RANA ASSOCIATES
(INCINERATOR FACILITY)

RAWALPINDI

ENVIRONMENT IMPACT ASSESSMENT (EIA)

PREPARED BY
“M.I.S” CONSULTANTS

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EXECUTIVE SUMMARY

Mr. Muhammad Qamar Rana the proponent has planned to launch an “Incinerator Facility” at Khasra # 550, Mouza Gattia, WAH Cantt, District Rawalpindi.

As the development of an Incinerator Facility project falls in Schedule-II, Part-I of Punjab Environmental Protection Agency’s (Review of IEE and EIA) Regulations, 2000, the Guidelines for the Preparation and Review of Environmental Reports, an Environment Impact Assessment (EIA) of “Incinerator Facility” is required. Proponent of the project has engaged M.I.S Consultants to undertake Environment Impact Assessment (EIA) study of “Incinerator Facility”.

To establish the background environmental conditions of the project area, a detailed survey of the site was conducted. This included but not limited to topography, geology, hydrogeology, hydrology, climate, flora and fauna, socio-economic conditions, archaeology, present infrastructure and future proposed development plans for the project area. Information describing the existing environment was gathered from various sources including the client, statutory bodies, local interest groups and published work.

Proposed Incinerator having capacity of 100kg/hr will deal with both Hazardous Industrial waste as well as Hospital waste. It consists of three chambers, which are interconnected. The objectives of the proposed incinerator are:

- to incinerate hospital and industrial hazardous waste on non profit basis
- to prevent the spread of hospital waste to avoid diseases and injury
- to protect industrial, hospital and municipal workers
- to protect the public
- to prevent scavenging of hazardous risk waste
The approximate proposed cost for the incinerator is as follows:

| Material & Civil Cost | = | Rs. 5,00,000/- |
| Work Cost (Fabrication + Erection) & Mechanical Equipment Cost | = | Rs. 45,00,000/- |
| Total Cost | = | Rs. 50,00,000/- |

Most of the alternative methods to incineration have one or two disadvantages when compared to incineration. They are more expensive, require additional mechanical equipment such as shredders or have limitations in the type of waste that can be burned e.g. cytotoxic, pathological and chemotherapeutic waste.

Guidelines for sensitive and critical areas were reviewed, so that the proposed project is planned and sited in a way that protects the values of sensitive and critical areas. The project site is not located in these sensitive and critical areas.

The proposed site for incinerator is located in WAH Cantt at un-populated area with no any human settlement within 300 meters and also there is no chance of human population displacement to acquire the land. The site of the proposed project seems to have no visual impact on historical, archeological, and cultural resources and on landscapes, as the site does not fall near or in the boundaries of the protected areas. The project area is uninhabited. Hence resettlement and rehabilitation requirements are non-existent.

There is no surface water source near the project area. There is no environmentally sensitive area in the macro environment. No trees or greenery would be removed and no significant impact would occur on the demographic pattern or on the social and cultural values of the settled population.

NCPC-F analyzed the data of ambient air of proposed site. The findings of the monitoring indicate that the Ambient Air Quality of Asif Abad, WAH Cantt is generally good. Levels of (CO, SO$_2$, NO$_2$, NO and PM$_{10}$) are within the limits defined by USEPA, WHO and NEQS.
It was evident from the assessment of impacts that no significant damage to wildlife, vegetation or habitats is anticipated from the proposed project. Similarly no residential property recorded, Cultural/historical or archeological sites would be affected by the project. Furthermore, no adverse socio-economic impact of the project is envisaged. During construction phase of the project employment opportunities will be provided to local population.

Different methods are used for the impact identification. These include: Assessment through the stages of the Project, Checklists, Matrices and Networks. To minimize the effects of adverse impacts the EIA recommends mitigation measures. These mitigation measures include the use of alternative options, management and physical controls, or compensation in monetary terms.

The proposed mitigation measures are based on the understanding of the sensitivity and behavior of environmental receptors in the project area, the legislative controls that apply to the project and a review of good industry practices while operating in sensitive environments.

For the effective implementation and management of the mitigation measures, an Environmental Management Plan (EMP) has been prepared. The EMP satisfies the requirement of the Pakistan Environmental Protection Act and ETA Regulations. The EMP outlines the aims and objectives, defines the responsibilities of the project owners and contractor(s), and lays down the required communication, reporting procedures and mechanism through which the proposed measures will be monitored.

The report also covers Monitoring Plan; it will help to ensure compliance with the relevant legislation, implementation of the mitigation measures and long-term minimization of negative environmental impacts. The Monitoring Plan present a schedule with a description of any proposed phasing of activities, recommended mitigation measures and proposed methods of compliance.

After screening of probable environmental impact it can be concluded that;
• Project activities will cause temporary impacts on local environment all of which are reversible. During operational stage the project will not pollute the environment in normal circumstances except when an incident of spillage occurs. The impact of such incidents will be mitigated by surveillance, proper maintenance, immediate reports, safety and management plan

• No significant damage to wildlife, vegetation or habitats is anticipated from the proposed project

• No residential property, cultural/historical or archaeological sites would be affected by the project

• No adverse socio-economic impact of the project is envisaged

• During construction phase of the project employment opportunities will be provided to local population

• By adopting recommended mitigation and safety measures. Little environmental impacts of the project can be eliminated

Environmental Impact Assessment Report concludes that the setting up of Incinerator and the associated activities will lead to minor environmental effects which could be mitigated as illustrated in the report. The project will not add to degradation of the environment at the Project Area. Therefore, the proposed project is considered viable, of enormous potential benefits and environmentally friendly, as supported by this EIA report. Accordingly the EIA in the present form may be approved.

**MAJOR IMPACTS:**

The EIA Report comprises baseline data on the existing condition of the physical and biological environment, the anticipated environmental impacts, and proposed mitigation measures. Field surveys were undertaken to assess the physical and biological environment. Data has been collected from secondary sources to supplement the findings of the field survey. All the issues such as the ecology, management of construction, shelter and sanitation, use of equipments and machineries,
environmental health and safety, occupational hazard, social and environment management and monitoring plan have been dealt with in detail in the respective sections of the report. However, these are briefly enumerated below to have a quick assessment of the situation.

<table>
<thead>
<tr>
<th>CONSTRUCTION PHASE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POTENTIAL NEGATIVE IMPACTS</strong></td>
</tr>
<tr>
<td>Dust Emissions</td>
</tr>
<tr>
<td>Soil Erosion</td>
</tr>
<tr>
<td>Solid Waste Generation</td>
</tr>
<tr>
<td>Vehicular Traffic and Noise</td>
</tr>
<tr>
<td>Health and Safety of Workers</td>
</tr>
</tbody>
</table>
## OPERATION PHASE

<table>
<thead>
<tr>
<th>Potential Negative Impacts</th>
<th>Recommended Mitigation Measures</th>
<th>Monitoring Responsibility</th>
<th>Parameters for Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Waste</td>
<td>Waste will not be disposed off in the open and on-site burning of waste materials will be eliminated. Dedicated waste segregation units/containers will be built or placed.</td>
<td>Proponent</td>
<td>Solid waste Management</td>
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<tr>
<td>Noise Pollution</td>
<td>Generator and vehicles used during the operation will be properly tuned and maintained to minimize noise and air emission. The access road will be watered regularly to minimize dust emissions (if required).</td>
<td>Proponent</td>
<td>Noise Level</td>
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<tr>
<td>Waste Water</td>
<td>Contaminated water will be disposed off into municipal drains of nearest area.</td>
<td>Proponent</td>
<td>Water Quality</td>
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<tr>
<td>Environment and Landscape</td>
<td>Creation of Landscape by tree planting, species introducing or landscaping appropriate to local conditions will be done.</td>
<td>Proponent</td>
<td>Environment and Landscape</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Sr #</th>
<th>DESCRIPTION</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SECTION 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>INTRODUCTION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>Introduction of the Project</td>
<td>13</td>
</tr>
<tr>
<td>1.1</td>
<td>Background</td>
<td>13</td>
</tr>
<tr>
<td>1.2</td>
<td>Hazardous Waste</td>
<td>15</td>
</tr>
<tr>
<td>1.2.1</td>
<td>Classifying Hazardous Waste</td>
<td>15</td>
</tr>
<tr>
<td>1.2.2</td>
<td>Hazard Classes</td>
<td>16</td>
</tr>
<tr>
<td>1.2.3</td>
<td>Impacts of Hazardous Waste</td>
<td>17</td>
</tr>
<tr>
<td>1.3</td>
<td>Consultant</td>
<td>18</td>
</tr>
<tr>
<td>1.4</td>
<td>Objectives of the Project</td>
<td>18</td>
</tr>
<tr>
<td>1.5</td>
<td>Screening of the Project</td>
<td>19</td>
</tr>
<tr>
<td>1.6</td>
<td>Objective of the EIA Study</td>
<td>19</td>
</tr>
<tr>
<td>1.7</td>
<td>Scope of the Study</td>
<td>20</td>
</tr>
<tr>
<td>1.8</td>
<td>Project Area</td>
<td>20</td>
</tr>
<tr>
<td>1.9</td>
<td>Standards and Guidelines</td>
<td>20</td>
</tr>
<tr>
<td>1.10</td>
<td>Time Period for the Project</td>
<td>20</td>
</tr>
<tr>
<td>1.11</td>
<td>Approach and Methodology</td>
<td>21</td>
</tr>
<tr>
<td>1.12</td>
<td>Components of the Report</td>
<td>23</td>
</tr>
<tr>
<td><strong>SECTION 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>INSTITUTIONAL LEGISLATIVE AND POLICY FRAME WORK RELATED TO IEE/EIA REQUIREMENTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>Organizations for Environmental Management</td>
<td>24</td>
</tr>
<tr>
<td>2.0.1</td>
<td>Federal Government Institutions</td>
<td>24</td>
</tr>
<tr>
<td>2.0.2</td>
<td>Provincial Government Institutions</td>
<td>27</td>
</tr>
<tr>
<td>2.0.3</td>
<td>Local Government Institutions</td>
<td>27</td>
</tr>
<tr>
<td>2.1</td>
<td>Environmental Legislation and Policies</td>
<td>27</td>
</tr>
<tr>
<td>2.1.1</td>
<td>Pakistan Environmental Protection Ordinance, 1983</td>
<td>28</td>
</tr>
<tr>
<td>2.1.2</td>
<td>National Conservation Strategy, 1992</td>
<td>28</td>
</tr>
<tr>
<td>2.1.3</td>
<td>Pakistan Environmental Protection Act, 1997 (Amended 2012)</td>
<td>30</td>
</tr>
<tr>
<td>2.1.4</td>
<td>National Environmental Quality Standards</td>
<td>32</td>
</tr>
</tbody>
</table>
2.1.5 Pakistan (Federal) EPA Environmental Assessment Procedures 32
2.1.6 Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations, 2000 33
2.1.7 National Environmental Policy, 2005 34
2.1.8 Hazardous Substances Rules, 2003 35
2.1.9 Hospital Waste Management Rules, 2005 35
2.1.10 Specifications of Incinerator (Pakistan) 36

SECTION 3
PROJECT DESCRIPTION

3.0 General 37
3.1 Location of the Project 37
3.2 Cost of the Project 37
3.3 Alternatives Considered 37
3.3.1 No Development Option 38
3.3.2 Alternative Site Option – Site Criteria 38
3.3.3 Technology Alternatives 39
3.3.3.1 Steam Autoclaving 40
3.3.3.2 Microwaving 41
3.3.3.3 Microwave Radiation 42
3.3.3.4 Vitrification 42
3.3.3.5 Chemical Treatment 43
3.3.3.6 Thermal Systems 43
3.3.3.7 Land Disposal 43
3.3.4 Conclusion 44
3.4 Project Administrative Jurisdiction 45
3.5 Proposed Incinerator Specifications 45
3.6 Management of Hazardous Waste 46
3.6.1 Hazardous Waste Storage 46
3.6.2 Waste Disposal 47
3.6.3 Disposal by Incineration 47
3.6.3.1 Advantages of Incinerator 47
3.7 Design & Construction of Incinerator 48
3.7.1 Scope of Work 48
3.7.2 Incineration Principle 50
3.7.3 Characteristics of Waste Suitable for Incineration 51
3.7.4 Waste Types not to be Incinerated 51
3.7.5 Factors Affecting Design of Incinerator 51

“M.I.S” CONSULTANTS
### SECTION 4
**BIO-PHYSICAL ENVIRONMENTAL BASELINE**

<table>
<thead>
<tr>
<th>4.0</th>
<th>54</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>54</td>
</tr>
<tr>
<td>4.1.1</td>
<td>54</td>
</tr>
<tr>
<td>4.1.2</td>
<td>55</td>
</tr>
<tr>
<td>4.1.3</td>
<td>57</td>
</tr>
<tr>
<td>4.1.4</td>
<td>58</td>
</tr>
<tr>
<td>4.1.5</td>
<td>59</td>
</tr>
<tr>
<td>4.1.6</td>
<td>59</td>
</tr>
<tr>
<td>4.1.7</td>
<td>60</td>
</tr>
<tr>
<td>4.1.8</td>
<td>61</td>
</tr>
<tr>
<td>4.1.9</td>
<td>61</td>
</tr>
<tr>
<td>4.2</td>
<td>62</td>
</tr>
<tr>
<td>4.2.1</td>
<td>62</td>
</tr>
<tr>
<td>4.2.2</td>
<td>64</td>
</tr>
<tr>
<td>4.2.3</td>
<td>65</td>
</tr>
</tbody>
</table>

### SECTION 5
**SOCIAL BASELINE**

<table>
<thead>
<tr>
<th>5.0</th>
<th>68</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>68</td>
</tr>
<tr>
<td>5.2</td>
<td>68</td>
</tr>
<tr>
<td>5.3</td>
<td>69</td>
</tr>
<tr>
<td>5.3.1</td>
<td>69</td>
</tr>
<tr>
<td>5.3.2</td>
<td>69</td>
</tr>
<tr>
<td>5.3.3</td>
<td>70</td>
</tr>
<tr>
<td>5.3.4</td>
<td>70</td>
</tr>
<tr>
<td>5.3.5</td>
<td>70</td>
</tr>
<tr>
<td>5.3.6</td>
<td>70</td>
</tr>
<tr>
<td>5.3.7</td>
<td>71</td>
</tr>
<tr>
<td>5.4</td>
<td>72</td>
</tr>
<tr>
<td>5.4.1</td>
<td>72</td>
</tr>
<tr>
<td>5.4.2</td>
<td>73</td>
</tr>
</tbody>
</table>
## 5.4.3 Average Monthly Incomes 74
## 5.4.4 Economically Active Population 75
## 5.4.5 Unemployment Rate 75
## 5.5 Public Facilities 75
## 5.5.1 Electricity 75
## 5.5.2 Cooking Fuel 75
## 5.5.3 Medical Facilities 75
## 5.5.4 Water Supply 76
## 5.5.5 Commercial Banks 76
## 5.5.6 Communications 76

### SECTION 6

**PUBLIC CONSULTATION**

| 6.0 | General 81 |
| 6.1 | Objectives of the Public Consultation 81 |
| 6.2 | Methodology 82 |
| 6.3 | Major Stake Holders Identified 82 |
| 6.4 | Categories of Stakeholders Consulted 83 |
| 6.5 | Issues Discussed 84 |
| 6.6 | Summary of Key Issues 84 |
| 6.6.1 | General 85 |
| 6.6.2 | Environmental 85 |
| 6.6.3 | Socio Economic 85 |
| 6.7 | Proposed Mitigation Measures for Key Issues of Incinerator Project 85 |
| 6.7.1 | General 85 |
| 6.7.2 | Environmental 86 |
| 6.7.3 | Socioeconomic 86 |

### SECTION 7

**ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES**

| 7.0 | General 87 |
| 7.1 | Extent and Evaluation of Impacts and Mitigation Measures 87 |
| 7.2 | Impact Identification 88 |
7.2.1 Thinking through the Stages of the Project
7.2.1.1 Location of the Project
7.2.1.2 Design & Construction Phase
7.2.1.3 Operation Phase
7.2.2 Impact Identification with Checklist
7.2.3 Impact Identification with Network

SECTION 8
ENVIRONMENTAL MONITORING AND MANAGEMENT PLAN

| 8.0  | Environmental Management Plan                      | 103 |
| 8.1  | Objectives of EMP                                   | 103 |
| 8.2  | Scope of EMP                                        | 104 |
| 8.3  | Components of the EMP                               | 104 |
| 8.3.1| Legislation and Guidelines                          | 105 |
| 8.3.2| Organizational Structure and Responsibilities       | 106 |
| 8.3.3| Mitigation Plan                                     | 107 |
| 8.3.4| Environmental Monitoring Plan                       | 109 |
| 8.3.5| Contingency Plan                                    | 111 |
| 8.3.6| Communication and Documentation                     | 112 |
| 8.3.7| Change Management                                   | 113 |
| 8.3.7.1| Changes to the operation                           | 113 |
| 8.3.7.2| Changes to the EMP                                 | 114 |
| 8.3.8| Environmental Training                              | 115 |

SECTION 9
CONCLUSION & RECOMMENDATIONS

| 9.1  | Conclusion                                          | 117 |
| 9.2  | Recommendations                                     | 118 |

LIST OF ANNEXURES

| Annexure I | Pakistan Environmental Protection Act, 1997 (Amended 2012) |
| Annexure II| National Environmental Quality Standards, 2000           |
| Annexure III| Pakistan Environmental Protection Agency (Review of IEE/EIA Regulations, 2000) |
| Annexure IV| Hospital Waste Management Rules 2005                     |
| Annexure V | Specifications of Incinerator (Pakistan)                 |
| Annexure VI| Water Quality Report                                    |
| Annexure VII| Ambient Air Quality and Particulate Matter (PM\textsubscript{10}) Reports |
| Annexure VIII| Noise Levels Monitoring Report                        |
| Annexure IX | WHO Drinking Water Guidelines                         |
| Annexure X | USEPA National Ambient Air Quality Standards            |
LIST OF TABLES

1.1 Work Schedule of the Project 20
4.1 One Day Maximum Annual Rainfall 57
4.2 Month-wise Temperature, Precipitation and Relative Humidity (RWP) 58
4.3 Ambient Air Quality Monitoring 60
4.4 Ambient Air Particulate Matter 60
4.5 Noise Levels Measurement 61
4.6 Plant Species Present in the Project Area 63
4.7 Common Grasses Present in the Project Area 64
5.1 Population and Intercensal Increase and Growth Rates since 1951 69
5.2 Percentage of Population by Religion and Rural/Urban Areas 70
5.3 Population Percentage Distributions by Selected Age Groups 71
5.4 Population Percentage Distributions by Marital Status 72
5.5 Education Levels of the Respondents 73
5.6 Professional Status of the Respondents 73
5.7 Income Level of the Respondents 74
5.8 Awareness About the Project 77
5.9 Acceptability of the Project 77
5.10 Impacts During Construction Stage 78
5.11 Impacts During Operation Stage 78
5.12 Protective Measures Suggested by the Respondents 79
6.1 Schedule of Consultations 83
7.1 Environmental Problems Due to Project Location 98
7.2 Environmental Problems Due to Inadequate Design, O& M 99
7.3 Environmental Problems in Construction Phase 100
7.4 Environmental Problems Relating to Inadequate Operations 101
7.5 Simplified Network for Air Quality Issues for Incinerator 102
8.1 Mitigation Plan Matrix for Construction Phase 108
8.2 Mitigation Plan Matrix for Operation Phase 109
8.3 Monitoring Plan for Construction Phase 110
8.4 Monitoring Plan for Operation Phase 111
8.5 Contingency Plan 111
8.6 Reporting and Assessment 113
8.7 Environmental Training Program 116
1.0 Introduction of the Project

Mr. Muhammad Qamar Rana the proponent has planned to launch an “Incinerator Facility” at Khasra # 550, Mouza Gattia, WAH Cantt. The total area for the project will be 1358 SFT. Mr. Muhammad Qamar Rana the Proponent deals with the project and its related activities. The proposed project is located at Khasra # 550, Mouza Gattia, WAH Cantt, District Rawalpindi.

As the development of an Incinerator Facility project falls in Schedule-II, Part-I of Punjab Environmental Protection Agency’s (Review of IEE and EIA) Regulations, 2000, the Guidelines for the Preparation and Review of Environmental Reports, an Environment Impact Assessment (EIA) of “Incinerator Facility” is required. Proponent of the project has engaged M.I.S Consultants to undertake Environment Impact Assessment (EIA) study of “Incinerator Facility”.

Mr. Muhammad Qamar Rana the proponent has engaged M.I.S Consultants to undertake Environment Impact Assessment (EIA) of “Incinerator Facility”, Mouza Gattia, WAH Cantt, District Rawalpindi.

Project Attraction: Facility for Incineration of Hospital and Industrial Waste near WAH Cantt, as there is no any private well maintained and environmental friendly Incinerator facility available.

Project Type: Carefully Planned and Environmental Friendly Incinerator Facility

Location: Mouza Gattia, WAH Cantt, District Rawalpindi

“Incinerator Facility” will be built in accordance with the modalities and procedures being followed by Incinerator Facilities in District Rawalpindi.

1.1 Background

Hazardous Waste Management is an important environmental, social and health problem, which requires definite attention by all concerned. This type of waste has worse impact on the...
community’s health and environment because it contaminates the land, air and water. Hazardous waste all too often contains unpleasant, potentially dangerous substances, which, if improperly managed, could cause harm to health and the environment, especially if burnt in uncontrolled conditions.

There are Guidelines for Hospital Waste Management since 1998 prepared by the Environmental Health Unit of the Ministry of Health, Government of Pakistan, giving detailed information and covering all aspects of safe hospital waste management in the country including the risk associated with the waste, formation of a waste management team in hospitals, its responsibilities, plan, collection, segregation, transportation, storage, disposal methods, containers, and their color coding, waste minimization techniques etc. However, these guidelines are not being properly implemented. There are still no systematic approaches to medical waste disposal. Hospital wastes are simply mixed with the municipal waste in collecting bins at roadsides and disposed of similarly. Some waste is simply buried without any appropriate measure. A common practice in Pakistan is the reuse of disposable syringes. People pick up used syringes from the hospital waste and sell them which is very dangerous.

As per Hospital Waste Management Rules (2005) of Govt. of Pakistan: “Every hospital shall be responsible for the proper management of the waste generated by it till its final disposal in accordance with the provisions of the Act, the rules and regulations there under”.

In developing countries, including Pakistan, uncontrolled dumping is used for the disposal of solid wastes. These dumps are frequently allowed to burn either deliberately, as a means of volume reduction, or accidentally. The emissions from this type of uncontrolled burning can be noxious and harmful. Typical materials found in the waste which contribute to these harmful emissions include certain plastics, batteries, paints, domestic chemicals, pharmaceuticals and many industrial wastes.

In this regard Rana Associates (Incinerator Facility) intends to develop a Hazardous Waste Management facility i.e. Incinerator having capacity of 100 kg/hr at Mouza Gattia, WAH Cantt, District Rawalpindi keeping in view the alarming situation of waste management.
Incineration was opted for reasons including being proactive in meeting up-coming legislations as in future the Hazardous waste legislative requirements will need to be complied with. Hazardous waste incinerator is proposed for Hospital Waste Management together with the management of industrial Hazardous Waste.

The proposed project is to operate the incinerator on very low profit basis in Mouza Gattia, WAH Cantt, District Rawalpindi as such facilities are not available in the area. The hospitals and community will be benefited through this project. Some hospitals have incinerators, but they are not operated due to poor management and maintenance. Rana Associates Incinerator will be developed for managing Hazardous Hospital and Industrial Waste.

For the proposed Incinerator, Rana Associates hired MIS Consultants to undertake independent Environmental Impact Assessment (EIA) study of the proposed operations.

1.2 Hazardous Waste

Hazardous waste is any waste or combination of waste that poses a substantial danger, now or in the future, to human, plant or animal life and which therefore cannot be handled or disposed of without special precautions.

1.2.1 Classifying Hazardous Waste

Hazardous Substances and wastes classification are defined as those merchandise, commodities, supplies, wares and goods which meet the criteria of one or more of nine U.N hazard classes and, where applicable, to one of three U.N packing groups. The nine classes relate to the type of hazard whereas the packing groups relate to the danger within the class. Wastes should be transported under the requirements of the appropriate class considering their hazards and the criteria of the regulations. Wastes not otherwise subject to these regulations, but covered under the Basel Convention on the control of Transboundary Movements of Hazardous Wastes and their Disposal (1989), may be transported under class 9. Many of the substances listed in classes 1 to 9 are deemed, without additional labeling, as being environmentally hazardous.
1.2.2 Hazard Classes

Some hazard classes are further subdivided into hazard divisions due to the wide scope of the class. The nine hazard classes and their divisions are listed below.

**Class 1 Explosive**
- Division 1.1 - Articles and substances having a mass explosion hazard.
- Division 1.2 - Articles and substances having a projection hazard but not a mass explosion hazard.
- Division 1.3 - Articles and substances having a fire hazard, a minor blast hazard and/or a minor projection hazard but not a mass explosion hazard.
- Division 1.4 - Articles and substances presenting no significant hazard.
- Division 1.5 - Very sensitive substances having a mass explosion hazard.
- Division 1.6 - Extremely insensitive articles which do have a mass explosion hazard.

**Class 2 Gases**
- Division 2.1 - Flammable gas.
- Division 2.2 - Non-flammable, non-toxic gas.
- Division 2.3 - Toxic gas

**Class 3 Flammable liquids**-This class has no divisions.

**Class 4 Flammable solids; Substances liable to spontaneous combustion;**
- Substances which, in contact with water, emit flammable gases
  - Division 4.1 - Flammable solid.
  - Division 4.2 - Substances liable to spontaneous combustion.
  - Division 4.3 - Substances which in contact with water, emit flammable gases.

**Class 5 Oxidizing substances and Organic Peroxide**
- Division 5.1 - Oxidizer.
- Division 5.2 - Organic peroxides.

**Class 6 Toxic and Infectious substances**
- Division 6.1 - Toxic substances.
- Division 6.2 - Infectious substances.
Class 7 Radioactive materials-This class has no divisions.

Class 8 Corrosives-This class has no divisions.

Class 9 Miscellaneous Hazardous Substances and wastes

1.2.3 Impacts of Hazardous Waste

Hazardous waste poses numerous concerns which can result in immediate danger to the environment and to human health. In some cases, such impacts could be difficult and/or very expensive to mitigate, while in others the impacts could be irreversible.

- Routes of Transport of Hazardous Waste

Hazardous waste can affect the environment as well as human health through different routes of transport into the environment and exposure to humans. These routes can be direct, such as direct human contact or the direct discharge into an environmental medium (air, water, soil), while others are indirect such as atmospheric deposition of wind born particulates to surface waters. Common routes of transport to the environment entail leaching of hazardous waste from unsecured disposal sites which could result in contamination of surface and/or underground water. The use of such contaminated water for drinking or irrigation purposes would present an important route of exposure in humans. Furthermore, crops cultivated on contaminated soil, as well as aquatic organisms living in contaminated waters, may take up hazardous constituents, resulting in their accumulation in the food chain. In addition, direct skin contact with the waste during handling in collection, storage, transport treatment and/or disposal operations, as well as inhalation of hazardous waste dusts and vapors constitutes another potential pathway for exposure of humans.

- Health And Environmental Impacts of Industrial Hazardous Waste

Hazardous waste generated from the different industrial sectors can result in severe health and environmental impacts. For example, many hazardous waste constituents have been identified
as occupational carcinogens, such as benzene and chromium VI. Lead in metal sludge can cause neurological dysfunction in adults and children or malfunction of the kidneys and the nervous system.

- **Health and Environmental Impacts of Hospital Waste**

Infectious waste may contain any of a great variety of pathogenic microorganisms. Pathogens in infectious waste may enter the human body through a puncture, cut in the skin, mucous membranes, inhalation and ingestion. Hazardous health-care waste causes fatal diseases. Major diseases are AIDS, hepatitis B and C.

The viruses of above-mentioned diseases are generally transmitted through injuries from syringe needles contaminated by human blood. Sharps may not only cause cuts and punctures but also infect these wounds if they are contaminated with pathogens. Because of this double risk of injury and disease transmission sharps are considered as a very hazardous waste class. Hypodermic needles constitute an important part of the sharps waste category and are particularly hazardous because they are often contaminated with patients’ blood.

### 1.3 Consultant

Mr. Muhammad Qamar Rana the proponent has engaged “M.I.S” Consultants to undertake Environment Impact Assessment (EIA) of “Incinerator Facility”, Mouza Gattia, WAH Cantt, District Rawalpindi.

### 1.4 Objectives of the Project

Objective of the project is to provide facility for Incineration of Hospital and Industrial Waste near WAH Cantt, as there is no any private well maintained and environmental friendly Incinerator facility available.

“M.I.S” CONSULTANTS
1.5 Screening of the Project

EIA is mandatory according to the Section 12 clause (1) of the Pakistan Environmental Protection Act (PEPA, 1997) (Amended 2012) for all the developmental interventions. According to Pak-EPA (Review of IEE/EIA Regulations, 2000), the proposed project falls under Category G (Waste Disposal) of schedule II, which states that “Waste disposal and storage of hazardous or toxic wastes including landfill sites and incineration of hospital toxic waste” require the EIA study.

1.6 Objectives of the EIA Study

The overall objectives of this Environmental Studies are to promote such development activities, which are environmentally friendly and sustainable. The specific objectives of this EIA study include:

- Review of legislative and policy framework related to environmental and social aspects of EIA such as environmental legislations, policies, and environmental approvals for the developing projects and national environmental quality standards (NEQS) etc.;

- Review of baseline environmental conditions using both primary and secondary sources of information;

- Review of biophysical and socio-economic conditions in the project area.

- Identifying environmental impacts both during construction and operation phases of the project and suggest suitable mitigation measures; and

- Developing Environmental Management Plan (EMP) identifying roles and responsibilities of the institutions involved in the implementation of the project
1.7 **Scope of the Study**

The scope of this study includes the “Preparation of the Environmental Impact Assessment (EIA) Report for the “Rana Associates (Incinerator Facility)”. For the preparation of this Report, both primary and secondary data have been utilized.

1.8 **Project Area**

The Project area of the Rana Associates (Incinerator Facility) is located at Khasra # 550, Mouza Gattia, WAH Cantt, District Rawalpindi.

1.9 **Standards and Guidelines**

Environmental Issues and control in Pakistan are governed by the Pakistan Environmental Protection Act, 1997 (Amended 2012). *Annexure-I* provide a brief of policy and legal framework relevant to this EIA study. Pakistan Environmental Assessment Procedures and Review of IEE and EIA Regulations, 2000 also have been taken into account, while preparing the EIA Report.

1.10 **Time Period for the Project**

The EIA study awarded to MIS Consultants on Jan 1\(^{st}\), 2016 and total time period for the study is 2 moths, to be completed up to Feb 26\(^{th}\), 2016. Figure 1.2 shows work Schedule of the Project.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Project Planning</td>
<td>Oct 2015</td>
</tr>
<tr>
<td>2</td>
<td>Construction Scheduled</td>
<td>July 2016 – Dec 2016</td>
</tr>
<tr>
<td>3</td>
<td>Construction Completed</td>
<td>Jan 2017</td>
</tr>
</tbody>
</table>

*Figure 1.1: Work Schedule of the Project*
1.11 Approach and Methodology

The methodology adopted for carrying out this Environmental Impact Assessment is based on the guidelines of the Pak-EPA. The salient features of each activity are provided in the following paragraphs:

Task 1: Desk Review of the Project Documents, Relevant Policies and Guidelines etc. and Interaction with the Client and other Line Agencies

The Consultant mobilized its Project Team for collection and review of all relevant policies of the Government of Pakistan (GoP) on environmental issues. All available national publications and data on environment such as GoP’s National Environment Policy (2005), National Conservation Strategy (1992), Pakistan Environmental Assessment Procedures (1997) etc. were consulted.

The Consultant simultaneously started interaction with the client and also remained in contact as and when required. At the same time, all other line agencies including government and non-government organizations were also consulted.

Task 2: Survey of Biophysical and Socio-economic Parameters

The survey of biophysical and socio-economic parameters includes collection of baseline data in the Project Area mainly consisting of the following parameters:

Physical Environment

- Climate
- Geology, Topography and Soil
- Hydrology
- Seismology
- Ground Water Quality
- Surface Water Quality
- Air Quality
- Noise and Vibration
- Solid Waste
- Terrestrial Flora and Fauna
- Protected Areas / Reserved Forests
- Rare / Endangered Species

Social Environment
- Demographic profile
- Settlement Pattern
- Housing patterns
- Economic Features
- Public facilities
- Physical and cultural heritage
- Recreational sites

The following tools / data are used for establishing the environmental and social profile of the Project Area:

**Site Reconnaissance:** The survey was conducted with the purpose to have a familiarity with the Project Area and to develop the study tools related to the features of the Area.

**Collection of Data from Primary Source:** The primary data was collected by developing various study parameters keeping in view the nature of the EIA study. The data was collected by applying the various study tools / techniques.

**Collection of Data from Secondary Sources:** The available published information related to the Project Area, relevant policies and guidelines prepared by various government organizations were obtained and reviewed. This review provided a base to go head.
Impact Assessment: The information related to bio-physical and socio-economic components was collected to assess the possible changes due to the proposed construction of the project. The impacts were assessed both in qualitative and quantitative forms like changes in various environmental parameters, variations in those parameters and consequences of those variations. All the possible efforts are made to control changes in those variations and defining the possible mitigation measures.

Public Consultation: Public Consultation was also held to effectively involve the potential stakeholders in the preparation of this EIA Report.

Documentation: Based on all the above activities related to EIA process of Pak-EPA, this EIA Report is prepared.

1.12 Components of the Report

This EIA Report consists of the following eight Sections:

Section 1  gives the introduction to the EIA Report;
Section 2  discusses the salient features of the relevant Environmental Policies and Legislations;
Section 3  provides the outlook of the project description;
Section 4  discusses the biophysical environmental conditions of the project area;
Section 5  discusses the baseline social conditions of the project area;
Section 6  is about findings of public consultation;
Section 7  gives the detailed description of environmental impacts and their mitigation; and
Section 8  provides outlook towards environmental management plan prepared for the project.
SECTION 2

INSTITUTIONAL, LEGISLATIVE AND POLICY FRAMEWORK RELATED TO IEE / EIA REQUIREMENTS

2 Organizations for Environmental Management

2.0.1 Federal Government Institutions

Headed by a federal minister, the Ministry of Environment, Local Government and Rural Development is the main government organization responsible for protection of environment and resource conservation. The Ministry works in collaboration with the Pakistan Environmental Protection Council (PEPC) and the Federal and Provincial Environmental Protection Agencies formed under PEPA 1997 (Amended 2012) (In Punjab, formerly it was Environmental Agency but now it is Environmental Protection Department i.e. EPD-Punjab). The PEPC and Pak-EPA (Federal Environmental Protection Agency) are primarily responsible for administering the provisions of the PEPA, 1997 (Amended 2012). The PEPC oversees the functioning of the Pak-EPA (Federal Environmental Protection Agency).

The Federal Government has formed the PEPC. Its members include the President of Pakistan, or a person appointed by the President, as the Chairperson; the Minister of the Ministry of Environment as the Vice-Chairperson; Governors of the Provinces; Ministers in-charge of the Ministry of Environment in the Provinces (there is Ministry of Environment in each province); Secretary to the Federal Government in-charge of the Ministry of Environment, (Federal Secretary); Director General Federal EPA (Pak-EPA); Heads of federal and provincial environmental protection departments; environmentalists and community representatives including Scientists. The functions and powers of the Council include formulation of National Environmental Policy, enforcement PEPA 1997 (Amended 2012), approval of the NEQS, incorporation of environmental considerations into National Development Plans and Policies and to provide guidelines for the protection and conservation of biodiversity in general and for the conservation of renewable and non-renewable resources.
The Federal Government has also formed the Federal EPA (Pak-EPA), which is headed by a Director General and has wide ranging functions given in PEPA 1997 (Amended 2012). These include preparation and co-ordination of National Environmental Policy for approval by PEPC, administering and implementing PEPA 1997 (Amended 2012) and preparation, revision or establishment of NEQS.

Federal EPA has over all jurisdictions over Environmental Impact Assessment or Initial Environmental Examination (EIA/IEE) issues. Federal jurisdiction is applicable to the projects as under:

- On federal land;
- Military projects
- Involving trans-country impacts; and
- Bearing trans-province impacts.

For all other cases, the concerned provincial Responsible Authority shall have jurisdiction. Federal EPA reserves the rights to review any Environmental Report at any time and to suspend the powers it has delegated to any Responsible Authority if it believes those powers have not been properly used. Figure 2.1 shows the organizational chart of Pakistan Environmental Protection Agency.
PUNJAB ENVIRONMENT PROTECTION AGENCY ORGANIZATION CHART

Figure 2.1: Organizational Chart of Punjab Environment Protection Agency
2.0.2 Provincial Government Institutions

Each provincial government has its own environmental protection institution responsible for pollution control. The provincial Environmental Protection Agencies or Environmental Protection Departments (EPAs/EPDs) are the provincial counterparts of the federal EPA, which is authorized to delegate powers to its provincial counterparts. The Provincial Environmental Protection Agencies are formed by the respective provincial governments. A Director General who exercises powers delegated to him by the concerned provincial government heads the provincial EPA. The reports covering IEEs and EIAs are submitted to the concerned provincial EPAs for approval.

For public works, responsibility for IEE management & review and granting or refusing environmental approval, will be vested in the Planning and Development Departments (referred as P&Ds) responsible for economic and development planning at federal and provincial levels.

2.0.3 Local Government Institutions

At the district level District Environment Officer (DEO) is the responsible person to look after the environmental issues in all the sectors. The issues identified by the DEO are referred to the provincial government for legal proceedings. The DEO can take action against any development activity contributing in the environmental degradation of the country.

2.12 ENVIRONMENTAL LEGISLATION AND POLICIES

The development of statutory and other instruments for environmental protection has steadily gained priority in Pakistan since late 1970s.
2.1.1 PAKISTAN ENVIRONMENTAL PROTECTION ORDINANCE, 1983

The Pakistan Environmental Protection Ordinance, 1983 (PEPO 1983) was the first piece of legislation designed specifically for the protection of the environment. The promulgation of this ordinance was followed, in 1984 by the establishment of the Pakistan Environmental Protection Agency, the primary government institution dealing with environmental issues. Significant work on developing environmental policy was carried out in late 1980s, which culminated in the drafting of Pakistan National Conservation Strategy. Provincial environment protection agencies were also established at about the same time.

2.1.2 NATIONAL CONSERVATION STRATEGY (NCS), 1992

The Pakistan National Conservation Strategy (NCS) is the principal policy document for environment issues in the country that was developed and approved by the Government of Pakistan on March 1, 1992. The NCS works on a ten-year planning and implementation cycle. It deals with fourteen (14) core areas, which are stated hereunder:

i. maintaining soils in crop land;
ii. increasing irrigation efficiency;
iii. protecting water sheds;
iv. supporting forestry and plantations;
v. restoring rangelands and improving livestock;
vi. protecting water bodies and sustaining fisheries;
vii. conserving biodiversity;
viii. increasing energy efficiency;
ix. developing and deploying material and energy renewable;
x. preventing / abating pollution;
xi. managing urban wastes;  
 xii. supporting institutions for common resources;  
 xiii. integrating population and environmental programs; and  
 xiv. Preserving the cultural heritage.

Based on the NCS, policies are being framed for institutional strengthening and human resource development for environmental protection, especially at the local and provincial level.

The NCS is a policy document that deals with the core environmental issues in Pakistan at macro level and recommends an action plan to address these issues. Project specified mitigation prescriptions cannot be expected in NCS document, however, the principles of environment protection, conservation and management provided in the NCS document have to be used as guidelines during the planning and execution of projects.

As a signatory to the Convention on Biological Diversity in 1992, it was also felt necessary for Pakistan to develop a national strategy for the conservation of biodiversity. Accordingly, the Government of Pakistan constituted a Biodiversity Working Group, under the auspices of the Ministry of Environment, to develop a Biodiversity Action Plan (BAP) for the country, which was completed after an extensive consultative process. The plan, which has been designed to complement the NCS and the proposed provincial conservation strategies, identifies the causes of biodiversity loss in Pakistan and suggests a series of proposals for action to conserve biodiversity in the country. PEPC has approved the action plan and steering committees at federal and provincial levels have been formed to implement it.
BAP recognizes that at project level Environmental Impact Assessment (EIA) is used as a tool to identify environmental impacts of a proposed project and to plan for reducing adverse impacts. BAP further stipulates that an EIA should be initiated attain early stage in project development cycle and that public participation in review of potential effects is important.

### 2.1.3 PAKISTAN ENVIRONMENTAL PROTECTION ACT (PEPA) OF 1997 (AMENDED 2012)

A comprehensive legislation was evolved over-time to prepare and implement national environmental policies. It is entitled as “the Pakistan Environmental Protection Act, 1997 (PEPA 1997) (Amended 2012)”. The PEPA 1997 was enacted repealing PEPO 1983. The PEPA 1997 provides the framework for implementation of National Conservation Strategy, protection and conservation of species, wildlife habitats and biodiversity, conservation of renewable resources, establishment of Environmental Tribunals, appointment of Environmental Magistrates, Initial Environmental Examinations (IEE), Environmental Impact Assessment (EIA), and promotion of public education and awareness of environmental issues through mass media.

The PEPA, 1997 (Amended 2012) is the basic legislative tool empowering the Government to frame regulations for the protection of the environment. The act is applicable to a board range of issues and extends to air, water, soil, marine and noise pollution, as well as to the handling of hazardous wastes. Penalties have been prescribed for those contravening the provisions of the Act.

The following are the key features of the law that have a direct bearing on development project:
Section 11(1) states that “Subject to the provisions of this Act and the rules and regulations made there under, no person shall discharge or emit, or allow the discharge or emission of, any effluent or waste or air pollutant or noise in an amount, concentration or level which is in excess of the “National Environmental Quality Standards”. The Pakistan Environmental Protection Agency (Pak-EPA)/Punjab Environmental Protection Agency, the body mainly responsible for enforcing the PAPA, 1997, has published National Environmental Quality Standards (NEQS).

Section 12(1) requires that “No proponent of a project shall commence construction or operation unless he has filed with the Federal Agency/Provincial Agency an Initial Environmental Examination (IEE) or, where the project is likely to cause an adverse environmental effect, an Environmental Impact Assessment (EIA), and has obtained from the federal agency approval in respect thereof”.

Section 12(2)(b) The Federal Agency/ Provincial Agency shall review the Environmental Impact Assessment report and accord its approval subject to such conditions as it may deem fit to impose or require that the Environmental Impact Assessment be re-submitted after such modifications as may be stipulated, or reject the project as being contrary to environmental objectives.

Thus for a development project, it is required as per the regulations, that an EIA/IEE report be submitted to the Pak-EPA/Punjab EPA, and approval obtained before undertaking any construction activity.

Section 14 requires that “Subject to the provisions of this act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle, or import any hazardous substance except (a) under a license issued by the Federal Agency/Provincial Agency and in such manner as may be prescribed; or (b) in accordance with the provisions of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement, or other instrument to which Pakistan is a party”. Enforcement of this clause requires the Pak-EPA to issue regulations regarding licensing procedures and to define ‘hazardous substance’.
2.1.4 NATIONAL ENVIRONMENTAL QUALITY STANDARDS

In order to control the Environmental Pollution, the Government of Pakistan/Government of Punjab has laid down National Environmental Quality Standards (NEQS), 2000 for municipal and industrial liquid effluents, industrial gaseous emissions, motor vehicle exhaust and noise (Annexure - II).

The NEQS were first promulgated in 1993 and have been amended in 1995 and 2000. The standards specify the following:

- Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged to inland waters, sewage treatment facilities, and the sea.

- Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources; and

- Maximum allowable concentration of pollutants (2 parameters) in gaseous emissions from vehicle exhausts and noise emission from vehicles.

2.1.5 PAKISTAN (FEDERAL) EPA/PROVINCIAL EPA ENVIRONMENTAL ASSESSMENT PROCEDURES

Federal EPA/Punjab EPA has published a set of environmental guidelines for conducting environmental assessments and the environmental management of different types of development projects. The guidelines that are applicable to various development projects are listed below, followed by comments on their relevance:

- Policy and Procedures of Filling, Review and Approval of Environmental Assessments, Pakistan Environmental Protection Agency, September 1997. These guidelines define the policy context and the administrative procedures that govern the environmental assessment process, up to the approval of the environmental report. The section on administrative procedures has been superseded by the IEE/EIA Regulations, 2000.
Guidelines for the Preparation and Review of Environmental Reports, Pakistan/Punjab Environmental Protection Agency, 1997. The guidelines on the preparation and review of environmental reports specify the following for project components:

- The nature of the information to be included in environmental reports;
- The minimum qualifications of the EIA conductors appointed;
- The need to incorporate suitable mitigation measures at every stage of project implementation; and
- The need to specify monitoring procedures.

The terms of for the reference for the reports are to be prepared by the project proponents themselves. The report must contain baseline data on the project area, detailed assessment thereof, and mitigation measures.

Guidelines for Public Consultation, Pakistan Environmental Protection Agency, May, 1997. These guidelines deal with possible approaches to public consultation and techniques for designing an effective program of consultation of that reaches out of all major stakeholders and ensures the incorporation of their concerns in any impacts assessment study.

2.1.6 PAKISTAN ENVIRONMENTAL PROTECTION AGENCY (REVIEW OF IEE AND EIA) REGULATIONS, 2000

In exercise of the powers referred by the section 33 of the Pakistan Environmental Protection Act, 1997, Pakistan Environmental Protection Agency with the approval of, the Federal Government made the rules, namely: - Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000. (Attached as Annexure-III)
These regulations clearly defines the categories of the projects requiring an IEE/EIA, review fees by EPA, filing process of the environmental reports, public participation, decisions by EPA, conditions of approval, compliance reports and monitoring of the Environmental parameters, etc. Figure 2.2 shows the current IEE/EIA process in Pakistan. As per IEE/EIA Regulations, 2000 the review time period required for IEE is 45 days and for EIA is 90 days.

2.1.7 NATIONAL ENVIRONMENTAL POLICY, 2005

The National Environmental Policy provides an over reaching framework for addressing the Environmental issues facing Pakistan, particularly pollution of fresh water bodies and coastal waters, air pollution, lack of proper waste management, deforestation, loss of bio-diversity, decertification, natural disasters, and climate change. It also provides directions for addressing the cross-sectored issues as well the underlined causes of Environmental degradation and meeting International obligations.

The National Environmental policy, while recognizing the goals and objectives of National Conservation Strategy, National Environmental Plan and other existing environment related national policies, strategies and action plans provides broad guidelines to the Federal Government, Provincial Government, Federally Administrative Territories and local Governments for addressing environmental concerns and ensuring effective management of their environmental resources.

The Provincial, AJK, Northern Areas, and Local Governments, however may devise their own strategies, plans and programs in pursuit of this policy.

Goal – The National Environmental Policy aims to protect, conserve and restore Pakistan’s environment in order to improve the quality of life citizens through sustainable development.

Objectives – The objectives of the policy include:

- Conservation, restoration and efficient management of environmental resources.
- Integration of environmental considerations in policy making and planning processes.
• Capacity building of Government Agencies and other stakeholders at all levels for better environmental management.
• Meeting International obligations effectively in line with the National aspirations.
• Creation of demand for environment through mass awareness and community mobilization.

2.1.8 Hazardous Substances Rules, 2003

Section 4: A license will be required to import or transport a hazardous substance.

Section 5: EIA of the industrial activity involving generation, collection, consignment, transport, treatment, disposal, storage, handling or import of hazardous substance will be required along with safety and waste management plan.

The rules provide information on validity, renewal and cancelation of license; packing and labeling; safety precautions: entry, inspection and monitoring: safety plan: waste management plan: import; and transport of hazardous substances.

2.1.9 Hospital Waste Management Rules, 2005

Ministry of Environment, Government of Pakistan has prepared the Hospital waste management Rules in August 03, 2005. The rules are attached as ANNEXURE-IV.

According to these rules, every hospital shall be responsible for the proper management of the waste generated by it till its final disposal in accordance with the provision of act and the rules 16 to 22.

The rules provide information on the roles and responsibilities of waste management team, waste management plan, waste segregation, waste collection, waste transportation, waste storage, waste disposal, accidents & spillages, waste minimization & reuse, inspection and hospital waste management advisory committee.
2.1.10 Specifications of Incinerator (Pakistan)

In Pakistan, Environmental Protection Agency, has prepared specifications and guidelines for incinerator in June 2005. The Guidelines are attached as ANNEXURE V.

The main features of the document are summarized below:

- All incinerators must be of multiple chamber type; minimum of two chambers.
- According to the guidelines, emissions from incinerator, irrespective of the operation mode, shall comply with the standards as specified in the EPA of Pakistan NEQS-1997 Schedule II Air Emission.
- Fuel for incinerator may be natural gas/diesel/LPG.
- Primary chamber temperature ranges 600-800°C and secondary chamber ranges 900-1200°C.
- The fuel to be supplied by the hospital may he Natural gas/Diesel/LPG.
SECTION 3
PROJECT DESCRIPTION

3 General

Mr. Muhammad Qamar Rana the proponent has planned to launch an “Incinerator Facility” at Khasra # 550, Mouza Gattia, WAH Cantt, District Rawalpindi.

3.1 Location of the Project

The proposed site for Rana Associates “Incinerator Facility” is located at 33°46'34.4"N 72°42'27.2"E, near Peshawar Road, WAH Cantt, District Rawalpindi.

3.2 Cost of the Project

The construction cost of Incinerator Facility is estimated to be Rs. 5 Million excluding the cost of land.

| Material & Civil Cost            | = | Rs. 5,00,000/- |
| Work Cost (Fabrication + Erection) & |
| Mechanical Equipment Cost        | = | Rs. 45,00,000/- |
| Total Cost                      | = | Rs. 50,00,000/- |

3.3 Alternatives Considered

This section covers the project alternatives which were examined for the proposed project in WAH Cantt, District Rawalpindi. An analysis of the available alternatives is necessary to
establish that the most suitable management and technology options will be adopted for the project, while minimizing environmental impacts. This evaluation explains the selection of appropriate option that was required to ensure optimal results within defined set of economic, environmental, health and safety constraints. In particular it outlines the following project options:

1. The “No Development Option”.
2. Alternative Site Option.
3. Alternative technology.

3.3.1 No Development Option

No-Project option means there would be no project at all. The No-Project option, if taken, would stop the community from an important and necessary project which is the need for today as per alarming situation of waste generated from industries and hospitals.

Other impacts of the ‘No-Project’ option would be loss in employment and social welfare in the project area, as the project is bound to create jobs and improve the existing condition of the community of the area through different community development and social welfare projects.

From the environmental point of view, this option would result in a loss of opportunity in further improvement of the environmental management of the area, environmental baseline data, and the mitigation and compensatory programs.

3.3.2 Alternative Site Option – Site Selection Criteria

In reference to the Project Site alternatives, several lands were evaluated. The final selection of site is based on following criterion:

**Accessibility:**
The site should be accessible from a permanent road to allow ready transport.
Water Supply:
Availability of adequate water supply, which should also, meets drinking water standards.

Soil conditions for civil structure:
Suitability and stability of soil conditions required for the civil structures.

Sufficient Land Availability:
Availability of sufficient land to design and layout plan in an appropriate manner, with consideration of future expansions.

Electricity:
Availability of electricity from the WAPDA for an uninterrupted supply of power, required for the Project.

Conclusion:
In view of all above criteria, it was concluded to construct the Rana Associates “Incinerator Facility” at Mouza Gattia, WAH Cantt, District Rawalpindi.

The project site is located inside the vicinity of WAH Cantt, so administrative control on proposed project will be easily for proponent. The geographic position of the proposed project is very ideal which connects it to the neighboring infrastructure and also away from the human settlement. Remaining proposed sites don’t possess such a broad spectrum of commercial, industrial and management benefits.

3.3.3 Technology Alternatives

Incineration of wastes has been widely practiced, but alternatives are becoming available, such as autoclaving, chemical treatment and microwaving, and may be preferable under certain circumstances. Incineration is the method of choice for most hazardous healthcare wastes and is widely all over the world. However some recently developed alternative treatment methods is also becoming increasingly popular.

Alternatives to incineration are available in many developed countries. As these techniques are either too complicated or very expensive, they are not being used in Pakistan. However some techniques used for the hospital waste disposal are explained below:
3.3.3.1 Steam Autoclaving

Steam Autoclaving is the most widely used and most efficient alternative medical-waste-treatment technology. Most available autoclaves are designed to handle both biohazard and normal hospital wastes simultaneously. However, they cannot treat pathological animal wastes, chemotherapy wastes, and low Level radioactive wastes. These wastes have to be treated separately.

Medical waste autoclaves usually jointly operate with a shredder and a compactor (to minimize the waste volume). In autoclaves, the effects of heat from saturated steam and increased pressure decontaminate medical waste by inactivating and destroying microorganisms. There are two types of autoclaves, gravity displacement and pre-vacuum. Those designed for medical waste are mostly pre-vacuum.

Advantages

- Can treat most types of biomedical waste
- High level of microbial inactivation of biomedical waste
- Does not create hazardous combustion by-product3 (dioxin, furans, etc.)
- Produces far fewer emissions than incinerators
- Treated wastes can be land filled along with normal municipal solid waste
- Autoclaves are the most widely used alternative to incineration of biomedical waste
- Autoclaves have extensive field/historical experience in the medical industry
- Many autoclaves require low capital investment
- Easier to operate than incinerators
- The most profitable investment unless there are no regulations at all on incineration emissions.

Limitations/Draw backs

- Inappropriate for Industrial waste
- Most autoclaves do not handle recognizable anatomical wastes
- Do not handle chemotherapeutic or other toxic chemical and radiological wastes
- Large volumes of liquids in sealed containers may not be adequately treated
- Offensive odors can be generated
• May exhaust volatile organic compounds (VOCs)
• May require hospital to alter method of separating waste

3.3.3.2 Microwaving

The process combines shredding, steam injection and conventional microwaves to disinfect biomedical waste. The microwave process begins when an operator fills the loading bucket with waste. An automatic hoist dumps the material into a hopper at the top of the unit. Before opening, the hopper air is treated with high temperature steam, and then extracted with a high-efficiency particulate air filter to capture airborne pathogens. Computers control the entire process, prompting the operator to feed more waste. Material feeds evenly into a shredder and emerges as small bits, unrecognizable as medical waste. The granules are automatically conveyed into a treatment chamber where they’re moistened by high—temperature steam. This mixture runs under a series of conventional microwave generators that disinfect each granule. The treated end product is ready for municipal solid waste landfills or waste-to-energy plants.

Advantages

• Microwave system is easier to get permitted because it doesn’t generate potentially toxic air emissions
• No obnoxious odors, its quiet
• It eliminates needle sticks and back problems
• Consequently there is no need for pollution control devices
• The cost for microwaving is about the same as for incineration

Limitations/Drawbacks

• In appropriate for industrial waste
• Not a co-generation process like incinerators
3.3.3.3 Microwave Radiation

In microwave radiation, medical waste is wetted with steam or water and healed by microwave irradiation to decontaminating temperatures.

Advantages

- This method has good disinfections efficiency under appropriate operational conditions
- It is environmental friendly

Limitations/Drawbacks

- Microwave radiation requires high capital investment with higher operation and maintenance cost
- In appropriate for Industrial waste
- This method also has potential operation and maintenance problems

3.3.3.4 Vitrification

A vitreous state is a non crystalline solid or rigid liquid formed by super cooling a melt. It’s also called a glassy state. For hazardous or radioactive wastes, vitrification is the process of cooling a liquid fast enough to prevent crystallization. This process turns waste material, even high-level and low-level radioactive wastes, into glass. During vitrification, contaminants are subjected to extremely high temperatures in the melter. The organic compounds are destroyed and the remaining organic elements become part of the glass’s molecular structure. Hazardous metal components in the waste are converted to nonhazardous oxides. Radioactive elements can’t leach out, so they won’t pollute the environment.

Advantages

- It converts a waste product into recyclable, reusable glass that has value
- With vitrification clean air, clean water, and glass are end product rather than ash
Limitations/Drawbacks

- Inappropriate for industrial waste
- Too much cost to treat low-level wastes

3.3.3.5 Chemical Treatment

In chemical treatment systems an anti-microbial chemical such as sodium hypo chloride, chlorine dioxide, or peracetic acid decontaminates the waste. Most chemical treatment systems currently in use operate at ambient temperature.

Limitations/Drawbacks

- This kind of treatment could become costly if the waste generated is in a large quantity and would require greater amount of chemical
- Chemical treatment requires highly qualified technicians for operation of the process
- Use of hazardous substances also requires comprehensive safety measures
- Chemical treatment is inadequate for pharmaceutical, chemical and some types of infectious wastes

3.3.3.6 Thermal Systems

Some systems use a combination of infrared radiation and forced hot-air convection to treat the waste. The waste then is compacted, preparing it for landfill. Other systems use gamma radiation to heat the waste to disinfecting temperatures. A portion of the solid residue obtained is recycled while the remainder is disposed. Several other thermal systems currently under development use steam, oil, electricity or some form of irradiation as their source of heat.

3.3.3.7 Land Disposal

If a municipality or medical authority genuinely lacks the means to treat wastes before
disposal, the use of a landfill has to be regarded as an acceptable disposal route. Allowing healthcare waste to accumulate at hospitals or elsewhere constitutes a far higher risk of the transmission of infection than careful disposal in a municipal landfill, even if the site is not designed to the standard used in higher-income countries.

The primary objections to landfill disposal of hazardous health-care waste, especially untreated waste, may be cultural or religious or based on a perceived risk of the release of pathogens to air and water or on the risk of access by scavengers. Land filling can potentially result in contamination of drinking water.

3.3.4 Conclusion

The final choice of treatment system i.e. Incineration is made carefully, on the basis of various factors, many of which depend on local conditions:

- Disinfections efficiency
- Volume and mass reduction
- Occupational health and safety considerations
- Quantity of wastes for treatment and disposal/capacity of the system
- Types of waste for treatment and disposal
- Locally available treatment options and technologies
- Options available for final disposal
- Training requirements for operation of the method
- Operation and maintenance considerations
- Available space
- Location and surroundings of the treatment site and disposal facility
- Investment and operating costs
- Public acceptability
- Regulatory requirements

Certain treatment options may effectively reduce the hazards of healthcare and Industrial waste but, simultaneously, give rise to other health and environmental hazards. Land disposal
may result in groundwater pollution if the landfill site inadequately designed. In choosing a treatment or disposal method the health-care and Industrial waste, particularly if there is a risk of toxic emissions or other hazardous consequences, it should therefore be carefully evaluated in the light of local circumstances. So Incineration is the best option to be opted for the Hazardous Waste Management in Pakistan.

3.4 Project Administrative Jurisdiction

The proposed project falls in the administrative jurisdiction of Cantonment Board WAH.

3.5 Proposed Incinerator Specifications

<table>
<thead>
<tr>
<th>Sr #</th>
<th>PROPOSED INCINERATOR SPECIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Capacity</td>
</tr>
<tr>
<td>02</td>
<td>Retention Time</td>
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<tr>
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<td>Fuel</td>
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<tr>
<td>04</td>
<td>Power</td>
</tr>
<tr>
<td>05</td>
<td>Incinerator Type</td>
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<tr>
<td>06</td>
<td>Incinerator Design</td>
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<td>07</td>
<td>Temperature Combustion Chamber</td>
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<td>08</td>
<td>Temperature Retention Chamber # 1</td>
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<tr>
<td>09</td>
<td>Temperature Retention Chamber # 2</td>
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<td>10</td>
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<td>11</td>
<td>Feeding System</td>
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<td>12</td>
<td>Solid Waste Capacity/Batch Load</td>
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<td>14</td>
<td>Burner 2 Capacity</td>
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<td>18</td>
<td>Skin Temperature</td>
</tr>
<tr>
<td>19</td>
<td>Negative Pressure</td>
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<td>20</td>
<td>Flue Gas Washer</td>
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</tbody>
</table>
### Management of Hazardous Waste

The main features of the Hazardous Waste Management program are:

- Storage and Incineration of hazardous waste
- Segregation, collection and transportation of waste

For an effective management of Hazardous Waste, it is essential to have the necessary tools for assessing the status of readiness at all levels. The absence of waste management lack of awareness about the health hazards, insufficient financial and human resources and poor control of waste disposal are the most common problems connected with hazardous and health-care wastes. An essential issue is the clear attribution of responsibility of appropriate handling and disposal of waste. According to the ‘polluter pays’ principle this responsibility lies with the waste producer, usually being the Industry or health-care provider, or the establishment involved in related activities.

#### 3.6.1 Hazardous Waste Storage

The collected waste has to be properly stored before final disposal by incineration, land filling or municipal collection. Segregation of the waste must be done at this stage as well. The following points may help in proper storage of the hospital and other hazardous waste.

1. Location of the storage site away from residential areas
2. Location of the site away from food storage or food preparation facilities
3. Providing convenient approach for the waste carrying wheel barrows/trolleys
4. Secure from unauthorized access at all times
5. Make easily accessible to authorized staff
6. Cover and secure properly to keep animals and birds etc. away from the site
7. Ensure daily evacuation

3.6.2 Waste Disposal

Although treatment and disposal of hazardous and health-care wastes aim at reducing risks, indirect health risks may occur through the release of toxic pollutants into the environment through treatment or disposal.

3.6.3 Disposal by Incineration

Incineration can treat Health-care and Industrial waste at the same time. Incineration is a high-temperature dry oxidation process that reduces organic and combustible waste to inorganic, incombustible matter and results in a very, significant reduction of waste volume and weight. This process is usually selected to treat wastes that cannot be recycled, reused, or disposed of in a landfill site.

Incineration breaks down some hazardous, non-metallic organic wastes and destroys bacteria and viruses, which is the main benefit of incineration of medical wastes. In considering the Hazardous Waste incineration option, one must weigh the benefits of incineration against the significant capital and operating costs, potential environmental impacts, and technical difficulties of operating an incinerator.

3.6.3.1 Advantages of Incinerator

Hazardous waste incineration is typically only cost-effective in regions where land suitable for land filling is scarce. Such landfill scarcity can arise due to geographical constraints, as with a highly urbanized region or island, or environmental conditions, as in regions where the water table is high. Jurisdictional and political boundaries can also constrain the size and number of
sites available for land filling, thereby increasing the attractiveness of incineration. Potential pollutants can be contained within the resulting residue, which, if disposed of carefully, reduces the risk of contamination of local groundwater.

Consequently, whilst recycling has an important part to play, incineration frequently forms part of an overall strategy for the management of hazardous waste. Landfill will always be required for the residue, which typically amounts to about one-third of the initial mass of waste. Incineration of wastes offers the following advantages:

- Volume reduction, especially for bulky solids with a high combustible content
- Detoxification, especially for combustible a1cinogens, pathologically contaminated material, toxic organic compounds, or biologically active materials
- Socio-environmental compliance, especially for fumes containing odorous compounds, carbon monoxide or other combustible materials subject to regulatory emission limitations
- Environmental impact mitigation, especially for organic materials that would leach from landfills or create odor nuisance
- Reducing atmospheric pollution caused by smoke emitted during combustion

3.7 Design & Construction of Incinerator

The objective of project is to construct an incinerator to promote cleaner practices and complete combustion of hazardous wastes with a view to waste volume reduction and amelioration. Incineration can treat healthcare and industrial waste at the same time minimizing impact on the environment.

3.7.1 Scope of Work

Incinerator

Capacity 100 Kg/hr
It consists of three chambers, which are interconnected
The primary chamber is for burning solid and liquid waste. The secondary chamber is for burning Hydrocarbons carried over from the primary chamber. The third chamber is for settling the ash and cooling of flue gases. The three chambers are constructed on steel structure with 45% Aumina Refractory bricks lining.

- **Waste Feed and De-Ashing System**

  The feed system of incinerator is manual (batch); the waste is typically batch-fed into a charging hopper or directly into the furnace Residue generated after combustion is removed manually. Ash removal and cleaning is conducted through Ash doors. The doors are steel fabricated with firebrick lining from inner side.

- **Controls**

  The burner has provision for pre-purge, automatic sequencing, automatic ignition and flame supervision.

  Temperature Controller is provided to automatically maintain the temperature of the secondary chamber. In case temperature in secondary chamber rises or falls down beyond safe limit both primary and secondary burners will shut down and alarm will sound.

  Temperature Controller is provided in the primary chamber to cut off the burner at set temperature for fuel saving. A temperature gauge monitors the fuel temperature.

- **Dust Collection**

  The cyclone dust collector made with S.S. casing has been provided to convey exhaust gases through chimney.

- **I.D. Fan**

  Induced Draft Fan made with S.S. impeller and SS. casing has been provided to convey exhaust gases through chimney.
• **Chimney**

The chimney is 25 feet high with 3” thick brick lining up to eight feet height conveys the flue gases to the atmosphere.

• **Ducting**

SS Ducts have been provided to connect incinerator with dust collector and further to connect dust collector to I.D. Fan and then to chimney.

### 3.7.2 Incineration Principle

Most modern large incinerators operate on the ‘starved air principle, in which the waste is gasified and partially burnt using a support fuel (e.g. gas or fuel oil), in primary chamber. Gaseous phase reactions are completed in a secondary chamber and the remnant solids are then burned as completely as possible in an air rich zone, or a tertiary chamber, at the discharge end of the incinerator. The gases and airborne particulates are then subjected to complex (and often expensive) ‘clean up’ before being emitted to atmosphere.

For this hazardous waste incinerator, the focus of this project is to achieve optimal emissions without the USC of sophisticated gas cleaning equipment, if costs are to be kept to a reasonable level. Given careful design, construction and operation. However, it should be possible to achieve acceptable levels of emissions without the need for gas cleaning, by using the starved air principle.

A significant proportion of hazardous waste has valued as fuel, but the waste composition could be such that it might become often very difficult to achieve complete combustion using this alone. Therefore the incinerator is designed to operate using a support fuel such as Natural Gas. The selection of a support fuel depends on its availability and the implications on operating costs.
3.7.3 Characteristics of Waste Suitable for Incineration

- Content of combustible matter above 60%
- Content of non-combustible solids below 5%
- Content of non-combustible fines below 20%
- Moisture content below 30%

3.7.4 Waste Types not to be incinerated

The proposed Incinerator is designed to incinerate hazardous waste at the rate of 100 kg/hr. Incineration of materials unsuitable for incineration can result in the release of pollutants into the air. Occupational risks may be associated with the operation of certain disposal facilities.

- Pressurized gas containers
- Large amounts of reactive chemical waste
- Silver salts and photographic or radiographic wastes
- Halogenated plastics such as polyvinyl chloride (PVC)
- The incineration of materials containing chlorine can generate dioxins and furans, which are classified as possible human carcinogens and have been associated with a range of adverse effects
- Waste with high mercury or cadmium content, such as broken thermometers, used batteries and lead-lined wooden panels
- Sealed ampoules or ampoules containing heavy metals. Incineration of heavy metals or materials with high metal contents (in particular lead, mercury and cadmium) can lead to the spread of heavy metals in the environment
- Dioxins, furans and metals are persistent and accumulate in the environment. Materials containing chlorine or metal should therefore not be incinerated

3.7.5 Factors affecting Design of Incinerator

Incineration of waste is an operation that includes feeding the furnace, burning the waste, exhausting the gases to the atmosphere, and removing the residue from the furnace. Factors,
which directly influence the detailed design of the incinerator, include:

- Combustion temperatures, combustion gas residence time
- Capital, operational and maintenance costs
- Current and future quantities of waste
- The waste composition and its calorific value
- The infrastructure of the area chosen for the field trials (roads, electrical power)
- Attitudes and legislation relating to emissions control
- Public concerns about incineration
- The degree to which an integrated waste management strategy has been prepared and the incinerator’s role within it
- Locally available materials (refractory bricks or other insulation materials)
- Locally available manufacturing skills

3.7.6 **Incinerator Operators**

Incinerator operators should be trained for smooth operation of incinerator. They should be specifically trained regarding the following subjects:

- Functioning of the incinerator facility
- Health, safety and environment implications of their operations
- Technical procedure for operation of incinerator

The conditions which operator has to face at the site are:

- Incinerator working at a high heat, which put the operators at a risk of burning,
- The heat may lead to fire, carbon monoxide poisoning, etc
- During burning refuse may yield substances that may be hazardous or even poisonous
- The Operators job is physically hard and may lead to pain and other problem in hands, arms, lower back and other body parts
- Incinerator operators work in a noisy, hot and humid environment that may cause tiredness and general ill feeling
The jobs and tasks of the operator would be:

- Activating/firing (burners)
- Adjusting air (Primary air requirement with louvers)
- Cleaning/removing (ash, debris)/shoveling/sweeping
- Detecting (malfunctions)
- Feeding (waste)
- Loading and unloading (waste)
- Maintaining (equipment)
- Measuring/monitoring/observing/recording
- Opening and closing (Incinerator doors)
- Regulating (flow, temperature)
- Turning on/off

### 3.7.7 Staffing and Supplies

Local people will be hired for construction and operation phase of the incinerator. It is expected that approximately 5-8 people will be required during construction phase and 2-3 people during operation phase of the incinerator. During operational phase, waste will be collected from hospitals and industries through local contractors.

The supplies will be transported to the project site in pickups/trucks. General supplies to be transported will include the construction material and equipments. Project personnel will travel to and from the site in smaller vehicles, mostly four wheel drive pickups.

Water during construction and operation phase will be transported to the project facilities from ground water supplies. A maximum of 1000 liters of water will be required per week during the construction phase.

During operational phase the waste to be incinerated will be collected by vehicles owned by the Incinerator Facility proponent.

### 3.7.8 Duration of Project

Total duration of construction phase is about 3-4 months.
SECTION-4
BIOPHYSICAL ENVIRONMENTAL BASELINE

4 General

The proposed Project has been studied with respect to physical, biological and socio-economic environmental conditions. The objectives of establishing baseline environmental profile include: (a) determine pre-project state of affairs which can be used to assess post-project environmental conditions – both for better and worse; and (b) provide maximum information to the proponent and decision-makers for informed decision making.

In order to establish baseline conditions for the EIA study of Proposed Project, the information about the various environmental parameters was gathered from Government Departments, through review of previous and journals, and site visits. The Socio-Economic survey was conducted to get information about the socio-economic conditions of the communities living in the Project Area. Different tools such as questionnaire and focus group discussions were used to solicit their viewpoints (including concerns and suggestions) about the proposed project.

4.12 Physical Environment

The physical environmental includes topography, geology, and soils, seismology, climate, surface water, ground water ambient air quality and noise levels.

4.1.1 Topography

Rawalpindi falls in the Salt Range and Potwar Plateau. Physical features of Rawalpindi exhibit a rich variety which is continental in dimensions. In Rawalpindi one can find Mountains, Forests, Plateaus, Valleys, Ravines, Torrents, Streams, Plains and all possible species of topography which the physical process could produce during the course of ages. Rawalpindi is shaped like a square. At the top rise the Murree hills. These hills form offshoot of the Himalayan system. They rise in spurs rising to heights between 2,133 to 2,438 meters. Rawalpindi is drained by the Soan and its tributaries. The nearest water body from the project is Haro River which is 10 km away.
The terrain of the site is undulating and rolling to hilly. The site is part of the Haro river drainage basin and is bounded to the north and east by gullies and the meanders of the Haro River. There is not a great variety of natural vegetation in the site area. Figure 4.1 shows the topography of the Project Area.

**Figure 4.1: Topography of the Project Area**

### 4.1.2 Geology and Soils

Geologically, the high hills of Murree, Kahuta and Kotli Sattian Tehsils are composed of tertiary sand stone, lime stones and alluvial deposits. These sand stones apparently belong to the Sirmar and Siwalik series of the sub Himalayan system. Some of the strata yield excellent building material and are also quarried for road material. Lime stone is the character of the Margallah range, and this is the main cause of fertility of villages which lies at its base. It is found also but in limited quantity in Murree hills. The alluvial deposits occur chiefly in the lower portion of Kahuta Tehsils. In Rawalpindi Tehsils, lime stone crops out everywhere along with the low hills and in the plains kankar deposits are common. The pebble ridges, described as
alluvial deposits in Kahuta hills are remarkable structural features of Kahuta and Rawalpindi Tehsils. Most of the forests in Rawalpindi are on pebbles ridges. Large isolated, boulders in many places seem to paint to a glacial epoch in the Potohar plain. Clay soils in Rawalpindi exhibit five distinct strata, from bottom to top:

(i) Course pebbles with sand or clay;
(ii) An alluvial stratum deposited by an older river system in the Soan Basin;
(iii) Alluvial deposits of the present river system;
(iv) An air-borne top layer of silt or clay (loess); and
(v) Conglomerate and loose gravel deposits.

As the project is located in WAH Cantt, which is situated at the bank of District Attock. The formation of rocks in the project area mostly composed of tertiary sand stone, lime stones and alluvial deposits. These sand stones apparently belong to the Sirmar and Siwalik series of the sub Himalayan system. Some of the strata yield excellent building material and are also quarried for road material. Lime stone is the character of the Burhan range, and this is the main cause of fertility of villages which lies at its base.

No visible signs of soil contamination were observed at the project location during the site visits. There is no sign of soil erosion or landslide anywhere within 500 m of the project site. Figure 4.2 shows the types of rocks present in the Project Area.

Figure 4.2: Rock types present in the Project Area
4.1.3 Climate

Seasonal climate conditions inter alia other environmental issues must be considered for the design and execution of a Project. The climate was an influencing factor affecting the construction of road and other engineering structure are the mean physical and chemical conditions including air, temperature, precipitation, humidity and evaporation. However to determine the overall effect of the climatic stresses, daily and seasonal temperature changes, site attitude, direct solar radiation, and precipitation must be considered.

The climate of the Project Area is classified as sub-humid to sub-tropical continental, receiving rainfall from both monsoon and western disturbances. The Project Area has hot summer and cold winters. In Rawalpindi, the mean maximum temperature ranges from 24° C to 39° C (75.2° F to 102.2° F) in June and the mean minimum temperature ranges from 3° C to 18° C (37.4° F to 64.4° F) in January. Temperatures vary from -1° C to 46° C (30.2° F to 114.8° F).

The Project Area receives rains in all the seasons but monsoon rain is pronounced and constitutes a definite rainy season between the month of July and September. The average rainfall is about 1,044 millimeters per year with 60% occurring in the rainy season. One day maximum annual rainfall per year is given in the Table 4.1.

<table>
<thead>
<tr>
<th>Year</th>
<th>Rainfall (mm)</th>
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<td>1955</td>
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<td>1975</td>
<td>116.8</td>
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</table>
Rawalpindi shows no prevailing wind directions in the mornings. Wind direction is evenly distributed throughout the year. In the late afternoon, winds are mainly from southwest, except in July and August when southeastern winds dominate. The meteorological conditions recorded during the monitoring were temperature, wind direction, wind speed, humidity and pressure. Table 4.2 summarizes month-wise temperature, precipitation, and relative humidity.

**Table 4.2: Month-wise Temperature, Precipitation and Relative Humidity (Rawalpindi)**

<table>
<thead>
<tr>
<th>Month</th>
<th>Mean Temperature</th>
<th>Precipitation (mm)</th>
<th>Relative Humidity (%)</th>
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<td></td>
<td>Maximum</td>
<td>Minimum</td>
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<td>July</td>
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<td>August</td>
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<td>September</td>
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<td>December</td>
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<td><strong>28.6</strong></td>
<td><strong>14.1</strong></td>
<td><strong>1142.1</strong></td>
</tr>
</tbody>
</table>

Source: District Census Report, Rawalpindi 1998

### 4.1.4 Hydrology and Drainage

Mountains, hills and spurs with potential of rainwater coming down to plains through various
streams originating from Murree and Kahuta Sattian hills surround Rawalpindi district. The important among them is Soan.

Surface water in the project area is available in the form of springs, nullahs and streams. The main stream in the project area is Jhablat Kas which is 1.5 km away and Sokha Kas is flowing 500 m away. The water from Sokha Kas falls in Jhablat Kas and Jhablat Kas falls in Haro River at Koliya in District Attock. During field visits, it was also observed that there is minimal flow of water in Sokha Kas.

4.1.5 Land Use

The dominant land use is agricultural land in 300 m radius. Figure 4.3 shows the land use pattern of the Project Area.

4.1.6 Water Quality

The ground water is available in Rawalpindi city area at a depth of water table ranges from 140 to 200 feet. The Project will have Bore. Water quality report is attached as Annexure- VI.
4.1.7 Ambient Air Quality

The ambient air quality was monitored at four locations. The ambient air quality was monitored for priority pollutants such as CO, NO, NO₂, SO₂ and PM₁₀. The results obtained are tabulated under Table 4.4 and 4.5. Ambient Air Quality and Particulate Matter Reports are attached as Annexure VII.

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<td>2.8</td>
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<td>Sulphur Dioxide (SO₂)</td>
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<td>3</td>
<td>Nitrogen Dioxide (NO₂)</td>
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<td>Nitrogen Oxide (NO)</td>
<td>40.0 μg/m³</td>
<td>5.6</td>
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</table>

Table 4.3: Ambient Air Quality Monitoring

<table>
<thead>
<tr>
<th>Sr #</th>
<th>Sample Point</th>
<th>Total Suspended Particulate Matter (One Hour)</th>
<th>NEQS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Plot Front</td>
<td>88.6</td>
<td>550 μg/Nm³</td>
</tr>
<tr>
<td>2</td>
<td>Plot Back</td>
<td>94.8</td>
<td>550 μg/Nm³</td>
</tr>
</tbody>
</table>

Table 4.4: Ambient Air Particulate Matter

The above table indicates that the concentrations of CO, SO₂, NO₂, NO & PM₁₀ are low at all points and well within limits specified by the USEPA Standards. The average value of PM₁₀ was within limits.
4.1.8 Noise Level

Noise levels were monitored with the help of a potable digital sound meter at 10 points. The hourly average data was provided by NCPC test results. The minimum and maximum noise levels observed at the given locations are tabulated under Table 4.6. Noise Levels Monitoring Report is attached as Annexure VIII.

Table 4.5: Noise Levels Measurement

<table>
<thead>
<tr>
<th>Sr #</th>
<th>Sampling Locations</th>
<th>Noise 75 dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Near Plot Front</td>
<td>56</td>
</tr>
<tr>
<td>2</td>
<td>Near Plot Back</td>
<td>54</td>
</tr>
<tr>
<td>3</td>
<td>Near Main Building</td>
<td>55</td>
</tr>
<tr>
<td>4</td>
<td>Near Right Corner</td>
<td>55</td>
</tr>
<tr>
<td>5</td>
<td>Near Animal Shed</td>
<td>56</td>
</tr>
</tbody>
</table>

It is evident from the noise monitoring data that noise levels are within limits. This is because the Project site is located away from the Main road and away from the commercial activities in the area.

4.1.9 Seismology

Horizontal and vertical seismic forces transmitted to the support structures by the ground earthquake may cause extremely high mechanical stresses to engineering structures as well as roads, seismic adaptation which is primarily related to the appropriate design of support structures and connections between the units.

Rawalpindi have been placed in zone 3 (moderate to severe damage zone) instead of zone 2 (minor to moderate damage zone) in terms of the area’s vulnerability to earthquake, according to a revised seismic survey. Therefore Project Area is located in Seismic Zone 3, where 3 represents moderate hazard with minor possible damage.
4.2 Ecological Environment

The flora and fauna of the Himalayas varies with climate, rainfall, attitude, and soils. The climate ranges from tropical at the base of the mountains to permanent ice and snow at the highest elevations. The amount of yearly rainfall increases from west to east along the front of the range. This diversity of climate, attitude, rainfall and soil conditions generates a variety of distinct plant and animal communities.

4.2.1 Flora

In view of its varied geographical features, the District Rawalpindi is rich in the variety of its flora. The vegetation of the area comprised of deciduous and ever green plants with diverse
shrub growth. In the upper reaches of Murree hills the main trees are Deodar (cedrus deodar), Biar (Pinus exeelsa), Paludar (Abies smithiana), Barangi (Querreus lassiflora) etc. The chil (Pinus longiflora) covers the lower hills. The commonly found trees/plants in the project area are Phulai, kikiar, kachnar, dhak, kinjal, Cheel and Sanatha. Figure 4.5 is showing the existing species of the Project Area.

Figure 4.5: Plant species present in the Project Area

The summary results of the dominant flora identified in the Project Area are given in Table 4.6.

Table 4.6: Plant Species present in the Project Area

<table>
<thead>
<tr>
<th>Sr #</th>
<th>Common Names</th>
<th>Botanical Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Phulai</td>
<td>Acacia Modesta</td>
</tr>
<tr>
<td>3</td>
<td>Sanatha</td>
<td>Deodonia Viscose</td>
</tr>
<tr>
<td>4</td>
<td>Sheesham</td>
<td>Dalbergia Sisoo</td>
</tr>
<tr>
<td>5</td>
<td>Granda</td>
<td>Carissa Spinarium</td>
</tr>
<tr>
<td>6</td>
<td>Cheel</td>
<td>Pinus logifolia/Pinus Roxberli</td>
</tr>
<tr>
<td>7</td>
<td>Simal</td>
<td>Bombax Cieba</td>
</tr>
</tbody>
</table>
The grasses commonly found in the area include the following species Table 4.7.

Table 4.7: Common grasses Present in the Project Area

<table>
<thead>
<tr>
<th>Sr #</th>
<th>Common Name</th>
<th>Botanical Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dab</td>
<td>Desmostachya bipinnata</td>
</tr>
<tr>
<td>2</td>
<td>Palwar</td>
<td>Bothriochloa perfuse</td>
</tr>
<tr>
<td>3</td>
<td>Bhablar</td>
<td>Eulaliopsis binata</td>
</tr>
<tr>
<td>4</td>
<td>Saroot</td>
<td>Sachharum bengalensis</td>
</tr>
<tr>
<td>5</td>
<td>Dib</td>
<td>Typha angustata</td>
</tr>
<tr>
<td>6</td>
<td>Khabbal</td>
<td>Cynodon dactylon</td>
</tr>
</tbody>
</table>

4.2.2 Fauna

No any endangered species of animals is found in the area. Wild Boar, Jackals or Wild Rabbit are quite common.

Common domestic animals include the goats, cows, buffaloes, donkeys, cats, dogs, hens and rats etc. Small herds of goats and sheep’s were found to be grazing in and around the Project Area. The fauna found in the Project Area is shown in Figure 4.11.

Figure 4.6: Domestic animals present in the Project Area
Mammals: Mammals present in and around the Project Area include – Wild boar (C), Golden Jackal (C), Red fox (C) and Fruit bats (C).

Note: T= Threatened, V= Vulnerable, R= Rare, C= Common.

Commonly found animals in the Margalla include Rhesus monkeys, jackals, wild boars.

Reptiles: Reptiles present in and around the Project Area – Russell’s viper, Indian Cobra, Himalayan pit viper and Saw scalded viper.

Birds: Due to the agricultural land in and around the project area commonly found birds species are:

- Peregrine Falcon; Kestrel;
- Indian sparrow hawk; Egyptian Vulture;
- White Cheeked bulbul; Black partridge;
- Cheer pheasant; Khalij Pheasant;
- Larks; Shrikes;
- Spotted Dove and Collard Dove.

4.2.3 Protected Area

"An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means”.

According to the guidelines for sensitive and critical areas, Total area under conservation in Pakistan is 7,661,784 ha, which represents 9.53% of the total land area of the Pakistan. The protected areas are classifies as:

A. National Parks;
B. Wildlife Sanctuaries; and
C. Game Reserves.

According to IUCN, Pakistan has a network of 225 Protected Areas comprising 14 National Parks, 99 Wildlife Sanctuaries and 96 Game Reserves.
A. National Parks
A national park is an area of outstanding scenic merit, where the landscape, flora and fauna are protected and preserved in their natural state and public access for recreation, education and research is provided for. Margalla Hills National Park and Ayubia National Park are the nearest national parks to the Project site. National Parks are includes the Rawal Lake. Several wildlife species inhabit these areas as well as the green belts separating the city’s sectors. Some of these green belts have a thick vegetation cover and provide their inhabiting wildlife with food and secure places for breeding and survival.

Margalla Hills: The Margalla Hills National Park is located in Northern Pakistan in a region of Federal Capital Territory at the foot hills of the Himalayas with a covered area of 17, 386 ha and is a beautiful National Park. It is a home to the leopards, gray Goral, Barking deer, wild boar, Asiatic Leopard, Jackal, Red Fox, Fruit bat, Porcupine and even Gazelle. It is also home to some bird and reptiles such as Larks, Pheasants, Spotted Doves, Egyptian Vultures, Falcons, Hawks and Russell’s viper, Indian Cobra and Saw-scaled Viper.

Ayubia National Park: Ayubia National Park is one of the best representative areas of Himalayan Moist Temperature Forest, a sub-category of Montane Forests. It covers area of 1684 ha. It has been declared as a National Park in 1984, and falls in IUCN Category V. A n ethno botany initiative is being carried out in this area to demonstrate the sustainable use of plant resources as a means for protecting biodiversity.

Rawal Lake: Rawal Lake is particularly important for thousands of birds that migrate from the cold northern areas during the winter season. These birds are diverse and include: Little Grebe, Little Cormorant, great Cormorant, Black Crown night Heron, Indian Pond Heron, Cattle Egret, Grey Heron, Common Quail, Moorhen, Long Legged Buzzard, Shikra etc.

B. Wildlife Sanctuaries
Wildlife Sanctuaries are areas set aside for the protection of wildlife. Public access is prohibited or regulated and no exploitation of forests is allowed.

As mentioned earlier, the provincial governments have listed 99 wildlife sanctuaries. On further classification, Punjab contains – 37, Sindh – 35, Northwest Frontier – 6, Balochistan – 15, Federal Territory – 1 and Northern Areas – 5.
There is no wildlife sanctuary in district Rawalpindi and Margalla Hills National Park in Islamabad is also declared as a wildlife Sanctuary.

C. Game reserves
Hunting and shooting of wild animals is regulated under permit. The numbers of shoots allowed in reserves varies, and is determined by provincial governments.

In addition, 96 other areas have been designated as game reserves and these govern an additional 4407 square miles of terrain, (Punjab – 19 areas, Sindh – 14 areas, Northwest Frontier – 38 areas, Balochistan – 7 areas, Northern Areas – 9 sites, Federal Territory – 1 and AJK – 8 sites).

There is no game reserve in district Rawalpindi and Margalla Hills National Park in Islamabad is also declared as a Game Reserved Area.
5 General

The Project Area is located in the WAH Cantt, District Rawalpindi. The construction of the Project is planned in the territorial jurisdiction of WAH Cantonment Board. There are no human settlements within 300 m near the project site.

5.12 Methodology

Social baseline was developed using both the primary and secondary sources of data. Social Survey was conducted in the nearby localities of the Project area located at Peshawar Road, Asifabad and Malakand Stop to get primary information about the socio-economic status of these communities. For the purpose of social survey, structured interview schedule was used keeping in view the nature and level of the respondents, in which both open and close ended questions were used. During the survey 50 people were contacted to study the socioeconomic conditions of the nearby settlements. In addition, informal and formal group discussions were also held within these communities and with various potential NGOs to study their awareness, acceptance, concerns, preferences and perceptions about the construction of the “Incinerator Facility”.

Documents related to historical records of population statistics like District Census Report of Rawalpindi (1998) was also used to get overall picture of the district population related to socioeconomic parameters.

5.13 Political and Administrative Setup

The proposed Project Area falls in the administrative jurisdiction of Cantonment Board WAH, Director General Military Lands and Cantonments is the highest ranked administrator for Cantonments all over the Pakistan, whose office is in Rawalpindi District. The total area of the District Rawalpindi is 5, 286 square kilometers out of which WAH Cantt covers a total area of 90.65 square kilometers.
5.3 Demography

5.3.1 Population Size, Growth and Distribution

Regionally the total population of the Rawalpindi District was 3, 363, 911 as enumerated in March, 1998 with an intercensal percentage increase of 58.6 since March, 1981 when it was 2, 121, 450 souls. The average annual growth rate of population in the District during intercensal period 1981-1998 was 2.7 percent. The total area of the district is 5, 285 square kilometers, which gives population density of 636 persons per square kilometer against 401 persons, observed in 1981 indicating a fast growth rate of the population. Table 5.1 gives population, its intercensal increase and average annual growth rate since 1951.

Table 5.1: Population and Intercensal Increase and Growth rates since 1951

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (in 000’s)</td>
<td>872</td>
<td>1,086</td>
<td>1,745</td>
<td>2,121</td>
<td>3,364</td>
</tr>
<tr>
<td>Intercensal Increase (percent)</td>
<td>-</td>
<td>24.5</td>
<td>60.7</td>
<td>21.5</td>
<td>58.6</td>
</tr>
<tr>
<td>Average Annual Growth Rate (percent)</td>
<td>-</td>
<td>2.2</td>
<td>4.1</td>
<td>2.3</td>
<td>2.7</td>
</tr>
</tbody>
</table>

(Source: District Census Report, Rawalpindi, 1998)

The total population of WAH Cantt is 198891 as enumerated in the March 1998 Census.

5.3.2 Religion

The population of the Rawalpindi District of which the Project Area is an integral part is predominantly Muslim i.e 97.72 %. The next higher proportion is that of Christians with 2.11 %. While other minorities like Ahmadis, Hindu etc. also live in small numbers are shown in Table 5.2. The population of the WAH Cantt is predominantly Muslims.
Table 5.2: Percentage of Population by Religion and Rural/Urban Areas

<table>
<thead>
<tr>
<th>Religion</th>
<th>Rawalpindi Average Area</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muslims</td>
<td>97.72</td>
<td>99.28</td>
<td>96.34</td>
</tr>
<tr>
<td>Christians</td>
<td>2.11</td>
<td>0.65</td>
<td>3.39</td>
</tr>
<tr>
<td>Hindu</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>Ahmadis</td>
<td>0.15</td>
<td>0.06</td>
<td>0.23</td>
</tr>
<tr>
<td>Others</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
</tr>
</tbody>
</table>

(Source: DCR 1998, Rawalpindi District)

5.3.3 Races and Tribes

One of the important races and tribes living in the Rawalpindi District are the Rajputs, amongst whom the important sub-divisions are Bhatti, Rawal, Janjua, and Chohans. Dhunds and Satti inhabit the Murree and Kotli Sattian Hills. People of the District Rawalpindi are well built and of medium height and are considered to be among best soldiers in the Pakistan Army.

5.3.4 Mother Tongue

The mother tongue refers to the language used for communication between parents and their children in any household. Punjabi is the predominant language being spoken by majority of the population of the district i.e. Rawalpindi followed by Urdu etc.

5.3.5 Sex Ratio

Sex ratio, i.e. number of males per every 100 females, was 105% recorded in 1998 Census, which had decreased from 107 in 1981. The ratio was 96% in rural areas and it was 113 in urban areas.

5.3.6 Age Structure

In 1998, the proportion of the infants under one year was 2.2%, children under 5 years 12.2%, children under 10 years 25.5%, under 15 years 38.6% of the total population. More than 18
years 54.6% and more than 21 years were 47.9% of the total population. The proportion of population of working age groups i.e. 15 to 64 years, were recorded as 57.8% and over 65 years 3.6%. Table 5.3 give detail on percentage of population by selected age groups, sex in rural and urban areas in 1998. (See Table 5.3).

Table 5.3: Population Percentage Distributions by Selected Age Groups, Sex, and Rural/Urban Areas

<table>
<thead>
<tr>
<th>Age Group</th>
<th>All Areas</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Both Sexes</td>
<td>Both Sexes</td>
<td>Both Sexes</td>
<td>Both Sexes</td>
</tr>
<tr>
<td>Under-1</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
</tr>
<tr>
<td>Under-5</td>
<td>12.2</td>
<td>12.2</td>
<td>12.2</td>
</tr>
<tr>
<td>Under-10</td>
<td>25.5</td>
<td>25.5</td>
<td>25.5</td>
</tr>
<tr>
<td>Under-15</td>
<td>38.6</td>
<td>38.7</td>
<td>38.5</td>
</tr>
<tr>
<td>15 - 49</td>
<td>49.4</td>
<td>48.8</td>
<td>50.0</td>
</tr>
<tr>
<td>15 - 64</td>
<td>57.8</td>
<td>57.5</td>
<td>58.1</td>
</tr>
<tr>
<td>18 &amp; above</td>
<td>54.6</td>
<td>54.4</td>
<td>54.7</td>
</tr>
<tr>
<td>21 &amp; above</td>
<td>47.9</td>
<td>47.9</td>
<td>47.9</td>
</tr>
<tr>
<td>65 &amp; above</td>
<td>3.6</td>
<td>3.8</td>
<td>3.4</td>
</tr>
</tbody>
</table>

5.3.7 Marital Status

The population above 15 years was further classified in to never married, married, widowed and divorced. Of that total population 35.7% were never married, 58.2% married, 5.7% widowed and 0.4% divorced. The percentage share of never married male was higher than the females, being 41.3% and 29.8% respectively. The percentage of never married females was higher in urban than rural areas. Table 5.4 gives details about percentage of population 15 years and above by marital status, sex and rural and urban residence.
Table 5.4: Population Percentage Distribution by Marital Status, Sex and Rural/Urban Areas

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>All Areas</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never Married</td>
<td>Both Sexes</td>
<td>35.7</td>
<td>34.2</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>41.3</td>
<td>40.9</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>29.8</td>
<td>28.1</td>
</tr>
<tr>
<td>Married</td>
<td>Both Sexes</td>
<td>58.2</td>
<td>58.3</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>55.7</td>
<td>55.4</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>60.8</td>
<td>60.9</td>
</tr>
<tr>
<td>Widowed</td>
<td>Both Sexes</td>
<td>5.7</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>2.8</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>8.8</td>
<td>10.2</td>
</tr>
<tr>
<td>Divorced</td>
<td>Both Sexes</td>
<td>0.4</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>0.6</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Source: DCR Rawalpindi, 1998

5.4 Quality of Life

5.4.1 Literacy

A person is treated as literate if he can read newspaper or a journal of same standard and can write a simple letter in any language. The literacy ratio in Rawalpindi district is 70.4% as per census of 1998 and in WAH it is 99%.

There are 3 universities, one medical college and many secondary colleges and schools in the town. The renowned names are:
1. COMSATS
2. Wah medical college
3. University of Wah
4. F.G colleges
4. Punjab group of colleges
5. ROOTS school
6. Beacon- house school
7. LGS

And many other renowned institutes for skill development both for men and women are in the town available at very less fees.
During the survey it was observed that people of the Project Area are very much prone towards higher education of their children. **Table 5.5** shows the survey results analyzed for education level of the respondents. Out of the total survey respondents, 44% were educated above intermediate level including college and university education. 19% were intermediate level, 9% were up to matriculation level, 13% Middle, 10% Primary and 7% Illiterate.

**Table 5.5 Education Levels of the Respondents**

<table>
<thead>
<tr>
<th>Sr #</th>
<th>Educational Level</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Illiterate</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Primary</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Middle</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>Matric</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>Intermediate</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>6</td>
<td>Above Intermediate</td>
<td>35</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>80</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

### 5.4.2 Professional Status

The Project Area is mostly plain but with no proper water supply for agriculture. This agriculture is mostly dependent on rain, as such could be formed as Barani Agriculture. Although the majority of the population of Project Area are linked with Government/Private jobs. The poor people in the community normally resort to labor jobs, while other goes for government and private jobs outside the Project Area. A minor segment of the population of the Project Area has got jobs overseas.

During the social survey, respondents were also asked about their occupational associations, and after analysis it was found that 55% of the total respondents were associated with Jobs, 15% with agriculture, 20% were shopkeepers and only 10% were teachers. **Table 5.6** shows the findings of the survey results.

**Table 5.6: Professional status of the Respondents**

<table>
<thead>
<tr>
<th>Sr #</th>
<th>Professional Status</th>
<th>No. of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Agriculture</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>Government Job</td>
<td>45</td>
<td>57</td>
</tr>
<tr>
<td>3</td>
<td>Shopkeeper’s</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>Teachers</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>Labor</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>80</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
5.4.3 Average Monthly Incomes

From the occupational affiliations of the respondents, it can be easily judged that affected communities belong to the income group of people whose income levels are low. Table 5.7 depicts the analysis results of the surveyed data. It can be observed that majority (40%) of the respondents belong to income group of 10,000 – 15,000 and only 04% respondents were earning their incomes above 20,000. Figure 5.1 shows the activities related to social survey of the Project Area.

![Social Survey in Process in the Project Area](image)

**Figure 5.1: Social Survey in Process in the Project Area**

**Table 5.7: Income Level of the Respondents**

<table>
<thead>
<tr>
<th>Sr#</th>
<th>Income Level (Rs.)</th>
<th>No. of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Less than 5,000</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>5,000 – 10,000</td>
<td>27</td>
<td>34</td>
</tr>
<tr>
<td>3</td>
<td>10,000 – 15,000</td>
<td>32</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>15,000 – 20,000</td>
<td>08</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>20,000 &amp; above</td>
<td>03</td>
<td>04</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>80</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
5.4.4 Economically Active Population

The economically active population is defined as the persons working, most of the time during the year preceding the cause date, looking for work, laid off and un-paid family helpers assisting their family. The economically active population of the district in the last census (1998) was 21.9% of the total population or 29.4% of the population 10 years and over, i.e. the population exposed to the risk of entering the economically active life anytime.

5.4.5 Unemployment Rate

Unemployment rate is measured as ratio of looking for work and laid off in total economically active population comprising employed, looking for work, laid off and un-paid family workers, generally representing in percentage. The unemployment rate in the district was 21.1%, which was mainly due to unemployment amongst males representing 21.8%, while female unemployment rate was just 0.9%.

5.5 Public Facilities

5.5.1 Electricity

Predominant housing units (91.0%) are using electricity as source of light in the whole district both in rural and urban areas. In the villages, under study for this project electricity is available in the 100% houses.

5.5.2 Cooking Fuel

Sui Gas is not available in the villages and people are mostly using wood as cooking fuel. If we have a look on the whole district, more than half (52.9%) of the housing units are using gas as cooking fuel in their houses and remaining population is using wood, kerosene oil and other sources of fuel.

5.5.3 Medical Facilities

There are many private clinics and hospitals; government dispensaries and hospitals in the Cantt. Free medical treatment is done in government dispensaries and hospitals. The main
hospital also known as P.O.F HOSPITAL is equipped with all the latest technology and machinery. Treatment of its employees is totally free.

5.5.4 Water Supply

People living around the project area are using bores for water. The project will have bore for fulfilling water requirement.

5.5.5 Commercial Banks

The nearest bank facility is available on Peshawar Road which is 1.5km away. Branches of various Banks are working in the WAH Cantt. People have to come there for their financial handlings of routine activities.

5.5.6 Communications

The Project Area is connected with excellent metalled road with WAH Cantt, Rawalpindi and Islamabad cities. The system of communication in WAH Cantt is very satisfactory. The Rawalpindi has total metalled road length of 1,446 kilometers.

The main line of the Pakistan Railways and the Grand Trunk Road parallel to the railways runs through the District Rawalpindi to various other cities like Peshawar, Kohat, Mianwali, Faisalabad, Lahore and Karachi.

5.6 Communities Acceptability about the Project

5.6.1 Awareness about the Project

Almost 80% respondents were aware of the construction of the proposed Project and 20% of the respondents was found who was unaware about the project. Table 5.8 shows the awareness level of the respondents.
5.6.2 Accessibility of the Project

After the sample survey it was observed that 75% respondents favored the construction of the Commoners Flower Valley while remaining 25% did not favor the Project implementation (Table 5.9)

Table 5.9: Acceptability of the Project

<table>
<thead>
<tr>
<th>Sr#</th>
<th>Response</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In Favor</td>
<td>60</td>
<td>75</td>
</tr>
<tr>
<td>2</td>
<td>Not in Favor</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

5.6.3 Perceptions about the Project

Perceived Impacts during Construction Stage

Based on the sample survey and informal meetings conducted with the people of the Project Area, the various perceived impacts of the respondents during construction stage of the project are tabulated in Table 5.10 (multiple response), 20% of the respondents think that with the construction of the proposed project will cause duct emissions, In nineteen percent (19%) cases, people expressed that construction activity at site will result in creating job opportunities for the local people. Eighteen percent (18%) perceive that it will produce noise and vibrations due to incinerator machinery and movement of vehicles which will result in disturbing the routine agricultural activities of the farmers. In sixteen percent (16%) cases the respondents showed their serious concern that during construction; movement of the females going outside for agricultural activities will be disturbed. In 9% cases, respondents did not give any response regarding impacts of this proposed Project during construction.
Table 5.10: Impacts during Construction Stage

<table>
<thead>
<tr>
<th>Sr #</th>
<th>Perceived Impacts</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dust Emissions</td>
<td>45</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>Employment Opportunities</td>
<td>41</td>
<td>19</td>
</tr>
<tr>
<td>3</td>
<td>Noise and Vibration Problem</td>
<td>40</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>Movement Problem for the Females Farmers in Their Routine Agricultural Activities</td>
<td>35</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>Increased Commercial Activity</td>
<td>25</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>Debris Fall</td>
<td>15</td>
<td>07</td>
</tr>
<tr>
<td>7</td>
<td>No Response</td>
<td>20</td>
<td>09</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>221*</td>
<td>100</td>
</tr>
</tbody>
</table>

*Multiple Responses

Perceived Impacts during Operation Stage
At the operational stage, (Table 5.11-multiple response), twenty two percent (22%) of the responses thought that construction of the proposed project would result in creating job opportunities for the local people. In nineteen percent (19%) cases respondents considered the increased commercial activity at the project site. In 13% & 05% cases responses were that implementation of the Project will create movement problem for the pedestrians and traffic jams due to increased number of vehicles. In twenty six percent (26%) cases, the respondents did not give any response.

Table 5.11: Impacts during Operation Stage

<table>
<thead>
<tr>
<th>Sr #</th>
<th>Impacts During Operational Stage</th>
<th>No. of Respondents</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Employment Opportunities for the Local People</td>
<td>25</td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>Increased Commercial Activity</td>
<td>21</td>
<td>19</td>
</tr>
<tr>
<td>3</td>
<td>Movement Problem for the Females</td>
<td>17</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>Pedestrians Movement Problems</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>5</td>
<td>Traffic Jams at the Entrance</td>
<td>05</td>
<td>05</td>
</tr>
<tr>
<td>6</td>
<td>No Response</td>
<td>31</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>113*</td>
<td>100</td>
</tr>
</tbody>
</table>

*Multiple Responses
Protective Measures Suggested by the Respondents

Table 5.12 (multi response), shows the protective measures suggested by the respondents during the field survey. It is evident from the Table that out of total 160 responses, 28% responses highlighted the need to provide local people jobs on priority basis. 20% responses emphasized that dust and noise should be controlled by adopting the latest techniques. 09% considered that it is necessary to chalk out proper management plan for traffic so that movement of the locals is disturbed at the minimum. Controlled blasting and construction at day time only was in 6% and 8% cases respectively, while 29% provided no response/suggestion.

Table 5.12: Protective Measures Suggested by the Respondents

<table>
<thead>
<tr>
<th>Sr #</th>
<th>Measures Suggested</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Priority in Jobs for Local People</td>
<td>45</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>Dust and Noise Control</td>
<td>32</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Controlled Movement of Traffic</td>
<td>15</td>
<td>09</td>
</tr>
<tr>
<td>4</td>
<td>Controlled Blasting</td>
<td>10</td>
<td>06</td>
</tr>
<tr>
<td>5</td>
<td>Construction at Day Time Only</td>
<td>12</td>
<td>08</td>
</tr>
<tr>
<td>6</td>
<td>No Response</td>
<td>46</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>160</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

*Multiple Responses

5.7 Recreational Sites

**Murree**

It is the most accessible hill station in North Pakistan and is connected with very fine metallled roads from Rawalpindi and Islamabad. Besides the old Rawalpindi-Murree Highway, a new Highway named “Murree Expressway” is being developed up to Murree. Magnificent views of the snow clad mountains of Kashmir can be seen during spring and autumn in Murree and its surroundings and gorgeous sunset and cloud effects are seen daily during the rainy season. The Places of interest include Angoori Road, Kashmir Point, Pindi Point and Patriata Chairlift/Cable Cars.

**Rawalpindi**

The famous recreational sites in the Rawalpindi city are Ayub National Park and Liaquat Memorial Park (Company Bagh).
Islamabad
The key places of interest in Islamabad are the Margalla Hills, Shakarparian, Rawal Lake, Islamabad Park, Rose and Jasmine Garden, Murghazar Mini Zoo, Children’s Park and Fatima Jinnah Park, etc.
SECTION 6
PUBLIC CONSULTATION

6.0 General

Consultation with the stakeholders is a tool for managing two-way communication between the project sponsor and the public. Its goal is to improve decision-making and build understanding by actively involving individuals, groups and organizations which have a stake in the project. This involvement increases project’s long-term viability and enhances its benefits to locally affected people and other stakeholders.

Consultation with the community and their active participation plays a vital role in successful implementation of the development projects. To identify the different types of stakeholders and ascertain their perceptions about the construction of the Incinerator Facility, an impact assessment survey was conducted. Stakeholders were consulted with the help of structured/semi-structured tools. Informal group discussions were also held as an additional tool for obtaining feedback from the stakeholders that are being discussed on the following pages.

6.1 Objectives of the Public Consultation

Public consultation plays a vital role in studying the effects of the Project on the stakeholders and in the successful implementation and execution of the proposed projects. Public involvement is a compulsory feature of environmental assessment which leads to better and more acceptable decision-making. The objective of the consultation with stakeholders is to help verify the environmental and social issues that have been presumed to a rise and to identify those which are not known or are unique to the construction of the proposed project.
The important general objectives of the Consultation process are:

- Information dissemination, education and liaison;
- Identification of problems and needs;
- Collaborative problem solving;
- Reaction, comment and feedback on proposed Project; and
- Documenting mitigation measures proposed by the stakeholders.

6.2 Methodology

The consultants carried out public consultations at various locations around the proposed Project Site. The Stakeholders consultation during this phase of the work targeted the Peshawar Road, Malakand Stop, Asifabad, various NGOs and administrative and educational institutions in the Project Area. Following strategy was adopted for public consultation:

- Selection of the stakeholders for consultation, reconnaissance of the proposed Project Site and initial discussions with the residents, office workers, pedestrians and shopkeepers etc.

- Appraising the targeted stakeholders initially for the purpose of consultation and working out a schedule for holding regular consultation meetings;

- Meetings with the stakeholders through the participation of consultants, environmental and social specialists and documenting the opinions of the stakeholders expressed during the meetings etc; and

- All the meetings were held in open atmosphere in which participants expressed their views freely.

6.3 Major Stakeholders identified

In the Project Area, all the possible stakeholders were identified during the survey. Following is the list of potential stakeholders in the Project Area.
• Local residents
• Teachers
• Shop owners
• Office Workers
• Laborers
• Pedestrians
• Mosque users
• Transport users
• Non-government organizations (NGOs)

6.4 Categories of Stakeholders Consulted

The stakeholders contacted during the survey belonged to different categories of people and institutions as below:

• Local residents
• Office Workers
• Shop Owners
• School Teachers
• Councilors
• NGOs

Schedule of consultations is given below in Table 6.1.

Table 6.1: Schedule of Consultations

<table>
<thead>
<tr>
<th>Sr #</th>
<th>Date</th>
<th>Venue</th>
<th>Contact Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>04/01/16</td>
<td>Mouza Gattia</td>
<td>Anwar Shah Syed S/O Iqbal Hussain Shah</td>
</tr>
<tr>
<td>2</td>
<td>04/01/16</td>
<td>Mouza Gattia</td>
<td>Mukhtar Ahmed S/O Shah Ibrar</td>
</tr>
<tr>
<td>3</td>
<td>04/01/16</td>
<td>Mouza Gattia</td>
<td>Muhammad Zafar Rana S/O Muhammad Qadeer Rana</td>
</tr>
<tr>
<td>4</td>
<td>04/01/16</td>
<td>Mouza Gattia</td>
<td>Muhammad Mehboob S/O Hayaat Muhammad</td>
</tr>
<tr>
<td>5</td>
<td>04/01/16</td>
<td>Mouza Gattia</td>
<td>Muhammad Sadeeq Ahmed S/O Nabi Jaan</td>
</tr>
<tr>
<td>6</td>
<td>12/01/16</td>
<td>Mouza Gattia</td>
<td>Muhammad Maqsood S/O Taj Muhammad</td>
</tr>
<tr>
<td>7</td>
<td>12/01/16</td>
<td>Mouza Gattia</td>
<td>Imran Ali s/o Nishan Ali</td>
</tr>
<tr>
<td>8</td>
<td>12/01/16</td>
<td>Mouza Gattia</td>
<td>Bahadur Khan s/o Sher Khan</td>
</tr>
<tr>
<td>9</td>
<td>17/02/16</td>
<td>Rawalpindi</td>
<td>Officials of Punjab Forest Department Rawalpindi</td>
</tr>
<tr>
<td>10</td>
<td>17/02/16</td>
<td>Islamabad</td>
<td>Officials of WWF in Islamabad</td>
</tr>
<tr>
<td>11</td>
<td>17/02/16</td>
<td>Rawalpindi</td>
<td>NCPC Foundation</td>
</tr>
</tbody>
</table>
6.5 Issues Discussed

Following issues were discussed during the stakeholder’s consultation:

- Overall activities of the project and their possible impacts;
- Possible impacts on natural vegetation, flora and fauna;
- Possible mitigation measures;
- Beneficial factors and involvement opportunities of the local people in the set of activities of Project; and
- Management of traffic during construction and operational phase of the project.

Figure 6.1 shows a view of public consultation in the Project Area.

6.6 Summary of Key Issues

During the course of the consultation process, a range of issues were raised by the project stakeholders. These are outlined below.
6.6.1 General

- Majority of stakeholders appreciated the project and taken it as a necessary step towards the current situation of waste problems.
- Few people had some reservations regarding the emissions of gases

6.6.2 Environmental

- Few people were concerned about the waste that would be left behind after burning and how that waste is going to be handled
- Odor due to the waste carrying by trucks/ pickups
- Vegetation removal from the project site

6.6.3 Socio Economic

- Expectations about employment opportunities and community development were extremely high among all stakeholders

6.7 Proposed Mitigation Measures for Key Issues of Incinerator Project

6.7.1 General

- Project activities shall be confined to the designated project site, minimizing any damage to the macro environment.
- This incinerator will be equipped with state of art technologies e.g. scrubbers for control of particulate matter and emissions. Regular monitoring of emissions will be practiced to comply with the NEQS.
- The road network is well established within the area of the proposed project. Moreover, if needed, it can be improved.
- Project will be completed in time.
6.7.2 Environmental

- There is no removal of trees and habitat destruction due to project activities as there exist no any trees or habitat at the proposed site.
- Tree plantation is the part of project to improve the environmental conditions of the site. Tree plantation activities are carried out by the project proponent on regular intervals.
- The vehicles carrying wastes would be properly covered to reduce the odor problem.
- Waste produced during the project activities would be properly managed and disposed off.
- Regular environmental monitoring would be ensured to meet NEQS.

6.7.3 Socioeconomic

- All unskilled jobs (watchmen, laborers) would be given to local people through local contractors. People directly affected by the project would be given priority.
- Appropriate measures for safety and control of pollution during project activities would be ensured to avoid risk and hazard to the community.
7.0 General

This section presents likely positive and negative environmental impacts together with the proposed mitigation measures to prevent and/or alleviate them to the extent possible during the design, construction and operational phases of the proposed project.

7.1 Extent and Evaluation of Impacts and Mitigation Measures

Incinerators can generate impacts on the surrounding natural environment if not properly monitored. The major impacts on the natural environment include soil contamination and air quality deterioration. There are however, a number of technical, social and environmental problems associated with incineration. These arise from the potential pollutants contained in the emissions and residual solids remaining from the combustion process.

In Europe the standards imposed for incineration are very high, leading to higher costs of incineration, depending on economies of scale. This is because the employment of Best Available Technology (BAT) requires the complete destruction of the waste to a completely burned, sterile ash and the control of emissions by gas cleaning techniques to reduce particulates, acid gases and dioxins to the very low levels specified in European legislation.

BAT, however, is clearly not affordable for developing countries. Simple incineration that leads to a dramatic improvement in the quality of air emissions compared to the continuation of open burning dumps, must therefore offer a major environmental amelioration.

The assignment of significance to various impacts issued to develop an environmental mitigation and management plan by highlighting significant potential impacts for which prevention, mitigation and control measures need to be implemented as required. The following basis of mitigation and management will be used.
7.2 Impact Identification

Few impact identification methods are used to perform this job. These include Assessment through the stages of the Project, Checklists, Matrices and Networks. All of these methods have few advantages, disadvantages and limitations, therefore number of methods and techniques are employing.

7.2.1 Thinking through the Stages of the Project

This method has to have the advantage of thinking logical mental approach and linking actions with Impact. To categorize the impacts, the magnitudes of impacts are designated as:

1. Impacts of Minor Significance: Limited measures and controls are required.
2. Impacts of Limited Significance: Additional and specific mitigation measures and controls are required. Generally monitoring will be required for these.
3. Impacts of Major Significance: These are considered intolerable, alternatives will he sought to avoid the possible consequence and preventive measures and multiple controls will be implemented to reduce likelihood and associated consequence.

7.2.1.1 Location of the Project

This section reviews the impacts of the proposed Incinerator on the surrounding environment from a physical prospective. The concerns regarding siting of the project includes the importance of positioning the incinerator away from tall buildings or overhanging obstructions, which may adversely affect draft conditions.

Screening of Potential Environmental Impacts

As the site of proposed Incinerator is located 300 m away from the human settlement and also the proponent has taken NOC from neighbors so there is very less chance of human population displacement to acquire the Land in very future. Similarly the project will have no effect on the demographic patterns and disruption of social and cultural values and pattern. The socio-economic impacts of the selling up of the incinerator are anticipated as being positive.
The properties of site includes: proximity to raw materials (waste to be incinerated), easy access, provision of services (water, electricity & gas etc), away from human settlement.

Removal of vegetation has an impact of a minor significance and there is no significant habitat identified in the area.

Guidelines for sensitive and critical area were reviewed, so that the proposed project is planned and sited in a way that protects the values of sensitive and critical areas. These guidelines include critical ecosystems including wildlife reserves and forests, archaeological sites, monuments, buildings, Antiques, or cultural heritage sites.

Protected areas in Pakistan can be broadly categorized into two groups; they are:

a. Ecosystems
b. Archaeological and Cultural sites

The Ecosystems includes protected areas such as wildlife, national parks, and game reserves, archaeological sites, monuments, buildings and cultural heritage (includes world heritage).

The site of the proposed project seems to have no visual impact on historical, archaeological, and cultural resources and on landscapes, as the site does not fall near or in the boundaries of the protected areas. The project area around 300m radius is uninhabited. Hence resettlement and rehabilitation requirements are non-existent.

**Recommended Mitigation Measures**

As far a project location is concerned, it cannot be categorized, as being ecologically sensitive or environmentally sensitive. The proposed facility will cause no specific adverse effect on the existing landscape. Structures must be laid out as to blend with the natural settings and plant trees at regular intervals.

It is crucial to avoid air turbulence and potential back pressure which can interfere with the design balance of primary and secondary air flow within the incinerator as well as possibly creating odorous emissions and paper char

Proper access must be available to the incinerator
7.2.1.2 Design & Construction Phase

It is essential to identify the potential impacts at the planning stage, and at the same time recommend appropriate control measures so as to ensure that these measures are duly incorporated as part of the project design. These impacts may create temporary hazard to the environmental resources of the project area during the projects construction phase.

**Screening of Potential Environmental Impacts**

These impacts are related to site preparation activities that include: Clearing, Excavation, Earth moving and Fill areas. Potential Environmental Impact is related with the site selecton and development stage of the proposed operation are outlined as follows:

- The project site and access road construction may lead to soil erosion and alteration of soil quality by removal of topsoil in the project site and access road area. The access road is already present therefore such impacts are insignificant. These impacts are found to have minor significance.

- During construction, water is required for numerous construction activities. The impact is found to have minor significance.

- The clearing for access road and project site development will result in removal of vegetation and very limited loss of plant cover and productivity. Also there is very few livestock grazing in the area. As the covered area is very small and inhibit no wildlife and trees, there will be no harm to ecology of the project area. The impact is found to have minor significance.

**Recommended Mitigation Measures**

**Management of Contractor:** The contractor will be required to comply with all existing environmental protection legislation of Pakistan and Pakistan Environmental Protection legislation’s Health Safety and Environmental policies. Compliance with these requirements will be made, a condition of contract for the contractor. The contractor will be required to take effective measure for the proper disposal of the wastes generated at the project site during construction activities.
Earth Work: During construction, the earthwork will be carefully planned and executed to minimize soil erosion, excessive land uptake and unnecessary clearing of vegetation. The area around the incinerator must be surrounded with retaining wall if required.

Water Supply: Water use will be planned depending upon the supply and timing to avoid and inconvenience.

Design and Construction: Proper designing and planning the construction activities will reduce environmental Impacts. The material involved in the excavation and filling will be minimized. Adequate drainage and erosion protection will be provided at the site.

7.2.1.3 Operation Phase

Proper planning is required to minimize environmental impacts, as well as community awareness and involvement that directly address these issues, are essential for successful incineration operation. The training of incinerator staff is quite important for smooth operation, minimum environmental and health impacts.

Screening of Potential Environmental Impacts

This section reviews the impacts of the proposed incinerator on the surroundings environment as a result of the operation of the hazardous waste incinerator. A normal operation of the incinerator normally generates the following types of emission:

A. Storage of Waste
The project site will be available with the liquid storage tanks and store for temporary waste storage. This facility could create impacts of major significance if not properly handled and supervised. The tanks have inlet and outlet valves to dump and emptying the tank. This storage facility would help:

- To prevent scavenging of waste
- Scattering of waste with wind
- Nuisance from smell and odor
• Protect the waste from sunlight and rain

**Recommended Mitigation Measures**

The storage facility requires following measures to be adopted for safe and healthy working conditions without affecting personnel’s health and environment:

- Medical waste should be incinerated the on the day it is received, if not possible, the medical waste (yellow bag) won’t be stored for more than 24 hrs.
- The storage tank must be marked as hazardous storage facility.
- The workers must wear personal protective equipment like Gas mask, gloves, overall and safety shoes before entering the storage tank
- Ensuring the housekeeping of area around the storage tanks and especially inside the facility

**B. Air Emissions**

**Stack Emissions**

The combustion of any substance will generate by-product emissions that could be released to the air. Waste burning processes generate wastes, which contain particulates, sulphur and nitrogen oxides, volatile organic compounds, dioxins/furans and acidic gases. The Particulates also includes heavy metals present in the waste. Primary attention needs to be focused on gaseous emissions of particulates less than 10 microns in size, dioxins/furans, sulfur dioxide and nitrogen oxides due to associated health concerns and other environmental damage caused by these pollutants.

Incinerator air emissions can have a major impact on the local and regional air quality if not controlled properly. The pollutants can seriously impair human health and damage vegetation and other materials.

**Recommended Mitigation Measures**

- To limit these emissions the incinerator should be properly operated and carefully maintained.
- The temperature in the primary chamber should he around 600-800°C and in the secondary chamber 900- 200°C.
To protect human health, agriculture, and native wildlife and vegetation, design higher stacks to reduce ground level concentrations.

In order to meet environmental standards, modern pollution control equipment is designed to remove emissions. When properly operated, the best air pollution control equipment can potentially remove up to 99% of dioxins and furans, more than 99% of heavy metals, more than 99% of particulate matter, more than 99% of hydrogen chloride, more than 90% of sulfur dioxide, and up to 65% of nitrogen oxides.

Gaseous and particulate air emissions can be controlled with different emission control technologies available for incinerators like Fabric filters; Electrostatic precipitators; Fabric filters also known as baghouses; Electrostatic gravel bed filters Wet and dry Scrubbers. These methods are extremely effective in controlling emissions of metals and organic compounds that could also attach to fine particulates.

Fabric filters consist of several cylindrical bags that filter emissions. Electrostatic precipitators also can be used to control particulate emissions; they electrically charge particulate emissions and then draw the particles to oppositely charged collection plates. The collection plates are shaken periodically to remove the particles, which constitute fly ash.

Exhaust gas from an incinerator can be forced through a wet scrubber to remove toxic gases. Scrubbers are used primarily to control acid gases, but they also remove some heavy metals. Wet scrubbers use a moving alkaline liquid solution to neutralize acids. Dry scrubbers use either a fine alkaline spray or powder to neutralize acids. The generally accepted state-of-the-art HSW air pollution control system for maximum pollution control is dry scrubbing followed by a baghouse.

Primary Pollutants emitted from a major incinerator facility should be monitored on a continuous basis.

Some potentially hazardous materials such as gaseous HCl, SO₂, and dioxins resulting from chlorine and sulfur containing materials in the waste are difficult to capture and remove, even when using sophisticated gas-cleaning plant. The pre-sorting of waste and the removal of as
much as possible of the materials, which lead to these hazardous contaminants, will therefore help to minimize harmful emissions to atmosphere.

It has been found that a strong correlation exists between combustion temperature, residence time and dioxin emission. The California air resources board recommends minimum temperatures of $98.22 + 87.77^\circ$C with a minimum residence time of 1 second. The design of Incinerator should operate under the conditions as per specifications to minimize the production of dioxins.

Production of CO and HC are directly related to the combustion efficiency therefore the optimum conditions must be ensured to prevent their production. The reasons could be incomplete burning of waste, due to fuel—rich burning (overloading of the furnace) and insufficient temperature caused by high moisture content of waste.

Regular and thorough cleaning of the incinerator, including ash removal is absolutely essential for efficient operation. An accumulation of ash/unburnt material/incombustible matter will cause excessive temperatures to be generated and should therefore be avoided. The incinerator should be cleaned and all ash removed regularly. Free passage of air is essential for combustion as well as for the cooling process. Therefore the removal of deposits from within as well as underneath the combustion chamber is critical.

Hospitals can reduce the need to burn medical waste by reducing the amount of waste they produce. Much of the waste burned in medical waste incinerators can be recycled and remade into new items instead. Recycling keeps these items from being burned, reducing air pollution and saving natural resources at the same time. Hospitals can take other steps to reduce the amount of trash they produce. Reducing the amount of trash produced by hospitals will reduce the amount of trash that needs to be burned.

Using Non-toxic materials as alternatives will reduce much of the toxic materials from incinerator emissions. Alternatives to many commonly used medical items containing dioxin and mercury does exist. For example, hospitals can use thermometers that contain no mercury and non-PVC plastic items that contain no dioxin or chlorine.
Good combustion practices can control emissions by ensuring that the temperature in the combustion chamber and the time the Waste remains in the combustion chamber are kept at optimal levels. Major variations in these or other incineration operations could lead to a limited but significant belch of contaminated air emissions.

C. Residual Incinerator Ash

Screening of Potential Environmental Impacts

Incinerator ash can contain concentrations of heavy metals such as lead, cadmium, mercury, arsenic, copper and zinc, which originate from plastics, colored printing inks, batteries, certain rubber products, and hazardous waste from households and small industrial generators.

Recommended Mitigation Measures:

Bottom ash and fly ash are often managed together and referred to as “Combined ash”. Incinerator ash is usually disposed off in a Hazardous Waste (HW) landfill or an ash-only landfill known as an Ash Monofill. Ash Monofills are specially designed to reduce the ability of heavy metals to migrate from the ash into the environment. Monofills are often co-located with HW incinerators or existing landfills to reduce transportation distances and siting difficulties.

The principal environmental concern of the public regarding incinerator ash is that when ash is disposed off in a landfill, the metals and organic compounds can leach (i.e. dissolve and move from the ash through liquids in the landfill) and migrate into ground water or nearby surface water. In addition to possibly contaminating water supplies. Incinerator ash could also affect human health through direct inhalation or ingestion of airborne or settled ash.

Proposed Ash Disposal Plans

Initially the ash could be collected in plastic bags and stored in a confined and restricted location. Thereafter the ash would be mixed with mortar and blocks shall be made which could be used for civil work.
If the ash is not collected in bags then the heap should be properly wetted or covered so that there are no fugitive dust emissions.

If to be landfilled, Ash can be stabilized and solidified by encasing in concrete prior to disposal, thereby significantly reducing the potential for the contaminant to migrate.

In addition to land filling, incinerator ash has also been used in the production of road bedding, concrete, brick, cinder block, and curbing.

D. Noise Levels

Increased noise and vibration during operation can cause significant impacts.

Specific Mitigation Measures

Places where workers are exposed to excessive noise provide ear protection to maintain noise levels below 85dB. Ear protections include Molded and pliable earplugs, cup-type protectors and helmets. Such devices may provide noise reductions ranging from 5 to 35 dB.

Mitigation Measures for Occupational Health & Safety

- Wear safety shoes with non-skid soles
- Wear long-sleeve shirts and protect hands with protective gloves
- Wear appropriate eye protection; consult a safety supervisor or a supplier
- Arrange for periodic inspection of incinerator structure integrity, to detect any cracking, etc.
- Wear respiratory protection (Gas Mask) during maintenance or other work in which dust and noxious gases may be released into the atmosphere
7.2.2 Impact Identification with Checklist

The method of checklist has the advantage of being simple to understand and use good for site selection and priority setting but has the disadvantage of not to distinguish between direct and indirect impacts and they do not link actions and impacts.

A Checklist of environmental parameters for Incinerator has been developed on experience basis to evaluate the impacts of various actions affecting the Environmental Resources and values with the recommended feasible protection measures.

**CHECKLIST:**

This lists significant environmental effects known to have occurred in past thermal power development projects. This is arranged to permit (i) ready screening out of non-pertinent items by checking the column ‘No significant effects”; and (ii) ready grading of significant environmental effects by degree of effect. The following checklists show Checklists of Environmental Parameters for Hazardous Waste Incinerator.
### Actions Affecting Environment Resources and Values

<table>
<thead>
<tr>
<th>Actions Affecting Environment Resources and Values</th>
<th>Damage to Environment</th>
<th>Recommended Feasible Protection Measures</th>
<th>Significance of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disruption of Hydrology</td>
<td>Impairment of other beneficial water uses</td>
<td>Careful site planning and project design</td>
<td>X</td>
</tr>
<tr>
<td>Resettlement</td>
<td>Social inequities</td>
<td>Appropriate resettlement planning and budgeting</td>
<td>X</td>
</tr>
<tr>
<td>Encroachment on historic/cultural values</td>
<td>Loss of Ecological values</td>
<td>Careful site planning and project design</td>
<td>X</td>
</tr>
<tr>
<td>Regional Flooding hazards</td>
<td>Hazard to Plant operations</td>
<td>Careful site planning and project design</td>
<td>X</td>
</tr>
<tr>
<td>Waste emissions related to sitting</td>
<td>Intensification of problems of pollution control</td>
<td>Careful site planning and project design</td>
<td>X</td>
</tr>
</tbody>
</table>

**Exhibit 7.1** Environmental Problems Due To Project Location
### Exhibit 7.2  Environmental Problems Due To Inadequate Design, Including Assumptions Relating to O & M

<table>
<thead>
<tr>
<th>Actions Affecting Environment Resources and Values</th>
<th>Damage to Environment</th>
<th>Recommended Feasible Protection Measures</th>
<th>Significance of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental pollution control operations</td>
<td>Impairment of downstream beneficial water uses</td>
<td>Careful design/O &amp; M/monitoring and use of appropriate environmental standards</td>
<td>X</td>
</tr>
<tr>
<td>a) Surface waters (fresh/esturaine/marine)</td>
<td>a) – same -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Ground Water</td>
<td>b) – same -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Air Environment</td>
<td>c) – same -</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>d) Noise</td>
<td>d) – same -</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>e) Residual Ash (Special Problem)</td>
<td>e) Ash disposal plan</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Impacts on adjacent land economic users including recreation/tourism</td>
<td>Impairment of land uses</td>
<td>Careful design/O&amp;M/monitoring and use of appropriate environmental standards</td>
<td>X</td>
</tr>
<tr>
<td>Occupational Health and Safety hazards</td>
<td>Hazards to workers health and safety</td>
<td>Careful design and operation planning</td>
<td>X</td>
</tr>
<tr>
<td>Bio Hazards/Spills/Fires/Explosions</td>
<td>Hazards to workers health and safety</td>
<td>Careful design and operation planning</td>
<td>X</td>
</tr>
</tbody>
</table>

---

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## C. Environmental Problems In Construction Stage

<table>
<thead>
<tr>
<th>Actions Affecting Environment Resources and Values</th>
<th>Damage to Environment</th>
<th>Recommended Feasible Protection Measures</th>
<th>Significance of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuing Erosion of unprotected area</td>
<td>Impairment of downstream water land uses</td>
<td>Careful construction stage planning plus monitoring</td>
<td>X</td>
</tr>
<tr>
<td>Other Construction Stage Hazards</td>
<td>Depends on nature of effect</td>
<td>Careful construction stage planning plus monitoring</td>
<td>X</td>
</tr>
<tr>
<td>Monitoring during construction</td>
<td>Without it, construction contractor not like it to observe constraints</td>
<td>Incorporate monitoring requirements in construction contracts</td>
<td>X</td>
</tr>
<tr>
<td>Depreciation of Environmental aesthetics</td>
<td>Loss in these values</td>
<td>Adequate attention to O &amp; M parameter</td>
<td>X</td>
</tr>
<tr>
<td>Erosion/silt runoff during construction</td>
<td>Damage to water quality and land uses</td>
<td>Careful planning to minimize hazards, plus competent cleanup system</td>
<td>X</td>
</tr>
<tr>
<td>Uncovered Cut and Fill area</td>
<td>Soil erosion/silt runoff and consequent damages to properties and aesthetics</td>
<td>Careful construction planning, plus monitoring</td>
<td>X</td>
</tr>
<tr>
<td>Quarrying Hazards</td>
<td>Hazards to safety of workers and others nearby</td>
<td>Careful construction planning, plus monitoring</td>
<td>X</td>
</tr>
</tbody>
</table>

### Exhibit 7.3  Environmental Problems in Construction Phase
<table>
<thead>
<tr>
<th>Actions Affecting Environment Resources and Values</th>
<th>Damage to Environment</th>
<th>Recommended Feasible Protection Measures</th>
<th>Significance of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate O &amp; M due to poor management</td>
<td>Failure to achieve protection to workers and environment assumed in design</td>
<td>Careful O &amp; M plus training and monitoring</td>
<td>X</td>
</tr>
<tr>
<td>Occupational health and safety program including accidents</td>
<td>Hazards to workers health and safety</td>
<td>Careful O &amp; M, including readiness for emergency actions</td>
<td>X</td>
</tr>
<tr>
<td>Nuisance from handling/storage of Hazardous waste</td>
<td>Heat/Odor and noise nuisance</td>
<td>Careful design/O &amp; M/monitoring</td>
<td>X</td>
</tr>
<tr>
<td>Operations Monitoring</td>
<td>Without it operations not likely to observe constrains</td>
<td>Incorporate carefully prepared monitoring program into O &amp; M plan</td>
<td>X</td>
</tr>
<tr>
<td>Traffic congestion and blockage of access to site</td>
<td>Loss of time and fuel and accidents</td>
<td>Careful construction planning, plus monitoring</td>
<td>X</td>
</tr>
<tr>
<td>Monitoring of deficiencies</td>
<td>Unnecessary damages to environment</td>
<td>Monitoring essential for ensuring careful/competent operation</td>
<td>X</td>
</tr>
</tbody>
</table>

Exhibit 7.4 Environmental Problems Relating to Inadequate Operations
7.2.3 Impact Identification with Network

Networks, also known as systems diagrams, consist of a number of linked impacts, known to result from initial actions; even mitigation and control measures can be illustrated. If a magnitude and importance score is assigned to each impact and the probability of occurrence of each impact is known, a final index value can be calculated for the network.

The advantage of a network approach is that it shows indirect impacts and the effects of change can be followed through the intermediaries but this approach is excellent for interlinkages. However, there are several problems associated with networks among which are the postulation of indirect effects that do not occur, obtaining reliable data on probabilities of occurrence of effects, and as with all grand index approaches, the final index value may obscure important uncertainties in the effects data. This network shows only the air quality aspect related to incinerator activities.

Exhibit 7.5 Simplified Network for Air Quality Issues for Incinerator
8.0 Environmental Management Plan

Rana Associates intends to construct a hazardous waste incineration facility within WAH Cantt jurisdiction. The Environmental Impact Assessment for the facility has identified potential impacts that are likely to arise during the project construction and operation phases. To minimize the effects of adverse impacts the E1A recommends mitigation measures. These mitigation measures include the use of alternative options, management and physical controls, or compensation in monetary terms. The proposed mitigation measures are based on the understanding of the sensitivity and behavior of environmental receptors in the project area, the legislative controls that apply to the project and a review of good industry practices while operating in sensitive environments.

For the effective implementation and management of the mitigation measures, an Environmental Management Plan (EMP) has been prepared. The EMP satisfies the requirement of the Pakistan Environmental Protection Act and EIA Regulations. The EMP outlines the aims and objectives, defines the responsibilities of the project sponsors/owners and contractor(s), and lays down the required communication, reporting procedures and mechanism through which the proposed measures will be monitored.

8.1 Objectives of EMP

An EMP provides a mechanism to address the adverse environmental impact of a project during its execution. To enhance the project benefits, and to introduce standards of good practice to be adopted for all the project works. The primary objectives of the EMP are as follows;

1. To facilitate the implementation of the mitigation measures.
2. To define responsibilities of the project proponents, contractors and environmental monitors, and to provide effective means of communication among all.
3. To provide monitoring mechanism and identification of its parameters for ensuring the complete implementation of all mitigation measures and their effectiveness.
4. To provide a mechanism for taking timely action in the place of unanticipated environmental situations.
5. To identify training requirements at various levels.
6. To ensure project sponsors/owners and contractors to inert all environment related obligations.
7. To facilitate owner/project sponsors to follow corporate policy on environment.
8. To ensure required equipment and human resources for environmental monitoring are in place.
9. To ensure personnel are trained to meet accidents and emergencies

8.2 Scope of EMP

The Environmental Management Plan is detailed strategy to be implemented for achieving improved environmental performance in the following areas:

1. Environmental Management
2. Water Usage and Disposal
3. Recycling and Waste Management
4. Storm Water Management
5. Pollution Prevention/Environmental Risk Assessment
6. Bio-Diversity
7. Energy Management
8. Transport
9. Community Awareness

8.3 Components of the EMP

The EMP consists of the following components:

❖ Legislation and Guidelines
Organizational Structure and Responsibilities
Mitigation Plan
Environmental Monitoring Plan
Emergency Procedures and Contingency Plan
Safe Handling of Petroleum Products
Emergency Action
Communication and Documentation Change Management
Environmental Training

8.3.1 Legislation and Guidelines

The EIA for hazardous waste incineration facility has discussed national and international legislation and guidelines that are relevant to the project. Rana Associates will also ensure that the key project management staff and contractors are aware of these legislation and guidelines prior to the start of the project activities.

- **PEPA, 1997**: The Pakistan Environmental Protection Act, 1997 (PEPA) is the basic Environmental Legislation in the country. The Act also requires that no person will emit pollutants or noise in amount, concentration or level that is in excess of the National Environmental Quality Standards.

- **EIA Regulation**: The project will be carried out in conformance with EIA regulation and relevant international conventions and that guidance is sought from national and international guidelines. An independent monitoring consultant will be appointed for the project.

- **NEQS Requirements**: NEQS will be followed throughout the project activities and operation. The NEQS are available for industrial gaseous emissions, motor vehicle emissions and noise level, and industrial and municipal effluents.

- **World Bank Guidelines**: The World Bank guidelines are presented in the EMP. The project designers need to know applicable bank requirements and the environmental implications of their design choices.
8.3.2 Organizational Structure and Responsibilities

This section provides an organizational structure for the environmental management during the proposed project implementation and defines the roles and responsibilities of the various stakeholders for the duration of the project. The organizational roles and responsibilities are summarized below:

**Primary Responsibilities**

- The primary responsibility to ensure compliance of the plan will rest with the project owner Mr. Qamar Rana and the contractor will be assumed by their respective senior personnel involved in execution and Operation of the project.
- Responsibilities will be assumed by its proponent during construction and Operation. He will be assisted by the Health, Safety and Environment (HSE) Officer with support from HSE Manager. Proponent will coordinate with relevant government department through its HSE Manager.

**Field Management and Quality Control**

- Carrying out construction of hazardous waste incineration facility in an environmentally sound manner will be the responsibility of the contractor, appropriate provision ensuring compliance will be incorporated in the construction contract.
- HSE Officer of project proponent will be responsible for environmental soundness during both construction and operational phases.

**Independent Monitoring Consultant**

- The project proponent will hire an independent monitoring consultant (IMC), in consultation with the Punjab EPD, to monitor the environmental performance of the contractors and the environmental impact of project activities.
On—the—Job Supervision and Monitoring

A dedicated HSE Officer engaged by the contractor will be responsible for ensuring compliance with the environmental management plan. He will also be responsible for communication and training of construction crews, in all aspects of the environmental management plan.

Communication

The following means will be employed to communicate environmental concerns among members of the staff:

**Kick-off Meeting**

At the beginning of the project, a meeting will take place at the main contractor camp to discuss the environmental issues. The purpose of the meeting will be to present the environmental management plan to the field personnel. Meetings will be held at least twice a month. Any relevant environmental issues, progress of the monitoring team, and areas of concern will be discussed during these meetings.

8.3.3 Mitigation Plan

The mitigation plan is a key component of the EMP. It lists all the potential effects of the project and their associated mitigation measures identified in the EIA. For each impact, the mitigation measures are suggested as below:

1. Construction Phase

<table>
<thead>
<tr>
<th>Potential Negative Impacts</th>
<th>Recommended Mitigation Measures</th>
<th>Monitoring Responsibility</th>
<th>Parameters For Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust Emissions</td>
<td>On exposed construction Surface during dry/windy periods fugitive dust generation will be suppressed by spraying of water.</td>
<td>Proponent/Contractor</td>
<td>Air Quality</td>
</tr>
<tr>
<td>Soil Erosion</td>
<td>Exposed Surface will be</td>
<td>Proponent/</td>
<td>Soil</td>
</tr>
</tbody>
</table>
resurfaced and stabilized as soon as possible  

<table>
<thead>
<tr>
<th>Solid Waste Generation</th>
<th>Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dedicated waste segregation units will be provided. Recyclable items will be provided to recycling contractors</td>
<td>Proponent/Contractor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vehicular Traffic and Noise</th>
<th>Noise Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicles and other noisy equipments should be in good conditions. Noisy construction activities will be carried out only during normal working hours.</td>
<td>Proponent/Contractor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health and Safety of Work Force</th>
<th>Health and Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>All occupational and health and safety requirement for workforce will be adhered to.</td>
<td>Proponent/Contractor</td>
</tr>
</tbody>
</table>

### Exhibit 8.1 Mitigation Plan Matrix for Construction Phase

#### Operation Phase

<table>
<thead>
<tr>
<th>Potential Negative Impacts</th>
<th>Recommended Mitigation Measures</th>
<th>Monitoring Responsibility</th>
<th>Parameters For Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Waste</td>
<td>Wastes will not be disposed off in the open and on-site burning of waste materials will be eliminated. Dedicated waste segregation units / containers will be built or placed.</td>
<td>Proponent</td>
<td>Solid Waste Management</td>
</tr>
<tr>
<td>Noise Pollution</td>
<td>Generators and vehicles used during the operation will be properly tuned and maintained to minimize noise and air emissions. The access road will</td>
<td>Proponent</td>
<td>Noise Level</td>
</tr>
</tbody>
</table>

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be watered regularly to minimize dust emissions (if required).

<table>
<thead>
<tr>
<th>Waste Water</th>
<th>Contaminated water will be disposed off into natural flowing nullah flowing nearby.</th>
<th>Proponent</th>
<th>Water Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental and Landscape</td>
<td>Creation of landscape by tree planting, species Introduction or landscaping appropriate to local condition will be done.</td>
<td>Proponent</td>
<td>Environment and Landscape</td>
</tr>
</tbody>
</table>

**Exhibit 8.2 Mitigation Plan Matrix for Operation Phase**

### 8.3.4 Environmental Monitoring Plan

Effective implementation of the mitigation measures to mitigate or minimize the environmental impacts would require the project to undertake a comprehensive monitoring program. The objective of the monitoring program is to ensure that the construction and operation activities are carried out in an environmentally sensitive and responsible manner, and in accordance with the recommendations of EIA. Recommended monitoring activities of the proposed project are presented in Exhibit 8.3 and Exhibit 8.4.

#### 1. Construction Phase

<table>
<thead>
<tr>
<th>Monitoring Category</th>
<th>Type of Monitoring</th>
<th>Monitoring Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air/Noise Pollution</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dust emission during site preparation, excavation</td>
<td>Monitoring adequacy of dust suppression measures undertaken</td>
<td>Contractor/Proponent</td>
</tr>
<tr>
<td>Storage and transport of construction materials</td>
<td>Monitoring adequacy of measures undertaken to prevent fugitive dust</td>
<td>Contractor/Proponent</td>
</tr>
<tr>
<td>Noise and emission from construction vehicles</td>
<td>Monitor maintenance of construction vehicles</td>
<td>Contractor/Proponent</td>
</tr>
</tbody>
</table>
### Noise and emission from construction activities
- Monitor preventive measures being implemented to curb noise

### Solid Waste
- Disposal of solid waste
  - Monitor to ensure solid waste segregation and proper disposal

### Health And Safety Of Construction Work force
- Health and safety requirements
  - Monitor adherence to all occupational and safety requirements
- Provision of health and safety equipment
  - Monitor availability of adequate number of protective gear
- Sanitary conditions of construction
  - Monitor provision of shelter, water supply excreta and solid waste management at camp sites

### Community life and Economic Activities
- Access to public and private properties
  - Monitoring impact of project on dwelling and business in the project area
- Damage to public and private properties
  - Monitoring construction activities to ensure public and private property is not damaged
- Hardship and inconvenience to public and business
  - Monitoring to ensure that communities and business face minimal hardship and inconvenience due to construction activities

### Public Awareness
- Awareness campaign for public cooperation to overcome short term construction phase inconveniences
  - Review and monitor effectiveness of the awareness campaigns conducted

**Exhibit 8.3 Monitoring Plan for Construction Phase**
2. Operation Phase

<table>
<thead>
<tr>
<th>Monitoring Category</th>
<th>Type of Monitoring</th>
<th>Monitoring Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operation and Maintenance of the System</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise and air emissions due to generators and vehicles</td>
<td>Monitor proper maintenance of the equipments</td>
<td>Proponent</td>
</tr>
<tr>
<td>Solid waste segregation, recycling and final disposal</td>
<td>Monitor adequacy of measures undertaken to collect and dispose off solid waste</td>
<td>Proponent</td>
</tr>
<tr>
<td>Sewage and wastewater disposal</td>
<td>Monitor disposal of wastewater according to the proposed mitigation measures</td>
<td>Proponent</td>
</tr>
<tr>
<td><strong>Environment and Landscape</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On site wastage material’s minimization</td>
<td>Monitor waste minimization activities</td>
<td>Proponent</td>
</tr>
<tr>
<td>Creation of landscape by tree planting, appropriated to local conditions</td>
<td>Monitor and implement site restoration and landscaping</td>
<td>Proponent</td>
</tr>
</tbody>
</table>

**Exhibit 8.4 Monitoring Plan for Operation Phase**

**8.3.5 Contingency Plan**

Explosion and Fire Hazards

<table>
<thead>
<tr>
<th>Activity</th>
<th>Strategy</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire hazards</td>
<td>Proper fire fighting equipments will be available at appropriate places.</td>
<td>Rana Associates</td>
<td>Construction and operation</td>
</tr>
<tr>
<td>Risk management</td>
<td>Proper equipments and trained staff</td>
<td>Rana Associates</td>
<td>Construction and operation</td>
</tr>
</tbody>
</table>

**Exhibit 8.5 Contingency Plan**
8.3.6 Communication and Documentation

An effective mechanism for storing and communicating environmental information during the project is an essential requirement of an EMP. This activity will be done by an Independent Monitoring Consultant. The key features of such a mechanism are:

- Precise recording and maintenance of all information generated during the monitoring in a predetermined format
- Communicating the information to a central location
- Storing raw information in a central database
- Processing the information to produce periodic reports

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date recording and maintenance</td>
<td>All forms will be numbered and a tracking system will be developed for each. Whenever a form is released for use in the field. Its number will be recorded. The monitors will be required to account for each from after completion. In this manner, it will be ensured that all forms are returned to the office, be they filled, unused, or discarded</td>
</tr>
</tbody>
</table>
| Storage of information             | A database for information collected during the project will be prepared. The database may include information on:  
  • Training programs  
  • Staff deployment  
  • Non-compliance  
  • Corrective actions  
  • Water Resources  
  • Quality  
  • Results of effects monitoring  
  • Water usage  
  • Fuel usage |
| Meeting                            | For effective monitoring, management and document of the environmental performance during the operation, environmental matters will be discussed during daily meetings held on-site. Environmental concerns raised during the meeting will be mitigated after discussions between the project site representatives |
The IMC will produce daily, weekly, monthly and other periodic reports, as well as a final report of the project based on the information collected. The project site representative and the contractors will also prepare a weekly environmental report. Copies of the report will be provided to the proponent and the contractor’s higher management.

Exhibit 8.6 Reporting and Assessment

8.3.7 Change Management

An environmental assessment of the proposed project has been made on the basis of the project description available at the time the EIA was conducted. However, it is possible that changes in the project design will be required when the project is implemented. This section describes the mechanism that will be put into place to manage changes that might affect the project’s environmental impact.

8.3.7.1 Changes to the Operation

The changes in the project design have been categorized as first-order, second order and third order. These are defined below:

a. First-Order Change

A first-order change is one that leads to a significant departure from the project described in the EIA and consequently requires a reassessment of the environmental impact associated with the change. In such an instance, the IMC will be required to reassess the environmental impact of the proposed change, the results of which will then be sent to the Punjab EPA for approval.

b. Second-Order Change

A second-order change is one that may entail the project activities not significantly different from those described in the EIA, which may result in project effects whose overall magnitude would be similar to the assessment made in this report. In case of such changes, the IMC will be
required to reassess the impact of the activity on the environment, specify additional mitigation measures if necessary, and report the changes to the Punjab EPA. The EPA will review the change management statement and communicate if any concerns. If EPA agrees with the assessment of the IMC, it does not have to send a formal approval. Seven days after submission of the change management statement, the change will be implemented unless a communication to the contrary has been received from EPA.

c. Third-Order Change

A third-order change is one that is of little consequence to the EIA findings. This type of change does not result in effects beyond those already assessed in the EIA, rather it may be made onsite to minimize the impact of an activity, such as realigning a particular section is to avoid cutting a tree, relocating construction campsites to minimize clearing vegetation, etc. The only action required for such changes would be to record the change in the Change Record Register.

8.3.7.2 Changes to the EMP

The possible categories of changes have been discussed above. The changes in the project design or the results of the environmental monitoring may necessitate changes in the EMP. In this case, the following actions will be taken:

❖ A meeting will be held between the project proponents, the concerned contractor, and the IMC representatives. During the meeting the proposed addition to the EMP will be discussed and agreed upon by all parties.
❖ Based on the discussions during the meeting, a change report will be produced collectively, which will include the additional EMP clause and the reasons for the addition.
❖ A copy of the report will be sent to the head offices of the project proponents the contractor, and the IMC.
❖ All the relevant project personnel will be informed of the addition. These additions will be reported in the IMC monthly environmental report.
❖ The changes in the EMP may include either additional or reduced monitoring or reporting requirements.
8.3.8 Environmental Training

An environmental training will help to ensure that the requirements of the EIA and EMP are clearly understood and followed by all the, project personnel throughout the project period.

The primary responsibility for providing training to all the project personnel will be that of the IMC to formulate indicative environmental training program, which will be finalized before the commencement of the project. The IMC will train the project proponent’s staff, the contractors, and other staff engaged for the project. Training will cover all staff levels, ranging from the management and supervisory to the skilled and unskilled categories. The scope of the training will cover the requirements of the EIA and the EMP, with special emphasis on sensitizing the project staff to environmental, ethnic, and social context of the area.

<table>
<thead>
<tr>
<th>Staff</th>
<th>Trainer</th>
<th>Contents</th>
<th>Schedule</th>
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</thead>
</table>
| Selected Management staff from the project proponents and contractors | IMC | • Environmental sensitivity of project area  
• Key findings of the EIA  
• Mitigation measures  
• EMP  
• Social and cultural  
• Values of area  
• Leadership dynamics | Prior to the start to the project activities |
| All sited personnel | Contractors and IMC | • Environmental sensitivity of project area  
• Mitigation measures  
• Contingency plan  
• Community issues  
• Social and cultural values | Prior to the start of the Project activities |
| Construction crew | Contractors and IMC | • EMP  
• Waste disposal | Prior to the start to the construction activities |
| Drivers | Contractors | • Road safety  
• Defensive driving | Before and during the |
<table>
<thead>
<tr>
<th>Role</th>
<th>Contractors and IMC</th>
<th>Training Areas</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanics</td>
<td></td>
<td>• Waste disposal</td>
<td>Before and during field operations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Cultural values and social sensitivity</td>
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<tr>
<td>Camp staff</td>
<td></td>
<td>• Camp operation</td>
<td>Before and during field operations</td>
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<td>• Housekeeping</td>
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<td>Restoration teams</td>
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<td>• Restoration requirements</td>
<td>Before Start of restoration activities</td>
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<td></td>
<td></td>
<td>• Waste disposal</td>
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</tbody>
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**Exhibit 8.7 Environmental Training Program**
SECTION 8
ENVIRONMENTAL MONITORING & MANAGEMENT PLAN

9.1 Conclusion

The EIA of the proposed Hazardous Waste incinerator at Rana Associates, Mouza Gattia, WAH Cantt, District Rawalpindi has achieved the following goals:

1. Identification of regulatory requirements that apply to the proposed activities in the context of environmental protection.
2. Identification of the environmental features of the project area and the likely impact of the project on the environment.
3. Recommendations of appropriate mitigation measures that Rana Associates will incorporate into the project design to minimize all adverse environmental impacts.

Baseline environmental and socioeconomic information was collected from the field surveys. The information collected was used to compose profiles of the natural and socioeconomic environments likely to be affected by the project. Information for the section describing the project came mainly from Rana Associates and their contractors. An assessment was then made of the potential impacts of the described project on the area’s natural and socioeconomic environments.

After screening of probable environmental impact it can be concluded that:

✓ Project activities will cause temporary impacts on local environment all of which are reversible. During operational stage the project will not pollute the environment in normal circumstances except when an incident of spillage occurs. The impact of such incidents will be mitigated by surveillance, proper maintenance, immediate reports, safety and management plan.
✓ No significant damage to wildlife, vegetation or habitats is anticipated from the proposed project.
✓ No residential property, cultural/historical or archaeological sites would be affected by the project.
✓ No adverse socio-economic impact of the project is envisaged.
✓ During construction phase of the project employment opportunities will be provided to local population.
✓ By adopting recommended mitigation and safety measures little environmental impacts of the project can be eliminated

Therefore, setting up of incinerator and the associated activities will lead to minor environmental effects which could be mitigated as illustrated in the report. Few major impacts could also be avoided with good operation practices, handling and housekeeping. The project will not add to degradation of the environment at the Project Area. Accordingly the EIA in the present form may be approved.

9.2 Recommendations

In view of the above conclusion, the following recommendation may be followed:

✓ Adoption of mitigation and environmental management plan during construction and operation phases of the project.
✓ Use of PPE’s.
✓ HSE Training of staff.
✓ Communication of Rana Associates with the contractors and workers.
✓ Good housekeeping.
✓ Proper waste management at the site during project activities.