CHAPTER-I

1.0 INTRODUCTION

With growing concern for protection of environment which has rapidly developed on a world wide scale, during the past twenty years in particular, the management and disposal of municipal solid wastes have assumed a critical role in today's society. Further, the production and composition of municipal solid wastes have changed substantially in recent years because of changing pattern of living, population-shits, and other reasons. Where once solid wastes were mostly domestic, they are now produced in substantial quantities by industry and commercial means as well. Solid waste from industry may pose special problems such as non-degradability (plastics) and toxicity (chemical residues).

The ultimate disposal of these municipal solid waste by open dumping in lowlying areas accounts for the deposition of a majority of solid waste produced in India. Approximately, there are more than 3,100 open dumping fills accepting more than 85,000 tons of household, commercial, industrial and municipal solid waste per day (Government of India, 1985). The disposal of such huge quantities of solid wastes by open dumping is not without its environmental impact. When solid waste is dumped in lowlying areas, it comes in contact with ground water or rain water resulting in the generation of leachate, a mineralised liquid which
contains organic and inorganic substances. This may move out of the disposal site. Under normal conditions, leachate is found at the bottom of the dumped material. From there, its movement is through the underlying strata, although some lateral movement may also occur, depending on the characteristics of the surrounding material.

A number of incidents have been reported where leachate has contaminated the surrounding soil and polluted the underlying ground water aquifer or nearby surface water (Saprykina, 1977; Olaniy and Saxena, 1977; Nicholson et al., 1983; Vogl et al., 1985; Jaroslav, 1985). A review of the literature on the impact of these leachate on ground water quality leads to the conclusion that most often the changes in the quality of ground water, that are to be expected are on the increase of total hardness, alkalinity, calcium, magnesium, sodium, potassium, chlorides, sulphates, and carbon dioxide/bicarbonate (Zanoni, 1973). The physical pollution introduced by the waste into surface water can be in terms of turbidity and colour. In the case of waste mass undergoing anaerobic decomposition, the produced hydrogen sulphide (H₂S) adds the taste and odour to the waste while carbon dioxide (CO₂) forms H₂CO₃ and it dissolves Ca, Mg, Na, K, Fe, Mn, etc., from the surrounding strata.

Considerable amount of literature on the pollutant release from the solid waste of western countries is
available from a number of studies. As Indian city refuse is known to have much different characteristics as which has been reported by Government of India (1985), Patil et al., (1985), Sastry and Rao (1984), it is necessary to study the pollutants release from these solid wastes under simulated laboratory conditions or field studies at disposal sites.

The field investigation requires installation of monitoring wells for ground water quality and coring the soil samples adjacent to the municipal disposal sites to identify the nature of contaminants and to determine their distribution in the soil and ground water beneath the land-fill site. Although, the potential damage in general can be demonstrated by the field investigation, the migration pattern of the contaminants that are released from the waste material at specific sites cannot be accurately predicted. However, both laboratory and field studies can accurately assess the contaminant release from the waste material and consequent damage to the underlined soils and ground water quality.

As it is very clear that municipal solid waste dumps based on their intrensic properties of leachates are noxious waste streams, that pose a potential threat to public health. The magnitude of such health hazards especially due to ground water pollution largely depends upon the ability
of the underlying soils. As such, studies are also conducted to investigate and evaluate the attenuating capability of different types of soils. A resistivity survey was also conducted in the vicinity of the presently available two municipal solid waste disposal sites which are in continuous operation of varying lengths of time. This is particularly carried out in order to determine the extent of ground water contamination due to the long term disposal of solid wastes.

The major objectives of the present investigation are:

1) To evaluate the leachate quantities and pollutional characteristics of the leachate generated through simulated landfills using Tirupati municipal solid waste with time,

2) To identify the attenuation capability of major types of Indian soils for leachate, and

3) To conduct geophysical survey and analysis of ground water in and around the solid waste disposal sites for delineation of contaminated zones at two solid waste disposal sites in Tirupati, one of which has been in operation since 1966 and the other one since 1987.