C.A.P.E. ESTUARIES PROGRAMME

Promoting appropriate Water Quantity & Quality Management in Estuaries

G.5

C.A.P.E. Estuarine Management Guideline

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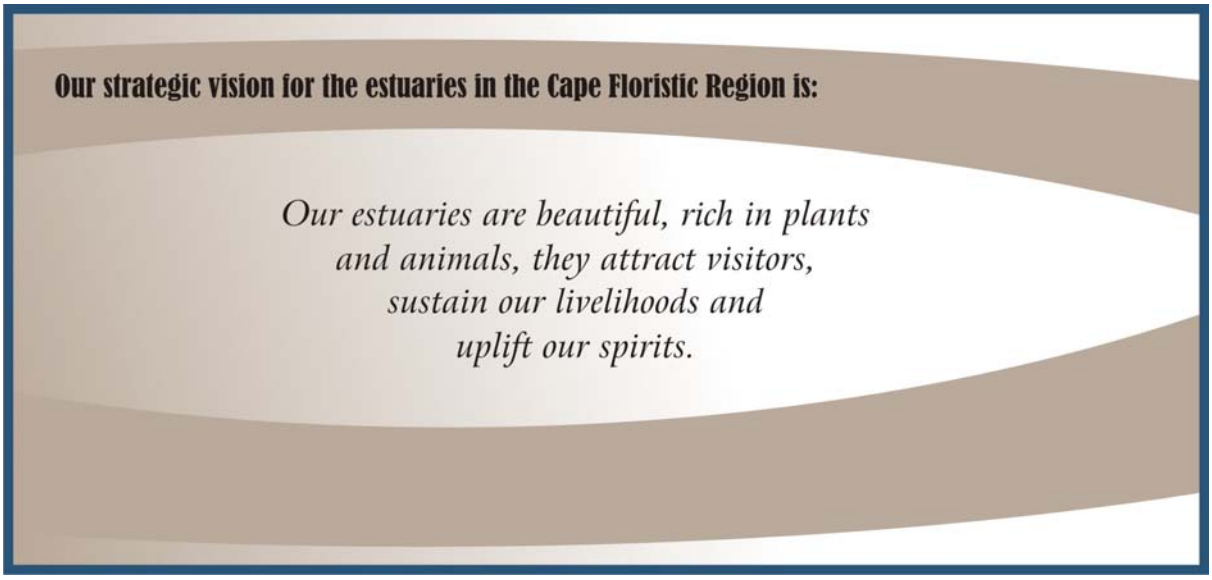

C.A.P.E. Estuaries Guideline 5: Promoting appropriate Water Quantity & Quality Management in Estuaries

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Water Quantity & Water Quality

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1. Introduction

The development of a generic Estuarine Management Plan for the CFR (a component within the larger C.A.P.E Estuarine Management Programme) included the development of a series of guideline documents to assist in the development of estuarine management plans aimed specifically at local management level. One aspect that had to be addressed was guidance on promoting appropriate water quantity and quality management in the estuaries of the CFR.

This report aims at highlighting key legislation, policies and protocols that are relevant to the management of water quantity and quality in estuaries and at distilling important aspects contained in these documents to facilitate more efficient and appropriate water quantity and quality management in the estuaries of the CFR.

The legal framework pertaining to the management of water quantity and quality in estuaries is dealt with in another guidelines report but a summary of the main acts relevant to water quantity and quality are summarised below:

NATIONAL LEGISLATION	SHORT DESCRIPTION
National Environmental Management Act (No. 107 of 1998) *Lead Agent: DEAT*	*The Act (www.info.gov.za/documents/acts/1998.htm) provides for cooperative environmental governance through the establishment of national environmental management principles and procedures for their incorporation into decisions affecting the environment. In 2006, the new environmental impact assessment (EIA) regulations were promulgated under this Act. Waste disposal activities are also scheduled activities under these regulations.*
NWA (No. 36 of 1998) *Lead Agent:: DWAF*	*Estuaries are classified as a water resource under this Act. Section 21 of the Act (www.info.gov.za/documents/acts/1998.htm) classifies a number of activities related to water supply and demand and to waste disposal (from land-based activities) as water uses that require authorisation (licensing) by DWAF.*
MLRA *Lead Agent:: DEAT (MCM)*	*This Act (www.info.gov.za/documents/acts/1998.htm) governs activities in fishing harbours, e.g. Laaiplek (Berg estuary), including harbour pollution. The Act also gives a mandate to the minister to promulgate regulations on marine pollution.*
Marine Pollution (Control and Civil Liability) Act (No. 6 of 1981) *Lead Agents: Department of Transport (prevention) and DEAT (combating)*	*The Act (www.uctshiplaw.com/shipleg.htm) provides for the protection of the marine environment from pollution by oil and other harmful substances, the prevention and combating of such pollution, and the determination of liability in certain respects for loss or damage caused by the discharge of oil from ships, tankers and offshore installations. It prohibits the discharge of oil from ships, tankers and offshore installations but provides exemptions in the case of, for example, oil being released as a result of damage and steps being taken as soon as practicable to stop or reduce the escape of oil. The Act also provides reporting procedures for the discharges of any harmful substance.*
Water Services Act (No. 108 of 1997) *Lead Agent:: DWAF*	*The main aspects of this Act (www.info.gov.za/documents/acts/1997.htm) relevant to the management of water quantity and quality in estuaries are to provide for the following:* • *The right of access to basic water supply and basic sanitation necessary to secure sufficient water and an environment not harmful to human health or well-being.* *The management and control of water services, in general, including water supply and sanitation.* *The regulation of the industrial use of water, both in terms of use and the disposal of effluent (a possible overlap with Section 21 of the NWA).* *The preparation and adoption of water services development plans by water services authorities that typically form part of IDPs.*
Dumping at Sea Control Act (No. 73 of 1980) *Lead Agent:: DEAT (MCM)*	*The Act provides for the control of the dumping of substances in the sea (including estuaries) and gives legal effect in South Africa to the London Convention.* *This Act will be repealed by the National Environmental Management: Integrated Coastal Management Bill (see above).*
National Ports Act (No. 12 of 2005) *Lead Agent:: Department of Transport and NPA*	*Environmental aspects in commercial ports, e.g. East London and Durban, (located in estuaries) are governed under this Act (www.info.gov.za/documents/acts/2005.htm), which repealed the Legal Succession to the SA Transport Services Act (No. 9 of 1989).*

NATIONAL LEGISLATION	SHORT DESCRIPTION
National Health Act (No. 61 of 2004) *Lead Agent:: Delegated to provincial and local authorities from the Department of Health*	*The Act delegated the responsibility to render environmental health services to metropolitan and district councils from 1 July 2004.* *Every metropolitan and district municipality must ensure that appropriate municipal health services are effectively and equitably provided in their areas. These include the following (insofar as they influence human health, except in ports):* *Water quality monitoring.* *Waste management.* *Environmental pollution control.*
National Environmental Management: Integrated Coastal Management Bill (2006) *Lead Agent:: DEAT (MCM)*	*Chapter 8 of the Bill (www.mcm-deat.gov.za/regulatory/czb.html) deals with marine and coastal pollution control, specifically addressing the discharge of effluent into coastal waters (administered in collaboration with DWAF) and incineration and dumping at sea (e.g. dredge spoil dumping).*
Seashore Act (No. 21 of 1935 *Lead Agent:: DEAT*	*The Act (www.polity.org.za/pdf/Sea-ShoreAA190.pdf) provides that ownership of the seashore (which includes the water and land between the low-water mark and the high-water mark in those estuaries that fall within the definition of tidal lagoons and/or tidal rivers) and the sea is vested in the state insofar as it was not in private ownership before the commencement of the Act. In terms of Section 10 of the Act, the minister may make regulations or, by notice in the Gazette, authorise any local authority, in regard to any portion of the seashore and the sea situated within or adjoining the area of jurisdiction of such local authority with his approval to make regulations, not inconsistent with this Act for the prevention or regulation of the depositing or the discharging on the seashore or in the sea of offal, rubbish or anything liable to be a nuisance or danger to health. This Act is to be replaced by the National Environmental Management:: Integrated Coastal Management Bill.*
Draft National Environmental Management: Waste Management Bill (2006) *Lead Agent:: DEAT*	*The purpose of this Bill is to reform the law regulating waste management in order to protect the health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards for regulating the management of waste by all spheres of government and for specific waste management measures.*

2. Resource Quality Objectives for Water Quantity and Quality

The setting of objectives for water quantity (freshwater flows) and quality in estuaries is currently a requirement under the NWA, where Chapter 3, Part 3 of this Act requires the classification and the determination of 2. Resource Quality Objectives (RQOs) for all water resources, including estuaries. The Water Resource Protection Policy (under the NWA) provides detailed guidelines and procedures for the Classification (in other words the predefined health status) and the setting of RQOs for the protection of aquatic ecosystems (including objectives for water quantity, water quality, habitat integrity and biotic integrity). A specific method for the Preliminary Determination of the Ecological Water Requirements for Estuaries has also been developed (DWAF, 2004a).

The process followed in the Preliminary Determination of Ecological Water Requirements for Estuaries forms part of a generic eight-step procedure for the determination of the Resource Directed Measures as described in DWAF (2004a). This preliminary determination can be conducted on the following different levels:

- Comprehensive level;
- Intermediate level; and
- Rapid level.

The main difference between an Intermediate and Comprehensive level Ecological Reserve Determination is the level of confidence (Intermediate = medium; Comprehensive = medium/high), which, in turn, is determined by the extent of data that are required. A Rapid level determination, on the other hand, usually implies low confidence and typically does not include additional data collection, in other words it relies primarily on available data and expert knowledge.

Procedures for the Intermediate and Comprehensive Preliminary Ecological Reserve Determination for estuaries in the context of the larger process are illustrated in Figure 1.

The human resources required to conduct an Intermediate or Comprehensive level determination of the Preliminary Ecological Reserve for Estuaries are illustrated in Figure 2. The Determination of the Preliminary Ecological Reserve Component for estuaries on an Intermediate level can be conducted within one to two years (limited data on seasonal variability need to be captured), while a Comprehensive level determination can take between two and three years (more detailed data sets on seasonal variability need to be captured).

Procedures for the Preliminary Ecological Reserve Determination for estuaries on a Rapid level, in the context of the larger process, are illustrated in Figure 3.

The human resources required to conduct a rapid level determination of the Preliminary Ecological Reserve are provided in Figure 4. A Rapid level study can typically be conducted within two to three months.

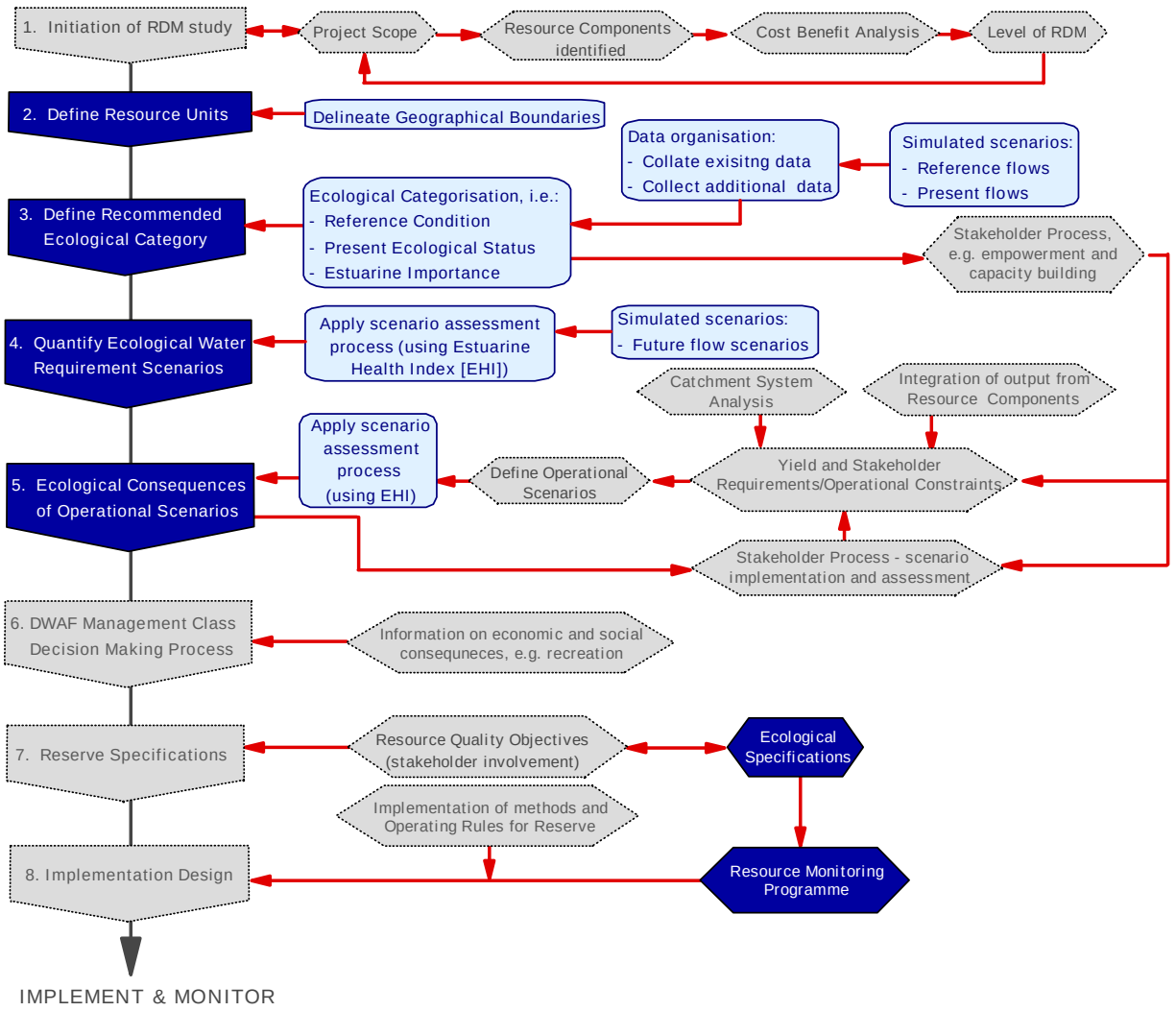

Figure 1. *Procedures for the Preliminary Determination Of The Ecological Water Requirements of Estuaries on Intermediate or Comprehensive levels in the context of the broader RDM process (components not addressed as part of the ecological reserve determination process are indicated by non-solid line boxes)*

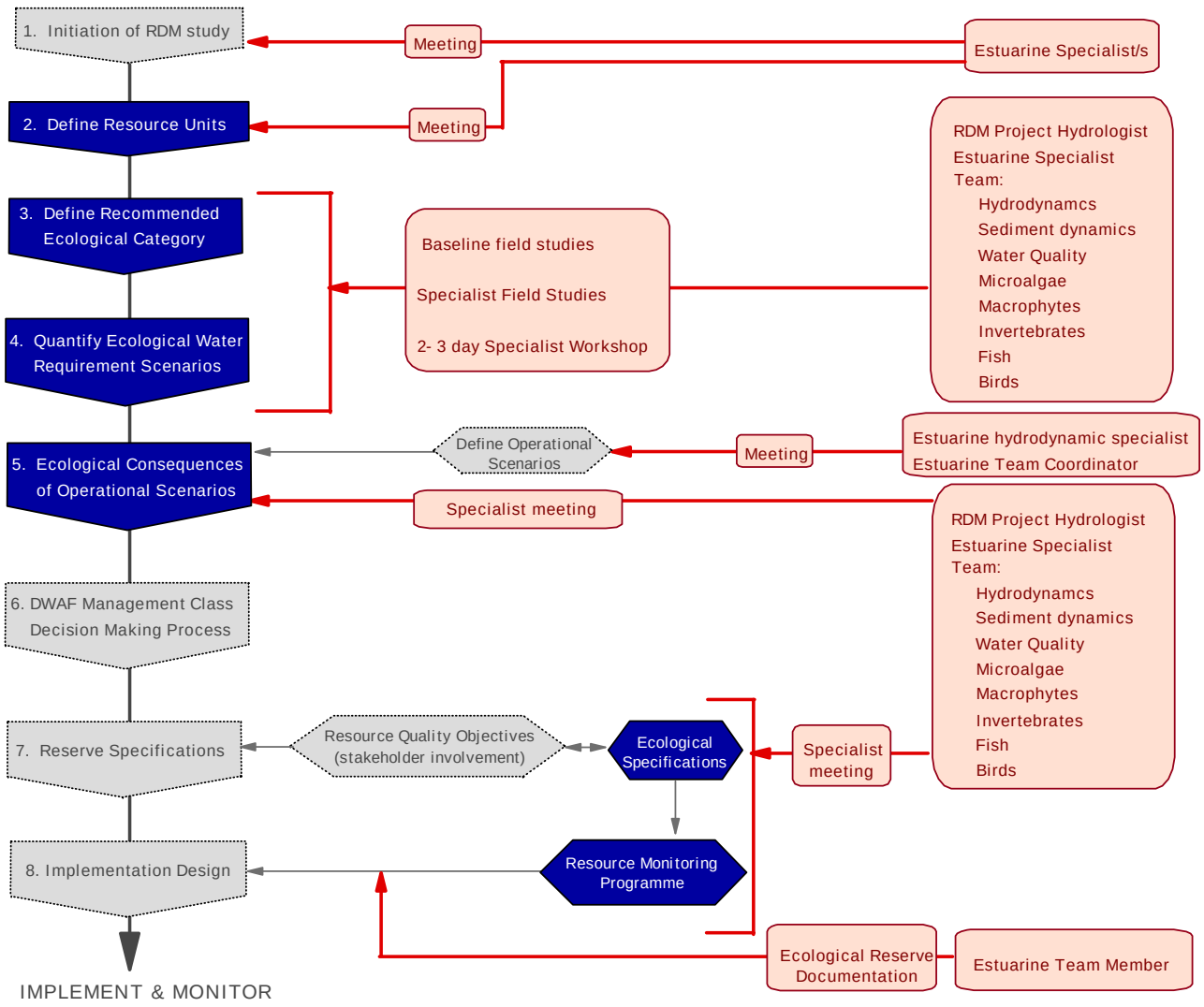

Figure 2. *Indication of human resource requirements for the Preliminary Determination of the Ecological Water Requirements of Estuaries on Intermediate or Comprehensive levels*

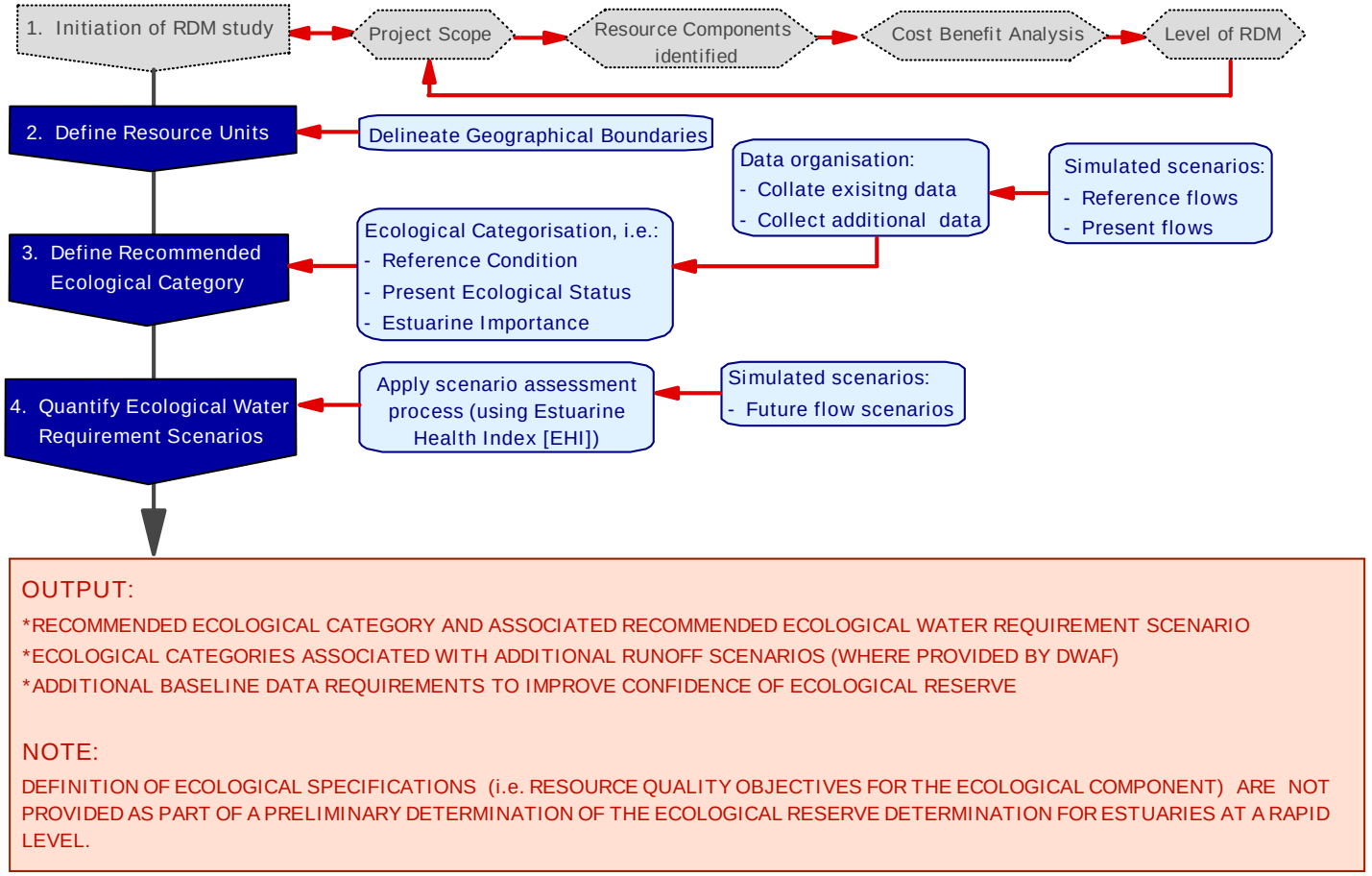

Figure 3. *Procedures for the Preliminary Determination Of The Ecological Water Requirements of Estuaries on Rapid level in the context of the broader RDM process (components not addressed as part of the Ecological Reserve Determination process are indicated by non-solid line boxes)*

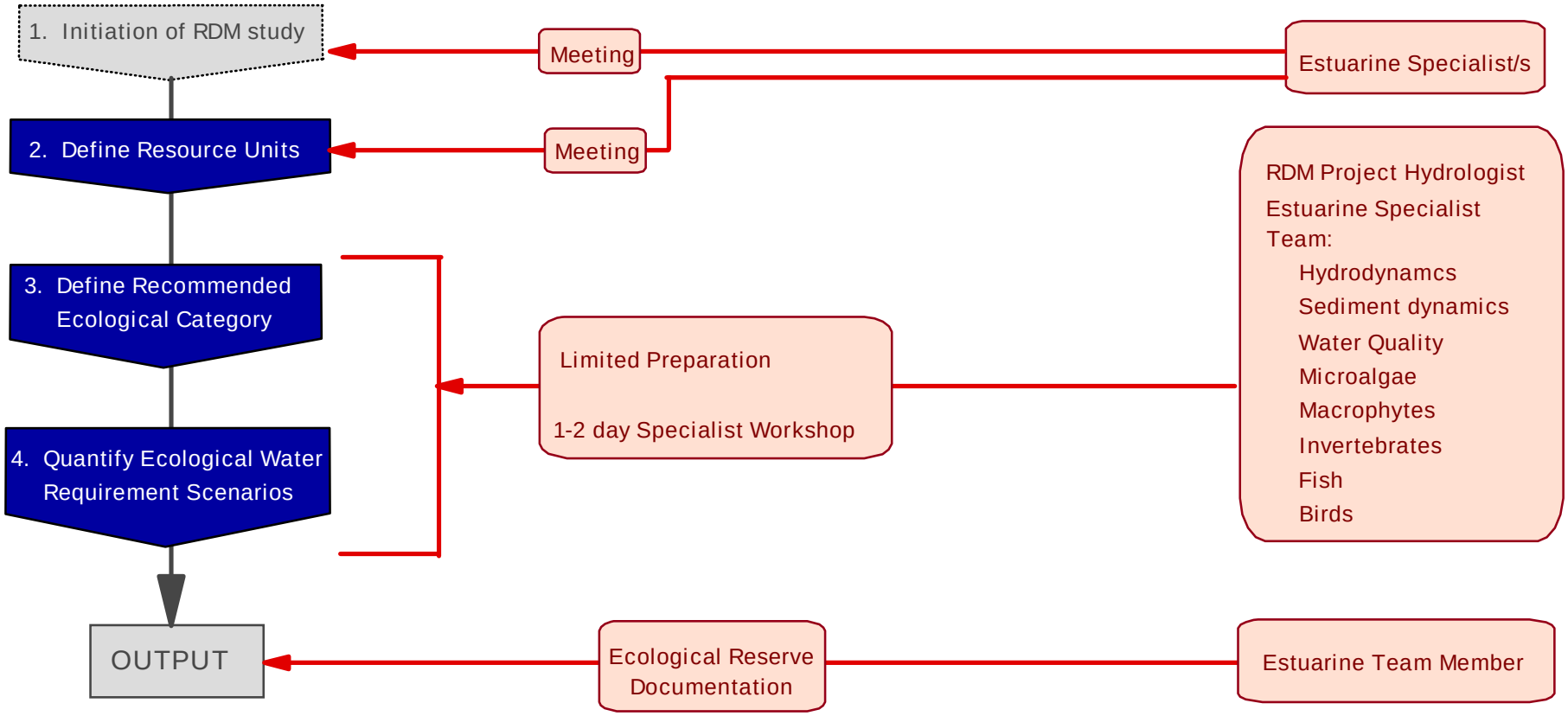

Figure 4. *Indication of human resource requirements for the Preliminary Determination of The Ecological Water Requirements of estuaries on Rapid level*

RQOs for water quantity and quality are usually set for the following:

- The water quantity of freshwater inflow into the estuary (the reserve of water quantity);
- The water quality of freshwater inflow at the head of the estuary (reserve for water quality); and
- Water quality within the estuary.

Water Quantity (i.e. freshwater inflow into the estuary)

The Reserve for water quantity is typically expressed as a summary of the flow distribution (mean monthly flows in m^3/s) derived from monthly-simulated data over a period of 50 to 70 years for the scenario that was accepted as the Reserve for water quantity:

MONTH	*FLOW (in m^3/s) (i.e. flows should equal/exceed given % in a month)*									
	10%	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*99%*
Jan	.....									
Feb	.....									
Mar	.....									
Apr	.....									
May	.....									
Jun										
Jul										
Aug										
Sep										
Oct										
Nov										
Dec										

Water Quality of Freshwater Inflow into the Estuary

The RQO in terms of the quality of river inflow into estuaries are typically specified as Thresholds of Potential Concern (TPC) (Rogers and Biggs, 1999). TPCs are defined as measurable end-points related to specific indicators that, if reached, prompt management intervention. In essence, TPC end-points should be defined in such a way that they provide early warning signals of potential non-compliance with operational objectives (in other words the point of no return). The reserve for water quality is typically expressed as follows:

Physical/chemical Variables

VARIABLE	*PRELIMINARY WATER QUALITY RESERVE*
Conductivity (mS/m) or TDS (mg/l)	*> 0 (expressed as salinity)*
Temperature	*Summer temperatures below 20°C*
pH	*Less than 6.5 to greater than 8.5*
Dissolved oxygen	*Less than 4 mg/L*
Turbidity	*No data; to be determined*

1. *For estuaries, it is the total salt content that is important; it is related to osmotic effects on biota and density effects on hydrodynamics*

Inorganic Nutrients

VARIABLE	*PRELIMINARY WATER QUALITY RESERVE*
Dissolved inorganic nitrogen-N (NO_x-N + NH_3-N) (DIN)	*When average river inflow is less than 5 m^3/s and average DIN concentrations exceed 100 µg/l in river inflow* *During the high flow season (flows > 20 m^3/s,) average DIN concentrations exceed 500 µg/l in river inflow*
Reactive phosphate -P	*Average DRP concentrations exceed 100 µg/l in river inflow*

Toxic Substances

VARIABLE	*PRELIMINARY WATER QUALITY RESERVE*[2]
Total ammonia -N (NH_3 plus NH_4^+)	*600 µg/ℓ*
Cyanide	*12 µg/ ℓ*
Fluoride	*5 000 µg/ ℓ*
Arsenic (As)	*12 µg/ ℓ*
Cadmium (Cd)	*4 µg/ ℓ*
Chromium (Cr)	*8 µg/ ℓ*
Copper (Cu)	*5 µg/ ℓ*
Lead (Pb)	*12 µg/ ℓ*
Mercury (Hg)	*0.3 µg/ ℓ*
Nickel (Ni)	*25 µg/ ℓ*
Silver (Ag)	*5 µg/ ℓ*
Zinc (Zn)	*25 µg/ ℓ*
DDT	*0.001 µg/ ℓ*
Dieldrin	*0.002 µg/ ℓ*
Endrin	*0.002 µg/ ℓ*

2. *No data were available from the catchments to set the water quality reserve for toxic substances in river inflow into the estuary. With no large agricultural or urban developments in catchments, however, this is not considered a major issue at present. As an interim recommended water quality target, values for coastal marine waters in Southern Africa can be used as a benchmark to indicate any potential risks (DWAF, 1995).*

Water Quality within the Estuary

Because estuaries also naturally receive water from the sea and there are large biogeochemical differences between freshwater and sea water, the quality of water within an estuary cannot be equated merely to the quality of river inflow. As a result, RQOs for the quality of water within an estuary are also required. As with the reserve for water quality, these are defined as TPCs, in other words measurable end-points related to specific indicators that, if reached, prompt management intervention. Examples of the way in which RQOs are typically expressed for water quality within an estuary are the following:

PARAMETER	*TPC*
Salinity	*Salinity is greater than 20 ppt for longer than 3 months at 7 km upstream from the mouth (brackish salt marsh, reeds and sedges, and invertebrates).* *Salinity of groundwater increases to 50 ppt and the depth of the water-table to 1 m (flood plain salt marsh).* *Total dissolved solids (a measure of salinity) of river inflow exceed 3 500 mg/l (phytoplankton).* *Salinity in the estuary exceeds 35 ppt (prevents hyper-salinity) (for phytoplankton).* *Salinity greater than 10 ppt occurs above 16 km upstream of the mouth (for fish).*
Turbidity	*Secchi disc reading above 8 km from the mouth is greater than 1 m (used as a proxy for turbidity concentrations in the estuary).*
pH	*pH > 8.5 or < 6.5*
Dissolved oxygen (DO)	*Water column DO drops below 4 mg/l (1 m above the bottom except in deep holes) (need to investigate the DO level at night in dense macrophyte beds)*
Inorganic nutrient concentrations	*When average river inflow is less than 5 m^3/s and average DIN concentrations in the upper reaches of the estuary (above 16 km from the mouth) exceed 100 µg/l* *During high flow season (flows > 20 m^3/s), average DIN concentrations in the upper reaches of the estuary (above 16 km from the mouth) exceed 500 µg/l.* *Average DRP concentrations in the upper reaches of the estuary (above 16 km from the mouth) exceed 100 µg/l.*
Toxic substances	*Concentrations exceed the target values recommended in the South African water quality guidelines for coastal marine waters (DWAF, 1995).*

3. Managing Water Quantity and Quality Activities

Links between specific activities (that may affect water quantity and quality in estuaries) and sections in key legislation are listed below:

<table>
<tr><th>ACTIVITIES</th><th>KEY LEGISLATION</th></tr>
<tr><td>Taking water from a water resource (surface and groundwater abstraction) or storing water</td><td rowspan="8">Section 21 of the NWA classifies these activities (largely influencing freshwater flows) as a water use that requires authorisation from the DWA. More details on such activities are provided in Section 21. Operational-management procedures and actions are typically specified in individual license agreements.

Under Section 39 of the NWA, DWAF promulgated a general authorisation (2004) (www.dwaf.gov.za/Documents) in terms of which certain activities classified as a water use exempt a water user from applying for a license.

Part 8 of the NWA also states that a water use may be subject to an EIA (under NEMA).

Section 12 of the Water Services Act requires water services authorities (municipalities) to prepare water services plans (WSPs) as part of IDPs. Details on the content of WSPs are provided in Section 13 of the Act.</td></tr>
<tr><td>Impeding or diverting the flow of water in a watercourse (e.g. inter-basin transfers)</td></tr>
<tr><td>Conducting activities resulting in stream-flow reduction (e.g. afforestation, cultivated land and alien vegetation)</td></tr>
<tr><td>Irrigating land with wastewater generated through an industrial activity or a waste-treatment works</td></tr>
<tr><td>Modifying atmospheric precipitation</td></tr>
<tr><td>Conducting power-generation activities altering the flow regime of a water resource</td></tr>
<tr><td>Providing water services (or supply)</td></tr>
<tr><td>Discharging waste or water containing waste (e.g. municipal and industrial wastewater, contaminated storm-water run-off, contaminated river run-off due to e.g. inappropriate catchment practices)</td><td rowspan="3">The EIA regulation issued under NEMA (Government Notice No. R386 of 2006, Activity No. 25) requires an EIA "for the expansion of or changes to existing facilities for any process or activity, which requires an amendment of an existing permit or license or a new permit or license in terms of legislation governing the release of emissions, pollution, effluent".
The EIA regulation issued under NEMA (Government Notice No. R387 of 2006, Activity No. 1) requires an EIA for the construction of facilities or infrastructure, including associated structures or infrastructure, for any process or activity that requires a permit or license in terms of legislation governing the generation or release of emissions, pollution, effluent or waste and that is not identified in Government Notice No. R386 of 2006.
Section 21 of the NWA classifies these activities (largely influencing freshwater flows) as a water use that requires authorisation from the DWA. More details on such activities are provided in Section 21. Operational management procedures and actions are typically specified in individual license agreements.

Under Section 39 of the NWA, DWAF promulgated a general authorisation (2004) in terms of which certain activities, classified as water uses, exempt a water user from applying for a license.

Part 8 of the NWA also states that a water use may be subject to an EIA (under NEMA).

Section 7 of the Water Services Act regulates the industrial use of water, both in terms of use and in terms of the disposal of effluent (possible overlap with Section 21 of the NWA).</td></tr>
<tr><td>Disposing waste in a manner that may detrimentally impact on a water resource (e.g. littering, solid-waste dumping, septic and conservancy-tank seepage and marine-aquaculture waste)</td></tr>
<tr><td>Disposing in any manner water that contains waste from, or that has been heated in, any industrial or power-generation process (e.g. industrial wastewater or contaminated storm water runoff originating from an industrial area)</td></tr>
</table>

ACTIVITIES	*KEY LEGISLATION*
	Chapter 8 of the Integrated Coastal Management Bill (ICMB) deals with marine and coastal pollution control, specifically addressing the "Discharge of effluent into coastal waters". The ICMB does recognise DWAF's current involvement in such matters and proposes that such activities be managed and controlled in collaboration with DWAF. *Pollution in commercial ports governed under the National Ports Act, A and B. The Harbour Regulations (Notice No. 5621, 26 March 1982), issued previously remain in force (insofar as they are not inconsistent with the new Act) until amended or repealed under the new Act. Any reference in the regulations to "harbour" must be interpreted to mean "port".* *The MLRA governs pollution matters in fishing harbours, e.g. Laaiplek (in the Berg estuary). The Marine Living Resources Regulations (R1111, Government Gazette 19205, 2 September 1998, and later amendments) stipulate specific requirements in this regard, e.g. Regulation 87, which stipulates that all waste, except biodegradable household waste, generated on a ship must be taken back to the harbour and may not be disposed of at sea.*
Dumping of waste (e.g. dredge spoil)	*This Dumping at Sea Control Act (as amended in 1995) provides for the control of the dumping of substances in the sea (including estuaries). As per the London Convention, Schedule 1 stipulates "Prohibited Substances", including organohalogens, mercury, persistent plastics and high-level radioactive waste. Schedule 2 refers to "Restricted Substances", including arsenic, lead, cyanides, fluorides, scrap metal and ammunition. Under the Act, dumping requires a permit from DEAT, usually subject to environmental investigations. The dumping of any substance not mentioned in Schedules 1 and 2 (to be repealed by the ICMB) (see below).* *Chapter 8 of the ICMB, A and B, deals with marine and coastal pollution control, specifically addressing "Incineration and dumping at sea".*
Oil spills at sea	*Pollution matter linked to oil spills at sea is primarily governed under the Marine Pollution (Control and Civil Liability) Act.*
Ballast water discharges	*Details to be obtained from DEAT (MCM)*

From the above, it is clear that activities and developments that may impact on water quantity and quality in estuaries are regulated primarily under NEMA (EIA regulations) and the NWA (Section 21, Water Use Authorisation). The context of Resource Directed Measures for estuaries (in other words classification and RQOs under the NWA [DWAF, 2004a]) in relation to the EIA process (NEMA) and water-use authorisation process (Section 21 of the NWA) is schematically illustrated in Figure 5 (DWAF, 2004c). Resource Directed Measures of an estuary therefore provide the **objectives against which potential impacts of activities and developments need to be assessed**.

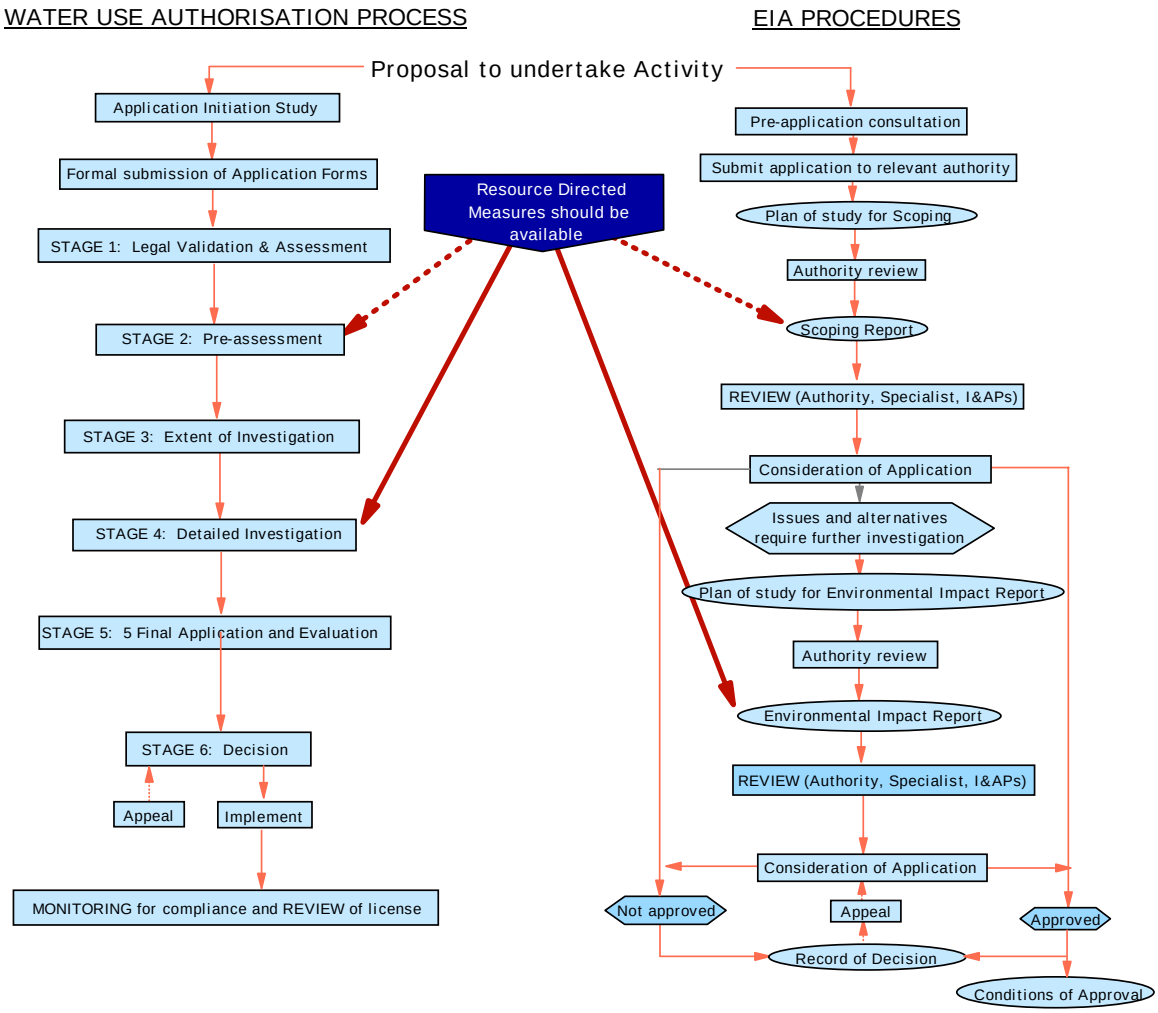

Figure 5. *Resource Directed Measures in the context of the EIA process (under NEMA) and Water Use Authorisation process (under Section 21 of the NWA)*

To assist applicants in the authorisation process under Section 21 of the NWA, DWAF has compiled a manual, *Water use authorisation process for individual applications* (DWAF, 2000) describing the administrative procedures and parties to be involved at different stages of the authorisation process.

In order to assist potential applicants, environmental assessment practitioners and interested and affected parties to understand what is required of them in terms of EIA regulations (2006), what their rights are and/or what their role may be, DEAT has prepared an integrated environmental management guideline series. This includes the following (www.environment.gov.za):

- Guideline 3: General guide to the EIA regulations;
- Guideline 4: Public participation;
- Guideline 5: Assessment of alternatives and impacts; and
- Guideline 6: Environmental management frameworks.

Several other best-practice guides and guideline documents are available to assist with the implementation of legislation, policies and protocols linked to the management and control of water quantity and quality in estuaries. Some of the more important and useful ones are highlighted in the following sections (documents can be accessed through the Legislation Guideline CD).

3.1 Management of Activities Affecting Water Quantity

The main activities posing threats to estuaries in terms of the modification of freshwater inflows (or water quantity) include the following:

- Damming;
- Water abstraction;
- Wastewater discharges (specifically linked to the volumes discharged); and
- Increased urban storm-water run-off.

These activities modify fresh-water inflows into estuaries from their natural conditions either by reducing inflow (such as damming or water abstraction) or by increasing inflow (such as wastewater discharges and urban storm-water run-off).

Key legislation that applies here are the following:

- Section 21 of the NWA listing specific activities requiring a licence, such as the abstraction of water and discharge of wastewater to estuaries. To assist applicants in the authorisation process, DWAF has compiled a manual, *Water use authorisation process for individual applications* (DWAF, 2000); and
- General authorisation (Government Notice No. 399, 26 March 2004) issued in terms of Section 39 of the NWA in terms of which certain activities, classified as a water use, exempt a water user from applying for a license.

3.2 Management of Land-derived Waste and Wastewater Discharges

With particular reference to the disposal of wastewater derived from land, South Africa adopted an operational policy for the disposal of land-derived water containing waste into the marine environment of South Africa, which includes a best-practice guide and appendices (DWAF, 2004b-d).

Although the final policy document was issued by DWAF (in terms of its responsibilities to manage land-derived wastewater discharges in terms of Section 21 of the NWA), it was developed in consultation with a wide range of stakeholders including local and provincial

DEAT bodies as well as representatives from other national, provincial and local government departments, industry, NGOs and the scientific community.

The operational policy falls within the category of best-practice guidelines and consists of the following:

- A goal;
- Basic principles, providing the broad-reference framework or direction of the policy;
- Ground rules, providing more specific rules derived from the broader context of the basic principles; and
- A management framework, providing a generic, structured approach within which to implement the policy.

Goal

To achieve water quality that is fit for use and that can maintain aquatic ecosystem health on a sustainable basis by protecting the country's water resources (including marine waters) in a manner allowing justifiable social and economic development. This will be achieved in accordance with the hierarchy of decision making for water-quality management. This hierarchy comprises the following:

- Prevent waste;
- Minimise waste; and
- Dispose responsibly.

Basic Principles

Basic principles provide the broad-reference framework or direction within which to develop ground rules for the disposal of land-derived wastewater into the marine environment and for the management of such wastewater:

PRINCIPLE 1: POLLUTION PREVENTION, WASTE MINIMISATION AND PRECAUTIONARY APPROACH

This hierarchy of decision making is as follows:

1) Pollution prevention, preventing waste production and pollution wherever possible.

2) The minimisation of pollution and waste at source, minimising unavoidable waste through the following:

- *Recycling*
- *Detoxification*
- *Neutralisation*
- *The treatment and reuse of waste streams*
- *Cleaner technologies and best-management practices*

3) Responsible disposal, applying the differentiated approach:

- *Apply wastewater standards as a minimum requirement.*
- *If wastewater standards are not sufficient, maintain fitness for the use of the receiving water body in accordance with the receiving water-quality objective approach.*
- *Exemption from compliance with wastewater standards will be considered only in exceptional circumstances provided that the receiving water body remains fit for use in accordance with the receiving water-quality objective approach.*

PRINCIPLE 2: RECEIVING WATER-QUALITY OBJECTIVES APPROACH

The requirements of the aquatic ecosystem as well as the requirements of the beneficial uses of the water resource will determine the objectives to be met (rather than a uniform effluent standard approach being followed as was the case with the general and special standard under the previous Water Act [No. 54 of 1956]). This principle applies to the marine environment as well.

PRINCIPLE 3: INTEGRATED-ASSESSMENT APPROACH

The operational policy will adhere to the principles of integrated environmental management, taking cognisance of concepts such as strategic environmental assessment and environmental-impact assessment and supporting the following underpinning principles:

- *"Cradle-to-grave".*
- *Strategic adaptive management (i.e. "improving-by-learning" and "thinking strategically while implementing locally").*
- *Best practice (to be developed by a regulator and implemented on an obligatory basis by the regulated community as a minimum for responsible source management).*
- *Consistent performance (i.e. all water users and impactors within the regulated community are required to ensure and strive for the same water-quality goals at the same risk level).*
- *Flexibility in approach (i.e. the regulator has the flexibility to consider the application of different alternatives and approaches provided that each of these is capable of meeting the desired objectives and requirements of the source management strategy.*
- *Continuous improvement (encouraging continuous improvement in the actions and practices of both government and the regulated community).*

PRINCIPLE 4: POLLUTER-PAYS PRINCIPLE

The responsibility for environmental costs incurred for the rehabilitation of environmental damage and the costs of preventive measures to reduce or prevent such damage will be shifted to impactors through, for example, the implementation of a waste-discharge charge system.

PRINCIPLE 5: PARTICIPATORY APPROACH

Transparent stakeholder participation will be required not only as part of the decision-making process (e.g. the environmental-impact assessment process and setting of common environmental-quality objectives) but also through ongoing transparent and open communication on a status quo basis during design, construction and operations. Local management institutions (e.g. pipeline or catchment forums) can be used for transparent stakeholder involvement throughout the process from application through to report-back on monitoring results.

Ground Rules

Ground rules are derived from the broader context of the basic principles and provide more specific rules that will be applied by government in the consideration of license applications to dispose of land-derived wastewater into the marine environment. A summary of the ground rules of the operational policy for the disposal of wastewater into the marine environment is given below:

Ground rules related to legislative framework:

1: The disposal, in any manner, of water that contains waste from or that has been heated in any industrial or power-generation process must be licensed by DWAF in terms of Section 21(h) of the NWA. A person who uses water must also return any seepage, run-off or water containing waste that emanates from that use to the water resource from which the water was taken, unless the responsible authority directs otherwise or the relevant authorisation provides otherwise (Section 22[2][e]).

2: The disposal of land-derived wastewater into the marine environment is subject to an EIA under the Environmental Conservation Act (No. 73 of 1989). The EIA process is administered by DEAT.

3: A licence issued for a water use, including the disposal of land-derived wastewater into the marine environment, is subject to review every five years (a provision of the NWA, Sections 28 and 49). Revisions can also be motivated on the grounds of

negative impact on the environment and non-compliance with licence conditions.

4: *The discharge of land-derived wastewater into any area declared a marine protected area under the MLRA is prohibited.*

5: *Any land-derived wastewater discharge into the marine environment may be subject to a waste-discharge charge.*

Ground rules related to management institutions and administrative responsibilities:

6: *The disposal of land-derived wastewater into the marine environment is currently governed by DWAF under the NWA. DWAF will, however, work in consultation with relevant local, provincial and national government departments (in particular DEAT) as well as local management institutions (such as pipeline and catchment forums). This collaboration is required to ensure effective cooperative governance in the management of waste disposal into the marine environment of South Africa.*

7: *The disposal of land-derived wastewater into the marine environment (whether offshore, the surf zone or estuaries) must be managed through a local management institution. This can be an existing institution, such as a pipeline forum, monitoring committee, pipeline advisory committee, water-quality committee or catchment forum. Representation must include government authorities (that hold jurisdiction) and non-government role-players (such as industries, users of the marine environment and non-government organisations).*

Ground rules related to environmental quality objectives (including sensitive areas):

8: *Estuaries are classified as sensitive areas. The disposal of municipal and industrial wastewater into these systems will therefore not be considered except in exceptional circumstances where such inflows are required to improve or maintain RQOs (also taking into account the effects of water quantity) or where ecological functioning has been irreversibly modified to support commercial harbours. In the latter case, the RQOs of other designated beneficial uses of the area, however, must be met as a minimum.*

Municipal and industrial wastewater discharges into estuaries that were existing lawful water uses on 31 May 2004 will be re-evaluated during the five-yearly licence-review process. Revisions can also be motivated on the grounds of negative impact on the environment and non-compliance with licence conditions.

9: *The surf zone is classified as a sensitive area. The disposal of municipal and industrial wastewater into the surf zone should therefore be avoided. Where legitimate motivation can be provided (such as in cases where sea water used on land is returned to source), the environmental-quality objectives for the study area must be met as a minimum. These include objectives pertaining to the alteration of the natural-salinity regime (in the case of freshwater discharges) and aesthetic impacts associated with the visibility of the discharge practice on land.*

Municipal and industrial wastewater discharges into the surf zone that were existing lawful water uses on 31 May 2004 will be re-evaluated during the five-yearly licence-review process. Revisions can also be motivated on the grounds of negative impact on the environment and non-compliance with licence conditions.

10: *The discharges of land-derived wastewater into offshore marine waters through a marine outfall may be considered as an option provided that the suitability of the areas to accommodate such activities is properly assessed.*

11: *Site-specific environmental-quality objectives for the marine environment (excluding estuaries) must take into account the South African water quality guidelines for coastal marine waters (DWAF, 1995) or any future updates thereof.*

12: *Where, in exceptional circumstances (as listed in Ground Rule 8), a discharge into an estuary is considered, RQOs must be determined according to the methodology for estuaries developed by the Directorate: Resource Directed Measures (DWAF, 2004d and future updates thereof). Estuaries are included in the definition of "water resource" in the NWA and objectives must therefore be determined in accordance with Chapter 3 of this Act.*

13: *Environmental-quality objectives must be met within the area beyond the initial mixing zone.*

Ground rules related to activities and associated waste loads (i.e. municipal, industrial and diffuse wastewater sources):

14: *South Africa is a water-scarce country. The marine disposal of land-derived municipal wastewater (particularly freshwater) will therefore be considered only where it has been evaluated in terms of the water-services development plan for a particular municipal area (required under the Water Services Act and that, in turn, forms part of the IDPs required in terms of the Local Government Transition Act [No. 209 of 1993]). This requirement supports the concept of a "master plan for water supply/demand and wastewater treatment".*

15: *Municipal Waste Water Treatment Works (WWTW) receiving industrial effluent (also referred to as trade effluent) will be subject to the ground rules for industrial wastewater (refer to Ground Rules 19 to 22). Service providers or local authorities operating such treatment works will be required to prepare industrial wastewater-management plans (as part of the master plan). It is also the responsibility of the service provider or local authority to investigate possible synergistic and/or*

cumulative effects that may occur as a result of the interaction between different (industrial) wastewater inputs.

16: *The design, construction and management of collection systems (in other words the land-based facilities at which wastewater is collected prior to discharge into the marine environment) are outside the scope of this operational policy. The design, construction and management of such systems must comply with related policies and specifications of DWAF.*

17: *In support of i) DWAF's strategic view of "enforcing source controls to get as close as possible to a situation in which there is no discharge of pollutants into our water" (referring to the strategic view), ii) the hierarchy of decision making (as reflected in Principle 1) and iii) international practice, primary treatment will be required as a minimum for the disposal of municipal wastewater into the offshore marine environment. This minimum requirement will apply to all marine outfalls to be authorised after 31 May 2004. For marine outfalls that were already authorised by 31 May 2004, preliminary treatment will be accepted as a minimum requirement, provided that the receiving environment is suitable for this marine disposal and that the environmental (or resource) quality objectives are met. Future expansions to or upgrades of such existing marine outfalls will, however, require the primary treatment of wastewater prior to discharge unless it can be proven that key socio-economic factors require otherwise. Environmental (or resource) quality objectives must nevertheless still be met.*

As a minimum, secondary treatment with disinfection will be required for disposal into the surf zone and estuaries. This applies to wastewater discharges into the surf zone and estuaries that existed on 31 May 2004 and those to be authorised thereafter (where such discharges are allowed – refer to Ground Rules 8 and 9).

NOTE: The above set minimum requirements: where such levels of treatment still do not meet the requirements of the receiving environment as defined in terms of the environmental (or resource) quality objectives, higher levels of treatment will be required.

18: *The disposal of sludge arising from wastewater-treatment facilities (such as primary, secondary and tertiary) must occur in accordance with the minimum requirements for waste disposal by landfill (DWAF, 1998) and the sludge guidelines (DWAF, 1997; DWAF, 2002 and DWAF, 2006) of DWAF or any future updates of such policies or guidelines.*

19: *The following are classified as industrial wastewater, requiring a licence under Section 21 of the NWA for disposal into the marine environment:*

- *Water used in an industrial process on land.*
- *Contaminated (or polluted) storm-water run-off originating from industrial premises on land.*
- *Freshwater or sea water used as cooling water on land.*
- *Sea water used in an industrial process on land, such as seafood processing, coastal-mining activities and return flows from oceanariums.*

20: *An industry discharging wastewater into a municipal WWTW or directly into the marine environment (or applying for a licence to do so) will be required to provide a detailed description of the waste stream in terms of both volume (quantity) and quality (in other words a list of all substances present and their concentrations and loads). Where industries discharge wastewater into a WWTW, the water-services provider is responsible for obtaining this information from the industries concerned. DWAF or a local authority may also require a detailed inventory of the raw materials and process material used by an industry.*

21: *Industrial wastewater discharged into a municipal WWTW disposing into the marine environment will be subject to appropriate pre-treatment. It is the responsibility of the local authority operating the WWTW to ensure compliance in this regard.*

22: *Wastewater containing radioactive substances is governed by the Department of Minerals and Energy (in concurrence with DEAT and DWAF) and must comply with policy developed in this regard.*

23: *Diffuse land-derived wastewater (such as urban storm-water run-off, agricultural return flows and contaminated groundwater seepage) discharged into the marine environment should not have any negative impact on the receiving environment, in other words the environmental-quality objectives must be met.*

Ground rules related to scientific and engineering assessment:

24: *A licence application for the disposal of land-derived wastewater into the marine environment will be considered only where a holistic process has been followed for the disposal of land-derived wastewater into the marine environment. This implies*

that potential impacts on the receiving environment be investigated in both the near and the far field, taking into account other anthropogenic activities and waste inputs to address possible synergistic and/or cumulative effects. Guidelines in this regard are provided in the official policy documentation (DWAF, 2004c).

25: A licence application for the disposal of land-derived wastewater into the marine environment will be considered only where a discharge system is designed, constructed and operated in accordance with recognised scientific, hydraulic and structural guidelines in order to meet environmental-quality objectives.

26: Recognised numerical-modelling techniques must be applied in the scientific and engineering assessment and design of a marine disposal system as and where considered appropriate and according to recognised scientific and engineering guidelines.

27: A precautionary approach must be followed in the assessment and design of any marine disposal system in which the temporal and spatial coverage and accuracy of physical and chemical oceanographic data do not adequately describe site-specific conditions.

Ground rules related to monitoring and contingency plans:

28: Any authority or industry responsible for the operation and management of a marine disposal system will be subject to the implementation of a monitoring programme.

29: Authorities operating WWTW that receive industrial wastewater (also referred to as trade effluents) must ensure that monitoring programmes are implemented to record the individual flow and composition of such wastewater inputs prior to it entering the wastewater reticulation system as part of their industrial wastewater-management plan.

30: Any authority or industry responsible for the operation and management of a marine disposal system will be required to prepare contingency plans pertaining to maintenance shut-downs, failure in operations and disasters.

31: Any authority or industry responsible for the operation and management of a marine disposal system will be required to provide DWAF with a regular evaluation of the performance of the marine disposal system.

32: Where performance evaluations indicate non-compliance with predetermined specifications (including environmental-quality objectives), the responsible authority or industry will be required to propose mitigating actions to ensure compliance (such as rehabilitation or alternative treatment options). The responsible authority and the industry operating the wastewater-disposal system will be required to implement such actions at their own cost on approval by DWAF.

33: The decommissioning of a marine-discharge structure must be addressed in the planning stages as part of the EIA process, supporting the cradle-to-grave principle. In the case of existing marine-discharge structures (authorised prior to 31 May 2004), the authority, service provider or industry responsible for the operation and management of the marine discharge will be required to conduct decommissioning in an environmentally responsible manner. This may require an EIA.. Negotiations should be conducted on a case-by-case basis and should involve DWAF, DEAT, the authority, service providers or industry responsible for the marine discharge and any other parties that may be affected by the decommissioning process.

Management Framework

The management framework provides guidance on a generic and structured approach within which the management and control of disposal of land-derived wastewater into the marine environment of South Africa, including discharges into estuaries, need to be conducted. Details are provided in policy documentation (DWAF, 2004c).

Another key concern in terms of land-derived wastewater is diffuse sources, such as urban storm-water runoff. Here DWAF produced a number of guideline documents to assist in the management and control of these sources. These include the following:

- A framework for implementing non-point source management under the NWA (Pegram et al., 1999);
- A guide to non-point source assessment (Pegram and Görgens, 2001);
- Guidelines for human settlement planning and design – The Red Book (CSIR, 2001); and
- The management of the water-quality effects of settlements (DWAF, 1999a; DWAF, 1999b; DWAF, 2000) (detailed guidelines can be obtained from www.dwaf.gov.za/Projects/Dense/).

In terms of the management of other land-derived (solid) waste, DWAF has also published documents specifying minimum requirements and guidelines for the following:

- Waste disposal by landfill, (DWAF, 1998a);
- The monitoring of a waste management facility (DWAF, 1998b); and
- Sludge disposal guidelines (DWAF, 2006).

DWAF is also in the process of developing a strategy for a waste-discharge charge system (DWAF, 2003). The aim here is a) to promote the sustainable development and efficient use of water resources, b) to promote the internalisation of environmental costs by impactors and c) to recover some of the costs of managing water quality.

3.3 Management of Dredged-spoil Dumping

These activities are of particular relevance to estuaries that are used as harbours or commercial ports, such as the Buffalo estuary (in East London). Dredged material to be dumped at sea requires a permit under the Dumping at Sea Control Act (to be replaced by the National Environmental Management: Integrated Coastal Management Bill). In this regard, DEAT has published pollutant limits (for substances listed in Annexures I and II under the London Convention) that need to be complied with before a permit to dump at an authorised dump site at sea will be issued (Guidelines for the management of dredge spoil in South African waters, unpublished document, DEAT). These are as follows:

ANNEXURE I SUBSTANCES (UNITS IN PPM)

SUBSTANCE	*SPECIAL CARE*	*PROHIBITION*
Cadmium	*1.5-10.0*	*> 10.0*
Mercury	*0.5-5.0*	*> 5.0*
Combined levels of above	*1.0-5.0*	*> 5.0*
Organohalogens	*0.05-0.1*	*> 0.1*
Oils	*1 000-1 500*	*> 1 500*
Persistent plastics: 4% by volume, suitably comminuted		
Radioactive materials: To be determined by the International Atomic Energy Agency (IAEA)		

ANNEXURE II SUBSTANCES (UNITS IN PPM)

SUBSTANCE	*SPECIAL CARE*	*PROHIBITION*	*8th CONSULTATIVE MEETING**
Arsenic	*30-150*	*> 150*	*1 000*
Chromium	*50-500*	*> 500*	
Copper	*50-500*	*> 500*	*1 000*
Lead	*100-500*	*> 500*	*500*
Nickel	*50-500*	*> 500*	
Zinc	*150-750*	*> 750*	*1 000*
Combined levels	*50-500*	*> 500*	*1 000*
Cyanides	*-*	*0.1*	*1 000*
Fluorides	*-*	*-*	*1 000*
Organosilicon	*-*	*-*	*1 000*
Pesticides	*-*	*-*	*500*

**According to the agreement at the eighth consultative meeting of contracting parties to the London Convention, significant amounts for these substances were $\geq$ 0.1% by weight or 0.5% by weight for lead and pesticides.*

3.4 Management of Oil Pollution

Coastal oil-spill contingency plans issued under the Marine Pollution (Control and Civil Liability) Act detail the actions to be taken when there is a threat of oil impacting on the shoreline or when an impact has occurred. Local authorities in coastal regions play an important role in the execution of such plans. Their tasks are detailed in the documents. These coastal plans are being re-drafted and it is therefore important that local authorities clarify their responsibilities in this regard (MCM can be approached for more information).

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