Guwahati, with cardinal points of 26°11'N latitude and 92°49'E, is the prime city in the North Eastern India. The city is situated on the southern bank of the river Brahmaputra. It is 54.75m above the mean sea level, covering about 24 km in East-West direction and about 9 km in the North-South direction. The mighty Brahmaputra flows along the Northern boundary of the city while the Southern and Eastern boundaries are made by a number of hill ranges, which are extensions of the Khashi Hills. The Jalukbari - Azara plain makes the Western boundary of the city. The Master-Plan area of the city also covers Amingaon and North Guwahati on the Northern side of the Brahmaputra. Structurally, this region is situated on the 50 m thick alluvium of the middle Brahmaputra Valley. The city is situated on an outcrop of the stable rocky foundation of the Shillong Plateau.

Guwahati being the gateway to the northeast India, it has undergone rapid urbanization. The number of motor vehicles in this fast growing city, is also increasing very rapidly. The establishment of the Guwahati refinery (Indian Oil Corporation Limited, capacity 1 million ton) at Noonmati and other industries has contributed to rapid development of the city. Keeping pace with the development in the spheres of industry, trade and commerce, the city has continued to develop as the centre for education in the northeast region. As the state headquarters, it has become the major centre for all activities of the state including political, economic, educational, engineering, business and commerce, etc. The city is fast expanding to accommodate the ever-increasing population and the
hills have had to bear the brunt of settling the extra population. The ultimate result has been the degradation of the city's environment.

Wet precipitation has been considered as an effective cleanser of the atmosphere and source of trace metals to water bodies on a global basis. The study of wet precipitation and road run-off of Guwahati has not been undertaken before. The present work is an attempt in this direction.

The characterization of wet precipitation and surface run-off of Guwahati city is an extensive work, carried over a period of three years, on the constituents of wet precipitation and surface run-off. The thesis, reporting the results of this investigation, is divided into the following chapters:

- Introduction
- Experimental methodology
- Quality of wet precipitation
- Quality of surface runoff
- Conclusion
- Bibliography

The first chapter is essentially a review of the existing national and international literature on the wet precipitation and surface run-off quality. Based on the published literature, the environmental consequences of wet precipitation and surface run-off have been discussed with particular emphasis on those, which have direct relevance to the present work. A brief description of the city of Guwahati and its general environment is
included in this chapter. The objectives of the study have been formulated, on the basis of the literature search, as:

a) Determination of major ions e.g. Na⁺, K⁺, Ca²⁺, Mg²⁺, HCO₃⁻, Cl⁻, SO₄²⁻, NO₃⁻, PO₄³⁻, F in wet precipitation and surface run-off during individual rain events,
b) Determination of trace elements viz. Fe, Mn, Zn, Pb, Ca, Cr, Ni, V, Ba, B, Sb, Se, Sr and Cd in wet precipitation and surface run-off,
c) Characterization of wet precipitation and surface run-off with respect to physical parameters, pH, conductivity, alkalinity, and hardness,
d) Treatment of the data to get information about the source of major ions and trace elements, their concentration and input to the environment

The second chapter includes a description of the various methods adopted in this work. The environmental importance of all the parameters of study has also been discussed. The locations of the sampling sites and the procedure for sampling have been discussed thoroughly along with the techniques for preservation, pretreatment and analysis of the samples.

The third chapter contains the experimental results with respect to wet precipitation in Guwahati. Wet precipitation was characterized at 8 different locations in the city and samples were collected during 23 rain events in total over a period of three years. The physicochemical parameters reported for wet precipitation in the present work are pH, conductivity, major anions - HCO₃⁻, Cl⁻, SO₄²⁻, PO₄³⁻, NO₃⁻ and F, major cations - Na⁺, K⁺, Ca²⁺, and Mg²⁺, and trace elements - Cu, Ni, Cd, Pb, Zn, Fe, Mn, Cr, Sr, Se, Sb, V,
Ba and B. Each of the parameters is discussed separately with respect to concentration at the different sampling locations. The results have been presented in tabular form for all the parameters in a systematic manner along with minimum-maximum, mean and standard deviation of the values for each location over all the events. The data for each parameter are elaborately discussed pointing out the significant findings and trends if any. The ratios of the total cation to total anion contents of the rainwater were computed and the trends from one event to another in the same wet season were evaluated. The similarity or otherwise of the results with those obtained in different parts of the world has also been pointed out on the basis of published literature. Possible correlations among the parameters are found and the same have been used to predict the availability of the constituents under study in the environment. The results have been utilized to draw conclusion about the pollutional status of the city with particular emphasis on the constituents present in the city’s atmosphere.

Surface runoff quality is presented in the fourth chapter. The same constituents were studied for surface runoff as in wet precipitation. Experimental results are presented through tables and figures. Pattern of variation in the concentration of the components was studied for the entire period for each of the locations and the relative compositions are discussed in the light of existing literature. The concentrations of the components in runoff were found to exceed the corresponding values in wet precipitation. Inter-parameter correlation as well as correlation with the corresponding parameter in wet precipitation was found out and the results are discussed on the basis of such correlation.
Conclusions drawn from the work are summarized in the fifth chapter. Some of the major ions showed seasonal influence. Majority of major ion concentrations were found to be higher at the beginning and also towards the end of a wet season. The concentrations of the major ions were influence by the dry period preceding an event. The impact of a cyclonic storm in the Bay of Bengal was distinct in the consequent event in the last year of study. Among the major ions HCO₃⁻, Ca²⁺ and Cl⁻ were predominant followed by SO₄²⁻ and Mg²⁺ in wet precipitation. Both in wet precipitation and surface runoff, Fe was found in abundance relative to other elements and concentration of Fe in runoff exceeded those in wet precipitation by several order. In runoff, the concentrations of HCO₃⁻, Cl⁻, Ca²⁺, Mg²⁺ and SO₄²⁻ were significant. The pH of both wet precipitation and surface runoff was found to be neutral to slightly alkaline as a result of neutralization of acid components by alkaline Ca²⁺, Mg²⁺ carbonates present in the soil dust. The possible sources of the contaminants were envisaged as the anthropogenic rather than industrial. Fossil fuel combustion and automobile emissions were the main contributors of pollution around the Guwahati city.

The literature consulted in the study is listed in the detailed bibliography at the end of the thesis.