8	
Transportation	L.S			8	
<b>Total</b>				<b>58</b>	
Earth Lining Canal Type S3 (Q=63 ~ 126 l/s)					
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	0.225	30.61	7	
Embankment	m3	0.150	34.56	5	
Lining	m2	1.814	8.75	16	
Others	L.S			6	
Transportation	L.S			17	
<b>Total</b>				<b>50</b>	
Earth Lining Canal Type S4 (Q=120 ~ 240 l/s)					
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	0.315	30.61	10	
Embankment	m3	0.210	34.56	7	
Lining	m2	1.997	8.75	17	
Others	L.S			7	
Transportation	L.S			6	
<b>Total</b>				<b>47</b>	
Earth Lining Canal Type S5 (Q=84 ~ 168 l/s)					
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	0.270	30.61	8	
Embankment	m3	0.180	34.56	6	
Lining	m2	1.997	8.75	17	
Others	L.S			6	
Transportation	L.S			6	
<b>Total</b>				<b>44</b>	

**Unit Construction Cost of Earth Lining Canal (2/2, unit : Nu./m)**

Earth Lining Canal Type S6 (Q=54 ~ 108 l/s)					
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	0.200	30.61	6	
Embankment	m3	0.150	34.56	5	
Lining	m2	1.714	8.75	15	
Others	L.S			5	
Transportation	L.S			5	
Total				36	
Earth Lining Canal Type S7 (Q=30 ~ 60 l/s)					
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	0.140	30.61	4	
Embankment	m3	0.120	34.56	4	
Lining	m2	1.431	8.75	13	
Others	L.S			4	
Transportation	L.S			4	
Total				29	
Earth Lining Canal Type S8 (Q=105 ~ 210 l/s)					
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	0.315	30.61	10	
Embankment	m3	0.210	34.56	7	
Lining	m2	2.180	8.75	19	
Others	L.S			7	
Transportation	L.S			6	
Total				50	
Earth Lining Canal Type S9 (Q=24 ~ 48 l/s)					
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	0.120	30.61	4	
Embankment	m3	0.120	34.56	4	
Lining	m2	1.331	8.75	12	
Others	L.S			4	
Transportation	L.S			4	
Total				27	
Earth Lining Canal Type S10 (Q=15 ~ 30 l/s)					
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	0.105	30.61	3	
Embankment	m3	0.090	34.56	3	
Lining	m2	1.249	8.75	11	
Others	L.S			3	
Transportation	L.S			3	
Total				24	