DESIGN OF WASTE MANAGEMENT FACILITIES

In the interest of economic development, organisations produce various types of waste ranging from general waste to hazardous waste. The need for environmentally acceptable, yet cost effective waste management solutions has become increasingly important. Every organisation is accountable for managing and disposing of their waste in a responsible manner that takes all reasonable steps to prevent harm to the environment. Therefore, every organisation producing waste should have a waste management facility for the handling, treatment, storage and/or safe disposal thereof. Examples of these waste management facilities include transfer stations, recycling facilities, treatment facilities and landfill sites.

GCS has the necessary experience and capability to provide various organisations with practical and thorough designs for their waste management facilities. The designs address the following:

- Identification of waste type, quantities and inherent characteristics of the waste and possible impact to the environment
- The prevention and mitigation of any adverse impacts identified during site investigations and the Environmental Impact Assessment
- The prevention of contamination of ground and surface water resources.

GCS compiles a detailed design of waste management facilities according to any prescribed regulatory requirements, for example, the South African National Norms and Standards for Disposal of Waste to Landfill and the National Environment Management Waste Amendment Act, 2014.

GCS addresses the following aspects in the design report for a waste management facility:

- Waste management facility planning and development
- Management of cover material, in the case of landfills
- Waste management infrastructure such as access and access control, workshops and weigh bridges, office buildings and ancillaries including ablution facilities
- Control and drainage of clean and contaminated water
- Containment barrier design, if applicable
- Collection, handling and treatment of leachate
- Water quality monitoring
- Gas abstraction systems, if required
- Landscaping and planning of zoning and land-use after closure
INTEGRATED WASTE MANAGEMENT PLANNING

The National Environmental Management Waste Act, 2008 (NEMWA) requires that municipalities (Section 11 of NEMWA) and industries (Section 28) should prepare Waste Management Plans. GCS designs integrated sustainable municipal and industrial waste management plans to provide the most cost effective, technically and environmentally acceptable solutions to the total waste management of the municipality or industry. This includes:

A status quo / Situation Analysis study:
The exact status of waste management of the total study area is determined. This involves understanding what and how much waste is generated currently and will be generated in the future and how it is being managed and disposed of.

Identifying gaps and needs to achieve the desired end state:
Any gaps in the current waste management system are identified. Needs are determined to reach the desired end state.

Drafting solutions for waste management problems and/or problem areas:
Once the gaps and needs are understood, goals and objectives are set for addressing the waste management problems.

Alternatives Investigation:
Various options are compared and evaluated for each waste management problem identified, and the feasibility of each option is determined.

Formulation of an integrated waste management and implementation plan:
An integrated waste management plan is compiled; outlining the process and providing the most cost effective solutions to the collection of all the waste, possible locality and type of transfer stations, transportation, processing of special wastes and disposal. A targeted timeframe is set for each recommendation made, including the associated cost for implementation.

Integrated waste management is an ongoing process that will require continuous attention and revision.
REGIONALISATION STUDIES AND THE DESIGN OF WASTE TRANSFER STATIONS

The GCS Waste Management team realises the need to regionalise waste disposal by establishing a regional landfill with transfer infrastructure. The collection, and more specifically transportation, of solid waste — especially in metropolitan areas where waste is transported over relatively long distances — constitutes a large component of the cost of waste disposal. Our regionalisation studies endeavour to find the optimal location for transfer stations, the most cost effective mode of transport, as well as the routing of vehicles resulting in the best utilisation of equipment, which in turn leads to enormous cost savings.

The GCS Waste Management team designs transfer stations, where waste from collection vehicles or individuals is transferred to bulk containers and taken to a landfill or disposal facility. The following design variables are considered before a transfer station is designed:

- Required capacity and amount of waste storage desired
- Types of waste received
- Processes required to recover material from waste
- Types of collection vehicles using the facility
- Types of transfer vehicles that can be accommodated at the disposal facilities
- Site topography and access

GCS designs transfer stations by planning the most efficient layouts and most cost-effective design of surfacing, retaining walls and mechanised and electrical plants, as well as performing the licensing of the site, if necessary. A suitable solution to the problem is not necessarily the most expensive or complicated solution.
POLLUTION BARRIER DESIGNS

Every organisation is accountable for the management and disposal of waste in a responsible manner by taking all reasonable steps to prevent harm to the environment. Where disposal to land is the preferred option for an organisation’s waste management, an effective barrier design will be required. This will require an engineering solution to the waste management option that will consider site conditions, waste characteristics, facility lifespan, barrier compatibility and stability.

GCS can design appropriate barrier systems for each waste that may be required. Together with the barrier design, associated pollution control measures will be necessary. The pollution control measures include, amongst others, surface water separation and containment, as well as subsurface migration control. It also includes storm water control berms, channels and subsoil drains.

The design of pollution barrier systems must take into account the following aspects:

- Liner compatibility, durability and stability
- Conformance to the required legislation and regulations
- Protection of barrier systems to simplify operational management
- Operations and water (clean and dirty) management
- Site conditions (fatal flaws, ground water, topography)
- Type of management and operations should always be considered
WASTE MANAGEMENT LICENCE APPLICATIONS

The GCS Waste Management Team assists clients with waste management licence applications for their existing or proposed listed waste management activities in terms of the National Environmental Management Waste Act, Act 59 of 2008. These activities include the storage of waste, waste re-use, waste recycling and recovery activities, waste treatment and waste disposal activities, as well as the construction/closure and/or upgrading of the mentioned facilities, and associated structures and infrastructure. Waste management licence applications are compiled according to the requirements and standards of the relevant legislation and promulgated NEMWA regulations.

GCS covers the following aspects as part of a waste management licence application:

- Public participation process
- Consultation with DEA, DWS and various Provincial Environmental Departments
- Type and quantities of waste
- Expected lifetime of sites
- Classification of the waste streams
- Finding suitable locations concerning adjoining land-uses, accessibility, wind direction, visibility, geotechnical and geohydrological aspects, and any other factors that may be influential
- Environmental Impact Assessment
- Operational methods
- Design (new and upgrades) for waste management facilities according to national norms and standards
- Closure and end-use plans
- Proposed land-use after decommissioning.

The Waste Management Group draws on the GCS Water and Environmental divisions to assist with necessary specialist studies as part of a waste management licence application such as:

- GIS for site selection studies, route planning and visual impacts
- Geotechnical and engineering geology for material selection, soils investigations and stability analysis
- Hydrogeology - assessment of the groundwater regimes, aquifer vulnerability and contaminant migration
- Surface Hydrology - rainfall run-off modelling, storm water control and assessment of flood return periods
- EIA - use of GCS in-house EIA expertise for licencing and regulatory processes.

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AUDITING OF WASTE MANAGEMENT SYSTEMS

GCS has the necessary skills and experience to conduct external waste management facility auditing for clients as per the conditions of the licences issued in terms of the National Environmental Management Waste Act, 2008 or the National Water Act, 1998.

GCS provides an objective assessment to the authorities or client in terms of how a waste management facility is managed and monitored and whether compliance with legal conditions are being achieved. The benefits of auditing include:

- Highlighting the environmental responsibilities of licence holders regarding waste management facilities, and encouraging the preservation of the environment for future generations
- Providing for improved compliance with waste management facility licences and raising the standard of operation, monitoring, recording and reporting by highlighting non-compliance and problem areas
- Providing solutions to non-compliance and problem areas.

The following steps are followed by GCS when conducting a waste management facility audit:

1. A pre-audit meeting will be held with the client to determine the exact detail of all audits previously executed.

2. To ensure that all aspects of the site licence comply, a comprehensive audit control sheet will be used to record all compliance and non-compliance issues and recommendations. To assist with further deviations, a photometric system will be implemented. The audit will include the following aspects:
   - Review the existing licence conditions and requirements thereof
   - Take into account the principle of cradle to grave waste management
   - Collect and interpret existing available data and test results

3. GCS compiles a comprehensive audit report, which will include the following:
   - The findings from the site visit and interviews with management
   - The non-compliance issues
   - The compliance items
   - Interpretation of available data and test results.
   - Recommendations and proposed solutions to non-compliant and problem areas
   - Compliance auditing provides insight into possible ways of improving the waste management system in use.