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Integrated Maintenance Plan

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TABLE OF CONTENTS

INTEGRATED MAINTENANCE..... 1
OBJECTIVES 1
PREPARING AN INTEGRATED MAINTENANCE PLAN 1
RANK CANALS AND DRAINS..... 2
INVENTORY MAINTENANCE NEEDS 4
PRIORITIZE MAINTENANCE NEEDS 4
ASSESS VOLUMES AND COSTS 7
PREPARE INTEGRATED MAINTENANCE PLAN..... 8
GUIDELINES FOR PROPER MAINTENANCE METHODS 9
INTEGRATED MAINTENANCE PLANS 2006/2007 11
INTEGRATED MAINTENANCE PLANS 2007/2008 11

Integrated Maintenance

Objectives

- To locate, identify, assess, and prioritize maintenance needs for both canals and drains.
- To present the priority needs in an integrated budget request (budget for maintenance of canals and drains) to the General Director and the MWRI Irrigation Sector.

Preparing an Integrated Maintenance Plan

As a preliminary step, it is important to establish an inventory of all public waterways (main and branch canals, open drains, and networks for subsurface drainage) within the boundaries of the IWMD. This inventory should also include the basic characteristics of these waterways (width, length, and main structures and will be used to rank the canals and drains by order of importance (see section 2 below).

After the inventory is complete, an integrated maintenance plan should be prepared using the following procedure and timetable:

Step	Date	Outcome
1. Prepare an inspection program	December	Annual Inspection Program (area, team, date)
2.* Inspect all waterways (canals and drains) by maintenance team according to program	January	Maintenance Needs Assessment Forms
3.* Sort and prioritize all maintenance needs (by category)	February	Prioritized Maintenance Needs (one form per category of works)
4. Survey sections that need dredging (silt/garbage removal) and/or bank rehabilitation/pitching	February– March	Estimated Volumes of Needed Works
5. Estimate quantities for all types of works	March	Bill of Quantities of Needed Maintenance Works
6a. Review last year’s maintenance contracts and estimate average unit cost for every maintenance item (per category)	March	Average Unit Cost for Every Maintenance Item
6b. Prepare cost estimate of all maintenance needs	March	Cost of Needed Maintenance Works (per category of works)
7. Review maintenance works in view of the available budget	March	Determination of Maintenance Works for the Coming Year
8. Prepare draft Integrated Channel Maintenance Plan and send it to the DG for approval	April	Draft Integrated Channel Maintenance Plan for the Coming Year
9. Prepare draft Integrated maintenance contracts	April	Draft Integrated Maintenance Contracts

* Water User Representatives should be involved in this step.

These steps are explained in sections 3, 4, 5, and 6 below.

Rank Canals and Drains

This ranking is essential to identify which canals and drains are more important in terms of area and facilities served. These are generally main canals and drains whose maintenance should be a top priority.

Tables I.3.1–I.3.4 below should be used to rank the canals and the drains.

Table I Scoring Criteria for Canals

	CRITERION	CATEGORY	RANGE	SCORE
1-	Area Served	Small	< 2000 feddans	0.5
		Medium	≥ 2000 - 5000 feddans ≤	1.0
		Large	≥ 5000 - 10000 feddans ≤	1.5
		Very Large	> 10000 feddans	2.0
2-	% of length passing through housing area(s)	None	0	0.0
		Small	< 20%	0.5
		Medium	≥ 20% - 50% ≤	1.0
		Large	> 50%	1.5
3-	Number of housing units (Villages)	None	0	0.0
		Few	1	0.5
		Medium	≥ 2 - 5 ≤	1.0
		Many	> 5	1.5
4-	Does not serve water treatment plant(s)			0.0
	Serves water treatment plant(s)			2.0
5-	Does not serve important factory(ies)			0.0
	Serves important factory(ies)			1.0
6-	Users do not complain			0.0
	Users complain			2.0

- Structural repair (welding, lubrication, painting, replacement, and removal of obstacles).

Figure 1 Standard Canal/Drain Maintenance Needs Assessment Form

Canal/ Drain Name:					
Feeding Canal (5th Rank):					
Feeding Canal (4th Rank):					
Feeding Canal (3rd Rank):					
Feeding Canal (2nd Rank):					
Main Canal:					
Status of Weed Infestation					
	Reach		Length of Infested Reach (km)	Weeds Type (Floating- Submerged- Bank)	Weed Control Method Needed (Manual- Mechanical- Biological)
	From km	To km			
	Total				
Status of Silting and Trash					
	Reach		Length of Silted or Trash Reach (km)	Type of Maintenance Work Needed (De-silting- Pumping out- Trash Removal)	
	From km	To km			
	Total				
Status of Banks					
	Reach		Side (Right/ Left) (km)	Length of the Bank (km)	Type of Maintenance Work Needed (Pitching- Lining- Retaining Wall- Heightening- Sheet Pile)
	From km	To km			
	Total				
Status of Regulators and Gates					
	Regulator/ Gate	km	Number of Gates	Gates Status (Silted- Trash- Erosion)	Type of Maintenance Work Needed (De-silting- Cleaning- Painting)
	Total				
Status of Coverings					
	Reach		Number of Conduits	Length of Conduit (km)	Type of Maintenance Work Needed (De-silting- Cleaning)
	From km	To km			
	Total				
Status of Siphons and aqueducts					
	Siphon/ Aqueduct	km	Number of Vents	Vents Status (Silted- Trashed)	Type of Maintenance Work Needed (De-silting- Cleaning- Painting)
	Total				
Status of Bridges					
	Bridge	km	Type of Bridge	Bridge Status	Type of Maintenance Work Needed (De-silting- Cleaning- Painting)
	Total				

Within each category, needs should be prioritized according to:

- The importance of the canal/drain (as prioritized earlier)
- The criticality of the need, based on:
 - When was the relevant channel or reach last maintained
 - What would be the consequences if this work is not carried out (rapid degradation or not, significant or minimal impact on the water supply, etc.)
 - If there is a strong demand from the BCWUA
 - The cost of maintenance work needed (Would it absorb a great part of the available maintenance budget? In this case it is better to include this work in a special request to the Irrigation General Director).

Once prioritized within each category, the needs can then be listed in the appropriate summary forms (figures 1.3.2 to 1.3.5).

Prepare Integrated Maintenance Plan

The first step is to gather information from the General Directorate regarding the expected budget allocation. The budget from the previous year can also be used as a reference.

Only maintenance needs for an amount equivalent or slightly higher to these references should be entered in the Integrated Maintenance Plan. As a rule, all canals and important drains should be included in weed control contracts every year, along with silt removal contracts. Weed control and silt/garbage removal are regarded as essential annual maintenance works that contribute to controlling water losses in channels and improving water conveyance efficiency to downstream areas.

Subsurface drainage networks should be regularly flushed every 6 months. IWMDs are now equipped with flushing machines. District managers have only to consider operation and maintenance cost of these machines in their annual maintenance plan.

If some needs are critical and costly, they should be requested from the Irrigation general Director separately (as an emergency or as a special maintenance/rehabilitation need).

Figure 1.3.6 shows the final Summary Form for the IWMD Channel Maintenance Plan.

Figure 6 Summary Form for the IWMD Channel Maintenance Plan

General Integrated Directorate of					
Integrated Water Management District of					
CATEGORY OF MAINTENANCE WORK	MAINTENANCE METHOD	UNIT	QUANTITY	UNIT COST (LE)	COST (LE)
Weed Control	Manual	Kilometer			
	Mechanical	Kilometer			
	Biological	Kilometer			
	Sub-total				
Silt and Garbage Removal	De-silting	Cubic Meter			
	Garbage Removal	Cubic Meter/ Lump Sum			
	Obstacles Removal	Number/ Lump Sum			
	Sub-total				
Embankment and Bank Repair	Stone Pitching	Cubic Meter			
	Plain Concrete Lining	Cubic Meter			
	Retaining Walls	Cubic Meter			
	Sheet Piles	Cubic Meter/ Kilometer			
Sub-total					
Gates and Metal Parts Repair	Welding	Number			
	Painting	Square Meter/ Lump Sum			
	Cleaning of Garbage	Cubic Meter/ Lump Sum			
	Sub-total				
Bridges Repair	Welding	Number			
	Painting	Square Meter/ Lump Sum			
	Concrete Repair	Cubic Meter/ Lump Sum			
	Cleaning of Garbage	Cubic Meter/ Lump Sum			
Sub-total					
Pumps Repair	Repair/ Maintenance	Number			
Sub-total					
Repair of Aqueducts, Siphons and Coverings	Cleaning	Number/ Lump Sum			
	Repair	Square Meter/ Lump Sum			
	Concrete Repair	Cubic Meter/ Lump Sum			
	Flushing	Number/ Hours			
Sub-total					
Cleaning of Sub-surface Drainage	Operation and Maintenance of Flushing Machines				
Sub-total					
GRAND TOTAL					

Guidelines for Proper Maintenance Methods

Category of Maintenance Works	Identification of Maintenance Problem	Proper Maintenance Method
Weed Control Works	Submerged weeds of 40 cm height or more above channel bed level.	<ul style="list-style-type: none"> • Manual removal by long handled hand-tools (Reed Sickle) in small channels (bed-width < 2 m). • Mechanical removal by mowing boat or harvesters in larger channels (bed-width > 2 m) operated under rotational or continuous flow. If channel sides are clear of trees and bushes, chains installed on tractors (a tractor per channel bank) can also be used to remove submerged weeds. • Biological weed control by Chinese grass carps can be applied if the channel is large and operated under continuous flow, and if weed infestation is not very intense. The best practice occurs when the fingerlings of Chinese grass carp are released after mechanical removal to keep channel free of weed throughout the year (to attain effective weed removal, fingerlings should be of 20–30 gm each; a quantity of 100–120 kilogram of fingerlings should be released for every 10,000 m² of water surface; and water quality should be suitable for fish survival).
	Floating weeds cover more than 10 percent of water surface in a certain canal reach of 100 m length.	<ul style="list-style-type: none"> • Manual removal by long handled hand-tools (Hoe or Fork) in small channels (bed-width < 2 m). • Mechanical removal by mowing boat or harvesters with a net in larger channels (bed-width > 2 m). If channel sides are clear of trees and bushes, chains installed on tractors (a tractor per channel bank) can also be used to remove floating weeds. • Install chains or stitched plastic drums at the upstream of the regulator's gates to prevent floating weeds from clogging the gates. Clean these chains or stitched drums of floating weeds regularly (once every 2 weeks).
	Embankment weeds or bushes of a height more than 40 cm.	<ul style="list-style-type: none"> • Manual removal by long handled hand-tools (Spit Knife for weeds and dauner sickle for bushes) in small channels (bed-width < 2 m). • Mechanical removal by mowing bucket or inclined mechanical harvesters in large channels (bed-width > 2 m).
Silt and Garbage Removal Works	Silt and/or garbage comprise more than 10 percent of channel cross-section.	<ul style="list-style-type: none"> • Removal of silt and garbage by hydraulic excavator for canals of bed-width ≤ 10 m. • Removal of silt and garbage by drag line machine for canals of bed-width >10 and up to 30 m. • Removal of silt and garbage by floating suction line machines for canals of bed-width ≥ 30 m.
Embankment and Bank Repair	Banks and embankment are deteriorated.	<ul style="list-style-type: none"> • Stone pitching for deteriorated embankments (most common solution) or lining by plain concrete (infrequently needed).

Category of Maintenance Works	Identification of Maintenance Problem	Proper Maintenance Method
	Embankment pitching is less than 40 cm.	<ul style="list-style-type: none"> • Collect obstacles (trees, bushes, weeds, and silts) by crawler dozers and move them away by tractors.
	Existence of bushes, trees, and accumulated weeds, silt and garbage.	<ul style="list-style-type: none"> • Rehabilitate banks with compacted sand and coarse grained gravels using motor grader, maintaining road slope as 1 percent as possible.
Gates, Bridges, Aqueducts, and Siphons Repair	Occurrence of holes, corrosion and or cracks in metal parts.	<ul style="list-style-type: none"> • Rehabilitation by welding of holes and cracked parts.
	Erosion of metal parts is more than 25 percent of the part thickness.	<ul style="list-style-type: none"> • Paint gates and metal parts of bridges, aqueducts and siphons.
	Incidence of rust between gears and sliding parts.	<ul style="list-style-type: none"> • Remove rust by sand blasting. • Lubricate between gears and sliding parts of mechanically operated structures.
	Aqueducts and siphons are clogged by dead animals, garbage and aquatic plants.	<ul style="list-style-type: none"> • Remove clogging substances from pipes of aqueducts and siphons manually or by drainage flushing machine if needed. • Remove silt that is underneath regulators gates.
Cleaning of Subsurface Drainage System	Collectors and manholes are clogged by straw, mud, dead animals, garbage, and aquatic plants.	<ul style="list-style-type: none"> • Manual cleaning of collectors and manholes every 2 months, or as needed. • Mechanical flushing by flushing machine of collectors and manholes every 6 months.

Integrated Maintenance Plans 2006/2007

New Zifta Irrigation General Directorate

West Sharkia Irrigation General Directorate

West Qena Irrigation General Directorate

East Qena Irrigation General Directorate

Aswan Irrigation General Directorate

Integrated Maintenance Plans 2007/2008

New Zifta Irrigation General Directorate

West Sharkia Irrigation General Directorate

West Qena Irrigation General Directorate

East Qena Irrigation General Directorate

Aswan Irrigation General Directorate