Project :

"Hot Dip Zinc Galvanizing Facility", Oryahovo, BULGARIA.

Environmental Impact Assessment

FINAL REPORT

June 8, 2007.
Sofia

Executive Summary.

The new Hot Dip Zinc Galvanizing Plant will be the only galvanizing facility in Northern Bulgaria. The new galvanizing plant will be installed on the premises of a former metallurgy facility, which comprised a foundry and electro-galvanizing facility. The Plant's capacity will be 6,000 t p.a. assuming a one-shift processing schedule. The new Hot Dip Zing Galvanizing Plant will be situated in the North-Western part of Bulgaria, and located in the town of *Oryahovo* - a port on the Danube River, with a customs office and a ferry-boat complex (see *Appendix 1.*).

During the period: October 2006 – March 2007, a full Environmental Impact Assessment Study (***EIA Study***) of the proposed Hot Dip Zinc Galvanizing Project (i.e., the ***Project***) activities was performed, and a final ***EIA Report***, documenting the EIA processes and results was prepared. The EIA Report was developed in compliance with the relevant guidelines, set by the Overseas Private Investment Corporation (OPIC), the IFC, and the BG Ministry of Environment and Waters (BG MEW). This EIA Report would be submitted to OPIC in June 2007.

1. Project Proponents.

A special entity (i.e., a "Special Purpose Corporation", or "SPC") will be incorporated to implement the Project with the participation of a Bulgarian and an American partner. ***Bulgarian Partner*** in this project is **"TRE-P" EOOD**, a Bulgarian company, which has acquired land, production, storage and administrative buildings, the related infrastructure and machinery and equipment located in the town of Oryahovo. "TRE – P" EOOD holds clean title over assets acquired against a consideration below the investment cost for setting up a similar plant which contributed to the lower overall cost of the Project. ***American partner*** in this project is **"GTI Engineering Inc",** - an U.S. corporation with more than 14 years of experience in manufacturing galvanizing equipment. GTI has been selected to supply the Plant's machinery and equipment. The assistance of GTI will be continuous as GTI experts were involved in the process of customizing the Plant's galvanizing equipment in order to optimize performance and streamline operations at the same time.

2. Policy, Statutory and Institutional Framework

The main law of the Republic of Bulgaria governing the rules applied in drafting an Environmental Impact Assessment – EIA and, which is applied in the implementation of specific projects (including this Hot Dip Galvanizing Facility Project), is the **Environment Protection Act**. *This act is the basic legislative tool empowering the government to frame regulations for the protection of the environment.* Passing the Environment Protection Act was followed by the establishment of the ***Executive Environment Agency***, which is governed by the requirements laid down in its Rules of Organization. The Executive Environment Agency is charged with the task to monitor the enforcement of legal provisions concerning the quality of the environment and to control the protection of the environment against pollution and disturbance. ***Regional Environment and Water***

Inspectorates were established at the same time with the task to assist the Executive Agency in discharging its duties in individual regions within Bulgaria.

The *main legislative body on the government level* in the field of environment protection and control is the ***Ministry of Environment and Waters***. The relevant properties of the environment subject to monitoring and control, and the methods according to which those activities are conducted, are regulated by laws defining the requirements applicable to the impact on individual components of the environment (*see Appendix 2.1*), as well as by the related regulations and guidelines adopted by the secondary legislation of the Council of Ministers.

A ***National Environmental Strategy*** is already in place, and now the ***"2007 – 2013 Environmental Operative Program"*** is being developed and discussed, and is to be adopted on the governmental level. The main strategic aim of this Program is to improve, protect and restore the natural environment and develop environmental infrastructure. The specific strategic aims are related to the preservation and improvement of the condition of waters; improvement of waste management and soil protection; preserving biodiversity and protecting the nature.

3. Project Description.

- ***Project Location and Project Area.***

Oryahovo Municipality is located in the North-Western part of Bulgaria, on the Danube River (see *Appendix 1.*). The new Hot Dip Zinc Galvanizing plant will be situated in the *industrial zone* of the town of Oryahovo, BG, i.e., about 3 miles away from the town and about 6 miles away from the Danube river . The project site is bordered by an empty land to the east and the south, by a power plant to the west and by an industrial zone to the north, (i.e. the project site is not in proximity to residential quarters). The Project Area, its surroundings and the Facility Site of the new plant are presented respectively in **Exhibit 1.1** and **Exhibit 1.2**.

- ***Existing Assets, Past Operation History and Current Operations.***

The assets acquired to date by "TRE-P" (i.e., the Bulgarian Partner), include land, production, storage and administrative buildings together with the related infrastructure. The Plant has an existing connection to the National Electricity Transmission Company high-voltage grid, a transformer station on the territory of the Plant and all related utilities. At present, "TRE – P" EOOD owns and operates *also* ***a metal processing facility***. The new hot dip zinc galvanizing facility will own part of the former metallurgy plant's existing infrastructure and a considerable part of the steel works manufactured by the "TRE – P" EOOD metal-working facility will be galvanized by the new Plant.

- ***Plant's Logistics and Infrastructure.***

The new Hot Dip Zinc Galvanizing Plant in Oryahovo will use an existing asset base comprising land, buildings, related infrastructure and will operate galvanizing equipment under a customized configuration, manufactured by GTI Engineering Inc.

The infrastructure of the new Galvanizing Plant is presented in *Exhibit 3.2.*

The plant's infrastructure consists of a *Hot Dip Zinc Galvanizing Facility*, a *Warehouse for Black Steel Works (to be galvanized)*, a *Warehouse for Galvanized Steel Works (finished products), Sorting and packing area(s), HAZMAT Buildings for temporary storage of the already containerized waste (waiting for transportation and definitive disposal, Maintenance and repair workshop, Warehouse for raw materials and spare parts, Garage for Fork-lift loaders, Offices (administration)and Inter-plant roads & sites.*

The "***In – Flows***" of the new zinc galvanizing plant will consist of steel works, that shall be submitted to galvanizing. The "***Out – Flows***" of the plant will respectively consist of the already galvanized steel works.

- ***Technologic, Waste Processing and Auxiliary Equipment.***

Full layouts of the galvanizing equipment, the auxiliary equipment and the waste treatment systems of the new Plant, are shown in *Exhibit 3.3.*

The Zinc Galvanizing Technologic System consists *of Caustic and Caustic Rinse Tanks, Acid, Acid Rinse and Flux Tanks, a Galvanizing Furnace (Galvanizing Kettle), a Pre-Heater (Dryer), a Centrifuge System (for small and/or complex parts galvanizing), a Quench Tank, a Dross Clamshell (for collection of the zinc dross and a Sludge Clamshell (for collection of the sludge).*

The Waste Treatment System of the new galvanizing plant consists of *Waste Filters and Filter Press for Liquid Waste, a Central Pumping Station, Chemical Reaction Tank Mixers, Neutralization and Storage Tanks for Waste Acids and an Air Quality & Kettle Air Control Equipment – Hood Enclosure and Baghouse.*

The plant's auxiliary equipment comprises *Bridge Cranes with Monorail Hoists (special design) for handling the steel works inside the galvanizing area, Fork Lift Loaders, Compressor Station & Air Tank, Universal Galvanizing Rack (for inter-facility transportation of the steel works) and a Scale & Control Equipment;*

- ***Process Stages and Materials.***

The components of the hot dip zinc galvanizing process flow diagram are presented in *Exhibit 3.4.*

- ***Construction and Installation Activities.***

All construction and installation works for the proposed project will be carried out *within the existing plant's boundaries.* No new area for the new zinc galvanizing plant will be acquired. All existing buildings and related infra structure will be utilized. Once all specific civil drawings have been prepared, the underground infrastructure will be installed and the foundations for the process equipment will be laid. GTI Eng. will prepare *installation drawings* and foundation layout drawings, showing the exact placement of the main technologic equipment and the location of the necessary

foundations within Plant's building, and in the area adjacent to the building where auxiliary and air control equipment will be located.

4. Baseline Conditions in the Project Area.

- ***Physical Geography – Climate, Soils, Geology, and Topography.***

In terms of geographic location the project area belongs to the *Moderate-Continental sub-zone of the European-Continental zone*. The Moderate-Continental sub-zone is subdivided in five climate regions, where the territory of the town of Oryahovo belongs to the Northern Climate Region of the Danube Hilly Plains and the Middle Climate Region of the Danube Hilly Plains. In *geological terms* the region of the town of Oryahovo lies in the Bulgarian section of the Moesian Platform, south of the Danube, and more specifically in its southwest section, near the Forebalkan. The top (platform) complex in the upper sections of the crust in flat areas is represented mainly by sedimentary rock, whereas the other, consolidated (geosyncline), complex is made up of highly metamorphic folded and solid rock complexes of various compositions. The lower complex is normally termed "crystalline foundation". The *soil-generating materials in the Project Area* are loess and alluvial deposits. The soil cover is quite varied, however, the most typical soil varieties are the Calcaric Chernozems, the Haplic Chernozems, and the Mollic Fluvisols. Gleyic Chernozems and Eutric Gleysols.

- ***Biological Environment – Flora and Fauna.***

The town of Oryahovo and environs are part of the floristic area of the Danube Plains. This area is characterized by spaces almost entirely free of woods used to grow agricultural crops and vineyards. Agricultural land occupies the area formerly occupied by woods. Existing woods occupy areas which are not fit for agricultural activity. The Oryahovo area is part of the Lower-Danube Biogeographic Province, where the steppe and forest-steppe type of communities are dominant. This predetermines the xerophilous fauna types in most of the area, with a rich water fauna along the bank and in the Danube.

- ***Socio-Economic Environment.***

The region of Oryahovo has a population of over 16,000, of which more than 95% Orthodox Christians of Bulgarian nationality. The official language in the region is Bulgarian. The alphabet is Cyrillic.

The leading industry sector in Oryahovo region is machine building, followed by construction and agriculture. A number of entities in the region manufacture machine parts for agricultural machinery and equipment and for automobile producers. The major part of the residential population in the Project Area are employed in more than 260 industrial and trade organizations & companies, established in various business sectors. All enterprises from Oryahovo region (i.e. industrial and trade companies, municipal and state administration, banks, insurance companies, etc.,), respect the terms of the *Equal Employment Opportunity Policy* (*EEO Policy*).

- ***Environment Quality in the Project Area.***

A). Ambient air conditions.

Oryahovo Municipality is an administrative unit within the territory of the Vratsa District. The quality of ambient air within the district is controlled through the readings taken from several stationary monitoring points /seven/, part of the National Automated Environmental Monitoring System, using also the Mobile Automated Station of the District Environment and Water Inspectorate of the town of Pleven. The following properties are monitored: dust, heavy-metal aerosols, sulphur dioxide, nitrogen dioxide, carbon monoxide, hydrogen sulphide, ammonia, nitrogen oxide and ozone.

B). Water Sources.

The main rivers, that run through the territory of Oryahovo Municipality are *the Danube River* (running at about seven miles to the north of the Project Area) and the *Studena*, *Yantra*, *Osam*, and *Iskar* rivers (running at about 50 to 80 miles away from the Project Area). *The Danube* river is the largest water body in the Project Area.

C). Soil conditions including contamination from previous or current activities.

A *field and analytical study* was performed by experts with the Ministry of Environment and Waters, the Vratsa Regional Testing Laboratory, and the Institute of Soil Sciences "N.Poushkarov" - Sofia, in order to establish any possible existing contamination of soils in the vicinity of the Project Area. The core sampling was performed in accordance with the methods adopted within the relevant soil-monitoring system. The collected samples were dried and prepared for analysis of heavy-metal content as per the relevant ISO standards. The statistical results obtained have been analyzed and evaluated to test the compliance with the adopted standards on heavy-metal content in soils valid in some EU member-states, in particular the UK, Germany, the Netherlands, and the EU in general.

The results, obtained are as follows:

- permitted limits, (as appear in the regulatory documents referred to), evidence *the absence* of toxic concentrations of heavy metals in the soils collected from the area of the Hot-Dip Galvanizing Facility of the town of Oryahovo, Bulgaria.

- it was found that the concentration of the elements under review is *several times lower* than the permitted levels according to the relevant regulations.

5. Waste Treatment and Disposal Measures - Technologies and Equipment for Waste Processing. Logistics of the Waste.

The technologic equipment delivered by GTI comprises also a state of the art ***Environmental Protection Equipment***, i.e. *an air control component equipment, a waste liquids treatment equipment and a flux filtration & transfer pump.*

The Plant's environmental exposure mitigation plan foresees, that a waste disposal company will be used to properly handle liquid waste.

- ***Treatment of the Liquid Waste.***

The primary liquid waste is a spent pickling acid. The Hydrochloric acid (used for pickling steel prior to galvanizing), becomes inactive as the iron concentration approaches 12% by weight and must be replaced in order to maintain plant throughput. The chemical reaction of pickling, produces ferrous chloride in solution, which will inhibit the pickling reaction. As the iron level increases, disposal becomes necessary.

The *spent acid* will be treated by *neutralization* using relatively simple equipment and readily available neutralizing chemicals. *The spent acid will be neutralized with lime chips.* After neutralization, an easily handled iron oxide sludge is produced which can be *landfilled without hazard.* The resulting liquid is free of heavy metals and can be reused in the plant or discharged to the sewer, or ground water depending on local regulations. The waste liquids treatment system, is capable to treat the waste liquids from plant's pickle area, and to maintain a proper chemistry in the process tanks. A *Filter Press* is used to remove liquid from the sludge, and the press cake is semi-dry (about 30% solids & no free liquid). The capacity of the system is based on a batch processing of spent acid tanks. The system is also designed to purify the flux tank by batch processing on a scheduled basis.

- ***Air Quality and Kettle Air Control Equipment.***

A particulate emission (i.e., smoke) escapes from the surface of the molten zinc as the steel work to be galvanized is dipped. This emission is caused by the volatilization of the flux and is primarily ammonium chloride, although zinc oxide is also present (See EPA AP-40). Pollution control agencies in general have ruled that, these fumes must be collected using the best available technology. This is done by using *a tightly enclosed fume hood* around the molten zinc bath (galvanizers refer to this bath as the "kettle") and a specific type of air filter known as a *baghouse*. This filter is equipped with a powerful suction fan and cloth bags, through which the air is filtered, and it may be thought of as a very large vacuum cleaner. The fume hood also makes a significant contribution to personnel safety by containing the splatter of hot zinc, that sometimes results when work is dipped. The combination, made of a fume hood and a baghouse will capture 99 % of the particulate emission. GTI Eng. quotes the design of the equipment (described below) for air pollution control of the galvanizing kettle in the new plant. The system consists of a hood enclosure and baghouse, with ductwork of PVC. System components will be supplied by GTI, and fabrication & installation will be by plant's personnel, under GTI supervision.

- ***Quantities of the Generated Waste - Liquids, Sludge and Solids.***

Galvanizing facilities are not large generators of waste.

For example, the proposed plant will process approximately *1,000,000 pounds* (i.e., about 500 tons) *per month* of galvanized steel works *during the 5-th year* of the Project. This equates to a use of 70,000 pounds of zinc per month, and the removal of

approximately 5,000 pounds of rust (ferric oxide) from the steel by the pickling acid (AGA & GTI data). If, the iron saturation is 12% by weight, then the average waste disposal is approximately *110 – 120 gallons per day* (waste liquids) and approximately *200 - 250 pounds of sludge (dry basis).*

So, the ***maximal waste load*** (during the 5-th year of the project) will be ***2 800 gallons (i.e., about 10,500 liters)*** *per month* (22 days month) of ***liquid spent & neutralized hydrochloric acid, plus 2 cubic yards*** *per month* ***of iron oxide sludge and solids.*** Respectively, during the 1-st year of the Project, the proposed plant will process approximately 660,000 pounds (i.e., about 300 tons) per month of galvanized steel works. The waste load *per month* will be *1,400 gallons of waste liquid, plus 1 cubic yard of iron oxide sludge and solids.*

- ***Logistics of the Waste – Storage, Transportation and Disposal Options.***

A). On-site Logistics - Material Handling and Temporary Storage of the Generated Waste. HAZMAT Containers and HAZMAT Buildings.

The generated waste shall be packed in ***"Hazmat Containers"***, specially designed for storage and transportation of solid & liquid waste (UN approved) – barrels & hazpack boxes.

A specially designed "*Warehouse for Stock of Spare Hazmat Containers*" will be designed and built in the main facility building. The storage capacity of this Warehouse (i.e., the number of the spare Hazmat Containers put "On Stock"), will provide possibilities for permanent supply of the waste treatment system(s) with all necessary quantities & types of spare Hazmat Containers, during a 6-month period of Plant's operation.

A special purpose ***HAZMAT Buildings,*** *designed for Temporary Storage* of the *already containerized waste*, will be installed and included in the Plant's logistics chain. Two HAZMAT Buildings will be situated near the main building of the facility and close to the waste processing area. The calculated ***capacity*** of the HAZMAT buildings provides the required options for temporary storage of the already *containerized waste* (waiting for transportation and definitive disposal), during a two-month period of Plant's operation.

The entire floor space of the Waste Liquids Processing Area, will be concrete lined and will have an additional cover, made of ***Spill Containment Modular Platforms & Ultra Spill Deck(s).*** The modular spill containment platforms and spill decks shall provide ***full protection*** of the Waste Processing area, in case, if some kind of *accidental hazardous spillage* could eventually occur during the waste treatment and waste handling procedures. Spill containment platforms will also provide options for hazardous waste collection from the waste processing area (in case of some accidental spillage).

B). Transportation of the Waste.

All types of the Hazmat Containers, selected for storage and transportation of the hazardous waste (liquids & solids), are in full compliance with the *ADR Convention*

requirements i.e., *European Agreement*, concerning the *International Carriage of Dangerous Goods by Road, Volume I, ADR -2007, Chapter 3.2, Volume II, ADR – 2007, Chapter 4.1.4.1.*

The selected types of Hazmat Containers will be placed on a flat and/or metal (or metal cage) pallets and will be manipulated by a specialized material-handling equipment - i.e., by fork-lift loaders at the factory site, by crane-manipulators of the transportation vehicles (if necessary) and by fork-lift loaders at the landfill. The transportation schedule of the already containerized waste from the factory site (i.e., from the HAZMAT buildings) to a certified landfill, designated for a definitive storage of the waste, will be made on a monthly basis.

C). Definitive Storage of the Waste on a Certified Landfill.

The *already containerized waste*, generated during the operation of the new Zinc Galvanizing Plant, shall be disposed (for a definitive storage) on a landfill, *specially designed for storage of Industrial & Municipal Hazardous Waste.*

The landfill is located near the town of Sevlievo, i.e., at about 70 miles away from the project area. The landfill was completed and opened for operation about an year ago (in October 2006). The landfill was designed by a German company and built by a BG-German consortium. The total capacity of the landfill is for about 1,300,000 cubic yards of waste, of which 325,000 cubic yards are designated for industrial hazardous waste (distributed in 47 specially designed, concrete-lined cells).

6. Project Impacts and Mitigation Activities.

An extremely important stage in this new Project will be the development of a detailed study of all significant ***potential environmental and social impacts,*** that could be generated during the proposed project activities. Such a study should comprise a definition of all *major issues*, related to each potential project impact, an evaluation of the *existing conditions*, a prediction of the *significance* of all generated project impacts and a determination and a development of appropriate *mitigation measures,* that should be applied to reduce the possible adverse impacts. An appropriate *monitoring requirements*, should also be created and included in the proposed study.

- ***Environmental Impacts and Mitigation Measures, Associated with Facility Operation.***

A). Potential Impacts of the Generated Waste on the Environment. Mitigation Activities. Waste Minimization Measures.

The liquid and solid industrial waste, generated during the operation of the new hot dip zinc galvanizing facility (and considered as a hazardous one), could potentially affect the environment. The metal working facility (owned and operated by "TRE – P" and situated in the project area) represents a source, that generates a non-hazardous industrial waste

When determining the *significance of the potential impacts* on the environment, an extremely important "weight factor" should be considered – i.e., that in fact, *the quantities of the liquid and solid waste, generated during the operation of the new hot dip zinc galvanizing facility shall be very small*. During *the First* and *the Second year* of the Project, the generated waste load, will not exceed 50 – 60 gallons of treated waste liquids & sludge *per day*, which equates approximately to just *1 (one) barrel*, with capacity of 55 gallons, *per day*. Respectively, the maximal waste load, generated *per day* during *the Fifth year* of the Project, will be about *110 gallons of treated waste liquid,* which equates approximately to *2 (two) barrels*, with capacity of 55 gallons per day, *plus about 0.1 cubic yard of solids and sludge.* These small quantities of waste shall be processed by an extremely effective technologies, applied for *complete neutralization* of the waste liquids.

As a result of all above-mentioned activities, a fully environmental protection measures, which *exclude* any possibility for occurrence of hazardous potential and/or unmitigated discharge on the environment have been developed and would be carried out. The first step of the proposed *Mitigation measures* was implemented in the *tank's design*. The pickling process tanks and the waste treatment process tanks will be contained by *five levels of security, so that leakage to the environment will be practically impossible.* These *five levels of security* respectively are the thermoplastic primary tank liner, secondary tank containment, the thermoplastic tank pit liner, the concrete tank pit itself, the thermoplastic under-liner between the concrete of the pit & the soil. In case of some highly improbable situation, when some accidental spillage of spent and/or fresh acids occurs, (for example, there could be some leakage from the tanks for fresh acid and/or the neutralization tanks), then, the area, that would be impacted by this leakage should have a total surface of about 22 m^2. The applied mitigation measures provide, that, all tank's pits, (which are under the bottom of all tanks and situated below the ground level), will be concrete-lined, with 30 cm thickness of the concrete. In fact, it will be practically impossible for some accidentally spilled acid (a treated and/or a fresh one) to pass through 30 cm (i.e. about 1 foot) of concrete, after that – go through the thermoplastic under-liner (placed under the concrete pit), and finally - penetrate into the soil.

The pickle and the waste treatment area *will be monitored* by a system of test points in the area between the concrete pit and the thermoplastic under-liner. These test points will be sampled daily to ensure that no liquid has escaped.

Records for all types of waste, generated during the facility operation will be maintained. Quantities of all waste (liquids, sludge and solids), that are subject to on-site temporary storage and/or definitive disposal, will be logged on a specially created *Waste Tracking Register.*

B). Waste Management and Mitigation Measures, associated with the On-site Handling, On-Site Storage and Disposal of the Waste.

All kinds & quantities of hazardous waste, generated during the operation of the new hot dip zinc galvanizing plant *must be packed* in appropriate *HAZMAT containers*, specially designed for transportation and storage of hazardous materials. Specially

designed *HAZMAT Buildings* must be used for a temporary storage of the hazardous waste "on-site". An appropriate environmental protection actions, which will provide *full protection of the environment* during the on-site handling and the on-site temporary storage of the generated waste, as well as during transportation of the already containerized waste, have been developed and would be carried out

Separation & collection of all recyclable materials shall be performed during the on-site handling of the waste. The main recyclable material in the new zinc galvanizing facility will be the so-called *"zinc dross"*. Specific types of containers for storage of the zinc dross and a special material handling equipment (a dross clamshell and a monorail system), shall be used for the purpose. All other kinds of recyclable materials, i.e., *plastic*, *paper*, *glass*, and *metal scrap*, will be separated, collected and stored in *separate bins*. All recyclable waste shall be sold to waste contractors. The zinc dross shall be sold to a smelter company.

On-site *audits* for all kinds of waste management activities will be carried out on a regular basis. *Audits* of the selected waste disposal contractors, as well as of the selected waste disposal facilities will be undertaken on a regular basis. The purpose of these audits will be to check that, all procedures and measures related to the waste transportation and the waste disposal activities, included in the already signed Agreements, are being respected .

- ***Potential Human Impacts. Mitigation Measures.***

The new Hot Dip Zinc Galvanizing Facility Project is a relatively small one. Therefore, the number of persons, that shall be employed during construction and rehabilitation works, as well as the number of the plant's permanent personnel, will also be a relatively small one. The estimated number of persons to be employed during the construction stage of this project (i.e., for construction, rehabilitation and installation works) will be about *20 people*. The estimated number of the plant's permanent personnel, to be employed during the first year of the Plant's operation (i.e., management, professional/technical and unskilled labor) will be about *30 people*, and respectively by the fifth year of operation – about *50 people*. The *Positive potential human impacts* of the new project will be the creation of opportunities for *new employment* and *new services*, related to the plant's operation activities. It is expected, that there should be ***no*** any kind of significant *Negative potential human impacts* from this project on the Oryahovo region, (for example some kind of resettlement and/or economic displacement). The new plant will be situated *inside the boundaries* of the already existing assets, and the number of the persons employed will be relatively small. Therefore, there should be no any real negative human impacts on the residential and occupational population in the project area.

During the construction stage of this project, the SPC (i.e., the Special Purpose Corporation) can provide jobs for the people from the villages, situated near the Project area. These people can be hired as unskilled laborers. Once the construction, rehabilitation and installation works are completed, some of the unskilled laborers will receive supplementary *training* and can be employed again (this time in the galvanizing operation) *on a permanent basis*. All these activities can

be considered as *Mitigation Measures,* developed during the implementation of this new Project.

- ***Environmental Impacts Associated with Construction and Installation Activities. Mitigation Measures.***

The main potential impacts, that could be generated during the construction, rehabilitation and installation works are the *Construction and Installation Noise, the potential Dust Emissions, and the Equipment and Vehicle Exhaust Emissions.*

A). Construction and Installation Noise.

All potential issues, related to the noise, generated during the construction & rehabilitation stage of this project, are mainly *the possible disturbances*, that could be caused to *the population*, residing near the project area, (but outside the boundaries of the new plant). These possible disturbances could be provoked by the operation of all types of light and heavy construction equipment, that should be used in the construction, rehabilitation and installation works, performed on the project site. The *existing sources of noise* in the project area are mainly *the industrial units* of the metal-working facility, (operated by "TRE-P" and situated also in the project area), the *inter-plant traffic*, and the existing *road traffic*, (outside of the facility boundaries). Since the new plant and the existing metal-working facility are situated in the *industrial zone* of the town of Oryahovo, and not in proximity to residential quarters, these existing sources of noise are not expected to generate some significant impacts to any nearby industrial facility and/or to residential quarters.

The management team of the Project will develop and apply an appropriate *mitigation activities*, that will result in *minimization* of the noise levels beyond the plant's boundaries and which include, a *noise survey of all construction equipment, a reduction of the equipment noise (at source) and a reduction* of *the traffic noise.*

No irreversible noise impacts are expected from the proposed construction activities at the project site. Since the size of the proposed construction & habilitation works is relatively small it is not expected that, the required noise levels would be exceeded.

B). Potential Dust Emissions

Potential dust emission, that could be emitted during the construction & rehabilitation activities, can eventually result in some deterioration of the ambient air quality and could be a nuisance to any person exposed to it. The potential sources of dust emissions during the construction phase of the project include the land excavation (for equipment's foundations), the exposed surfaces and/or storage piles, the concrete and the masonry batching and mixing, the truck dumping and the vehicle movement, the combustion of liquid fuel in construction and/or material handling equipment and transportation vehicles.

There are *no any existing sources* of dust emissions at the project site. The existing factory site has many green areas, fountains and a decorative pool, designated for

recreation of the plant's personnel. All inter-plant roads as well as the external roads, are *concrete roads*, so it is not expected, that, the construction related traffic can cause significant amount of dust emissions, that could affect the persons, who shall be employed during the construction stage of this project.

Since the project activities will not involve a significant amount of civil and ground-works, it is not expected that they will cause significant dust emissions. There will be *no any kind of complex excavation works*, since no new factory buildings shall be built. The construction activities will be mostly a rehabilitation of the existing plant buildings and warehouses. There will be no heavy cranes and heavy excavators at the construction site. The digging of all foundations, (needed for the process tanks and the furnace), will be performed only in the interior of the main plant's building, and under a strict control of all potential dust emissions. The material handling equipment, that shall be used during the construction and rehabilitation activities will be fork-lift loaders and bucket loaders, powered by gas engines (i.e., their combustion will be a natural gas), so there will be no significant dust emission generated. An appropriate mitigation measures, resulting in considerable reduction of all potential dust emissions, will be developed and applied at the construction site. These measures include *a reduction of* ***all*** *potential dust emissions by* ***wet suppression,*** *a reduction of the dust emissions from the aggregate stock piles, specific options for transportation of all materials, that are susceptible to dust formation, and reduction of potential dust emissions during batching and mixing of the aggregate materials.* Since the applied mitigation measures will provide a considerable reduction of the dust emissions, it is expected, that the air quality shall remain always within the acceptable limits. The potential effects of an eventual dust nuisance shall be only temporary, and with no residual impacts.

C). Construction Equipment and Vehicle Exhaust Emissions.

The combustion processes in all kinds of construction & material handling equipment, transport vehicles and camp generators (if any), in general result in exhaust gases, that could potentially affect the ambient air quality at the construction site. However, since there will be no any complex construction and excavation works at the construction site, there will be no heavy cranes and heavy excavators, that could emit significant exhaust emissions.

An appropriate mitigation activities, resulting in prevention of all adverse impacts of potential exhaust emissions on the ambient air quality will be developed and applied. A proper implementation of all mitigation measures developed, should *not allow the generation* of any kind of long-term residual impacts on the ambient air quality.

- ***Potential Impacts on the Biological Resources – Vegetation and Wildfire Loss.***

Since the proposed project activities do not require any kind of widening and/or new development of the existing access roads (i.e., the existing infra-structure will be fully utilized), there will be *no loss* of the existing vegetation, and there will be ***no*** *any potential impact* on the vegetation as well. The project site is not located on the

natural habitat of any faunal species and so the project activities would not result in any impacts on the wildlife resources of the area.

- ***Potential Impacts on the Water Resources.***

The amount of water, required for the operation of the new facility will be provided by the plumbing system of Oriahovo region. An additional advantage of the new project will also be the application of a *water recycling system* (currently under operation in the metal-working facility), during some specific technologic processes. The supplied water quantities would not result in any kind of water shortage. Therefore, no mitigation measures are required, since no any potential impacts on the water resources will occur.

- ***Stakeholders Consultations.***

It is an advantage of this project, that specific consultations, related to some potential environmental issues, have been developed at a very early stage in the project cycle. These specific consultations (referred as ***"stakeholders consultations"***), have been organized and have been carried out with a participation of *the Project team* and the potential *stakeholders* of this Project. *The stakeholders*, represent people, groups, and/or institutions, that might be affected by, or can significantly influence, or are important to the achievement of a stated purpose of a proposed project action.

The main objective of the stakeholders consultations, was to spread widely a relevant information on the new project and its expected environmental impacts, among the groups of people concerned (i.e., *the stakeholders*), as well as to provide an appropriate *feedback information*, collected from communities and other stakeholders, concerned with the project activities. Such feedback information could be used for eventual modification and improvement of the project's design, its planning and its implementation, (especially from an environmental and social perspective). *A second important objective* of the stakeholders consultations, was to determine the range of all potential positive and negative impacts, that could be generated during the proposed project activities and to recommend an appropriate mitigation measures.

The stakeholders consultations consisted of meetings, held with relevant organizations and government departments, which are concerned with the new project (and therefore considered as secondary stakeholders). The purpose of these meetings was *to inform* the stakeholders about the project components, *to analyze* the generation of some eventual project impacts on the stakeholders activities, and *to record* their concerns (whether real or perceived). In general, there was no any specific concern, that was expressed by the stakeholders during the consultation process. However, most of the stakeholders expressed a general concern about some possible impact on the Danube River, especially, regarding some potential discharge of any untreated waste liquids (effluents) into the river. The new hot dip zinc galvanizing plant will be a *zero effluent facility*. The plant will be situated at about 7 to 8 miles away from the Danube River, and on the far side of the industrial zone (*see Exhibit 1.1. and Exhibit 1.2.*), where a *direct effluent* in the Danube River is *practically impossible*. Moreover, all waste liquids of the plant will be first treated

(by the facility's waste processing system) and then - safely containerized and sealed in a specially designed containers, that shall be stored on a certified landfill, situated 60 miles away from the Danube river. All this considerations resulted in the fact, that this particular concern ***is not relevant to the Project***.

7. Conclusions.

This EIA Study was carried out to assess the environmental and socio-economical conditions, as well as the potential impacts of the proposed Hot Dip Zinc Galvanizing Project – Oryahovo, Bulgaria. A final ***EIA Report***, documenting the EIA processes and results was prepared. The EIA Report was developed in compliance with the relevant guidelines, set by the Overseas Private Investment Corporation (OPIC), the IFC, and the BG Ministry of Environment and Waters (BG MEW).

An important amount of baseline environmental and socio-economical information was collected from a variety of information sources, including reports on previous studies and published literature. A considerable and a very important preliminary information, (related to the existing soil conditions in the project area), was collected also from a field survey, which was specially developed for the purpose of this EIA study. The collected information was used for creation of specific profiles on the natural, socio-economic and cultural environments, that could eventually be affected by the project activities.

As new zinc galvanizing facility will be located in the industrial zone of Oryahovo, where the residential communities are at least 3 miles away, there should be no significant environmental and/or social impacts during the construction phase of this project. The only environmental concern, expressed by the stakeholders consulted, was related to some potential discharge of any untreated waste liquids (effluents) into the Danube river. Since the new hot dip zinc galvanizing plant will be a zero effluent facility and will be situated at about 7 to 8 miles away from the Danube River, a direct effluent in the river is practically impossible. All waste liquids will be first treated, after that - safely containerized (in HAZMAT containers), and finally - disposed at a certified landfill. All this considerations resulted in the fact, that this particular concern is not relevant to the Project.

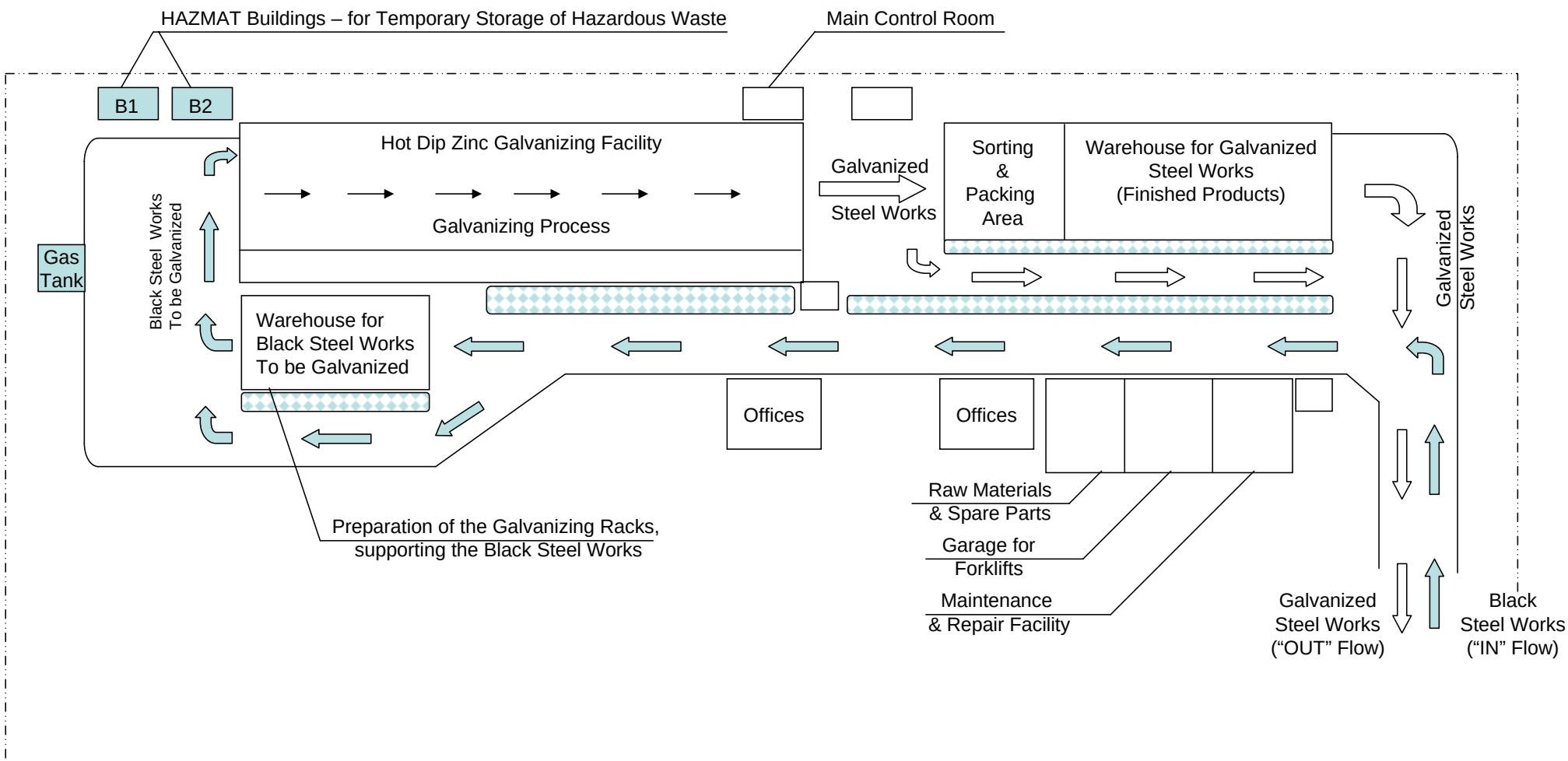
It is therefore concluded, that, if all project activities, including the strict implementation of all mitigation measures, will be developed as described in this EIA Report, then, the anticipated project impacts on the natural and the socio-economical environment (in the project area), will be well within the acceptable limits. The proposed project will also comply with all statutory environmental requirements and norms, presented in Chapter 2 of this EIA report.

Exhibit 1.1. Oryahovo Region

Exhibit 1.2. Project Area & Facility Site

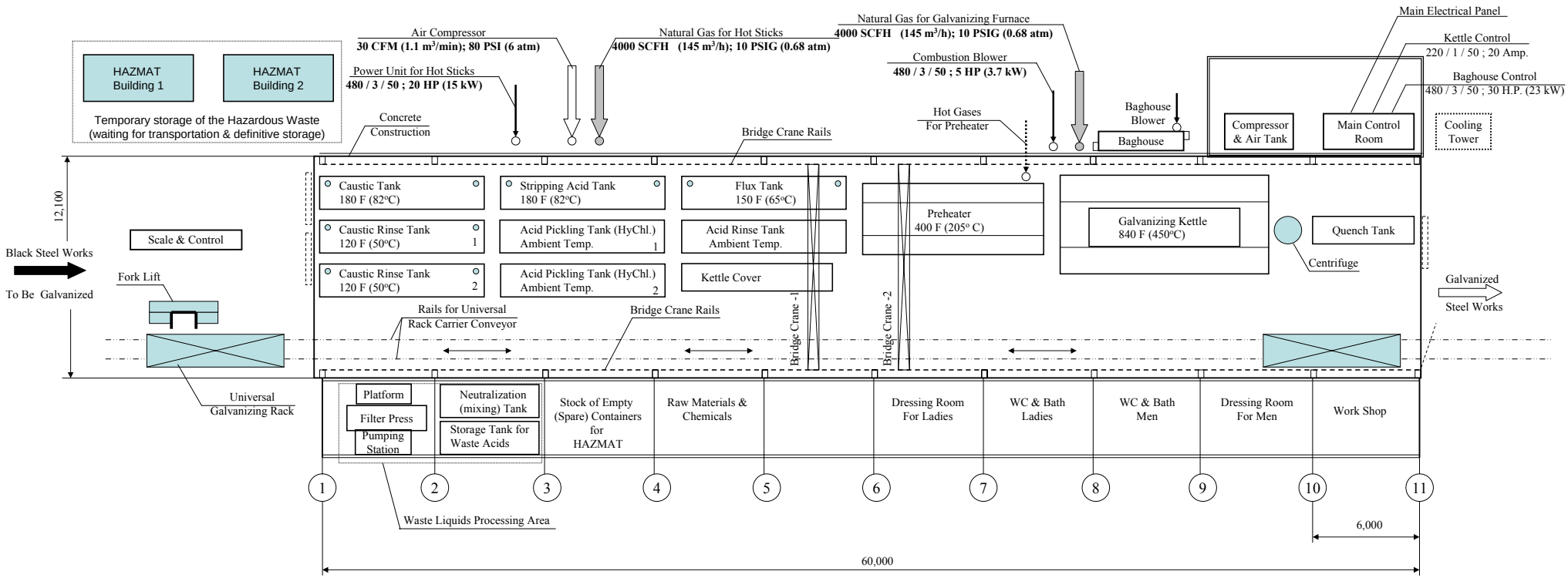
Hot Dip Zinc Galvanizing Facility "Oryahovo" – Bulgaria

PLANT INFRA-STRUCTURE



Hot Dip Zinc Galvanizing Facility "Oryahovo" – Bulgaria

EQUIPMENT LAYOUT – Variant 2



Технически изисквания и условия:

1. Да се съобрази разположението на основните модули, които са консуматори на природен газ (метан) и сгъстен въздух с разположението на резервоара (т.е., батериите) за газ, трасетата за газ, резервоара (и компресора) за сгъстен въздух, както и на трасетата за сгъстен въздух.
2. На страничната стена на основната сграда, от страната на галваничната пещ (вж. Технологичния чертеж за детайли) трябва да се изградят отвори (с упълтнения) за преминаване на димоотводите на **вторичната смесителна** (т.е., отвеждащата) камера за отходните газове (пушека). Размерите на отходната камера са 8500 mm x 1200 mm x 1200 mm. Изработва се от ламарина. Вторичната смесителна камера се монтира отстрани на **главната отвеждаща камера**, която е разположена над самата галванична пещ (вж. Черт.... за детайли). Във вторичната смесителна камера се монтират 4 броя димоотводи (за отвеждане на отходните газове), които се изработват от PVC или ламаринени тръби с диаметър 400 - 600 mm и които съответно се спускат отстрани (по стената) на сградата и достигат до монтираните на нивото на терена въздухо-пречиствателни филтри (т.е., да се съобрази какви тръби с какви колена и разклонения са подходящи.
3. Да се провери, какви са възможните варианти за отстраняване (т.е., цялостно премахване) на преградните стени (към цеха, както и между отделните клетки), разположени между колони 1, 2, 3, 4 и 5.
4. Да се съобрази, от коя част на сградата са дренажните ями, и кои точно могат да се използват за приемане на отработените води (съответно пречистени в пречиствателната система за течности).
5. Да не се получава конфликт при разполагане на кабелите за ел.ток, на тръбопроводите за газ, на тръбопроводите за сгъстен въздух, на тръбопроводите за отработени разтвори, на тръбопроводите за свежи разтвори, и на тръбопроводите за чиста (индустриална) вода. Разполагането на всички тези трасета трябва да се съгласува. Най-вече, това е валидно за каналите и тръбопроводите, които трябва да преминат под нивото на пода, т.е., под кота "0", (включително и под релсовия път), и които трябва да свързват всички резервоари за киселини с пречиствателната система. Трябва да има възможност да се извършва както отвеждане на отработен киселинен разтвор (от резервоарите към пречиствателната система), така и подаване на пресен разтвор и вода (към резервоарите).

Contents

Chapter 1. Introduction.

The new Hot Dip Zinc Galvanizing Plant will be the only galvanizing facility in Northern Bulgaria. The new galvanizing plant will be installed on the premises of a former metallurgy facility, which comprised a foundry and electro-galvanizing facility. The Plant's capacity will be 6,000 t p.a. assuming a one-shift processing schedule. The use of hot dip galvanized products is extensive and there is a growing demand on the local market, which cannot be met by the existing capacities.

During the period: October 2006 – March 2007, a full Environmental Impact Assessment Study (***EIA Study***) of the proposed Hot Dip Zinc Galvanizing Project (i.e., the ***Project***) activities was performed, and a final ***EIA Report***, documenting the EIA processes and results was prepared.

The EIA Report was developed in compliance with the relevant guidelines, set by the Overseas Private Investment Corporation (OPIC), the IFC, and the BG Ministry of Environment and Waters (BG MEW). This EIA Report would be submitted to OPIC in June 2007.

1.1. Project Proponents.

A special entity (i.e., a "Special Purpose Corporation", or "SPC") will be incorporated for the implementation of this Project. The new SPC will be created with the participation of a *Bulgarian* and an *American* partner.

Bulgarian Partner in this project is **"TRE-P" EOOD**, a Bulgarian company, which has acquired land, production, storage and administrative buildings, the related infrastructure and machinery and equipment located in the town of Oryahovo. "TRE – P" EOOD holds clean title over assets acquired against a consideration below the investment cost for setting up a similar plant, which contributed to the lower overall cost of the Project.

American partner in this project is **"GTI Engineering Inc"**, - an U.S. corporation with more than 14 years of experience in manufacturing of a galvanizing equipment. GTI Eng. has been selected to supply the Plant's machinery and equipment. GTI experts will be supervising the installation of the galvanizing equipment, and will be providing an on-site training of the Plant's personnel in the art of galvanizing. GTI will assist the Plant's experts in fine-tuning the operations, as well as will address any issues, that might have come up immediately after the Plant's launch. GTI's expertise will be utilized to select and procure the best suited air pollution control equipment and waste liquids treatment equipment.

1.2. Project Location and Project Area.

The new Hot Dip Zing Galvanizing Plant will be situated in the North-Western part of Bulgaria, and located in the town of *Oryahovo* - a port on the Danube River, with a customs office and a ferry-boat complex (see *Appendix 1.*).

The ***EIA Study*** was performed in ***four main phases***, which are developed below:

Phase A. Scoping.

The general activities, developed during the scoping phase of the EIA study included:

- *Compilation of the Project Data* : A generic description of the proposed project activities, all specific technical data, (related mostly to the technological processes & equipment), as well as all significant logistics factors, that should be relevant to the EIA, were compiled and analyzed during this first phase of the EIA study.
- *Review of the published specialized literature and other sources for information* : An appropriate (secondary) data on the weather, soil, water resources, wildlife and vegetation were reviewed and complied during the second phase of the EIA study;
- *Review on Legislation* : Complete information on relevant legislation, regulations, norms and standards, that must be used in the EIA, was reviewed and complied during the third phase of the EIA study;
- *Identification of the Potential Environmental Impacts*: The already collected data bases were analyzed and the main potential environmental issues were identified.

Phase B. Collection of Baseline Data.

An appropriate amount of baseline information on the Project Area was collected from an already published information sources, as well as from previous studies, conducted in the Oryahovo region (close to the project area).

A considerable and a very important preliminary information, related to the existing soil conditions in the project area, was collected from a *field survey*, which was specially developed for the purpose of this EIA study. The field survey was conducted in the period: November 2006 – January 2007, and included a soil sampling data collection, analysis and evaluation of the obtained results.

Phase C. Analysis and Assessment of the Impacts.

All environmental, technologic, socio-economic, logistics and other type of project information, which was collected during the first two phases of the EIA study, was used for analysis and assessment of all *potential environmental impacts,* that might be generated by the proposed project activities. These environmental impacts could *potentially affect* the baseline conditions in the Project Area, as well as some important technologic, logistics and socio-economic factors at the facility site.

The main environmental impacts, associated with *the facility operation*, represented all potential impacts, that could be caused by the *waste generation*, as well as, by the *treatment, storage* and *transportation* of the waste in the project area (or close to it).

The environmental impacts, from *construction and installation activities* are mainly the impacts, caused by construction and installation noise, as well as, by dust emissions and vehicle exhaust emission (that might be generated during the construction phase of the project).

The analysis of all potential issues determined, was focused mainly on the assessment of *the following types of environmental impacts*:

a) environmental impacts on the geomorphology of the project area, i.e., potential impacts on geology, topography and soils;
b) impacts on the ecology in the project area (including the flora and the fauna);
c) impacts on the ambient air quality and ambient noise levels;
d) impacts on the water quality ;
e) impacts on the human environment, i.e., on the residential and/or occupational population in the project area (if any);

The *assessment process* covered the following main aspects:

- identification and analysis of all potential issues, related to the proposed project activities;
- evaluation of the present (i.e., the existing) baseline conditions ;
- prediction of all potential changes, that could be generated in the environmental parameters, (which are likely to be affected by the project related activities);
- identification of all potential impacts;
- analysis and evaluation of the significance and the magnitude of all potential impacts;
- development of mitigation activities and minimization measures, that should be applied to reduce the "potential" of each significant project impact, (or even to avoid the impact entirely);
- prediction and preliminary analysis of any residual impacts ;
- determination of an appropriate minimum of monitoring requirements .

Phase D. Preparation of the Report Documentation.

A final ***EIA Report***, documenting all developed EIA-processes, as well as all results, obtained during the EIA study, was prepared. The EIA Report was prepared in compliance with the relevant guidelines, set by the OPIC, the IFC, and the BG Ministry of Environment and Waters. The final version of this EIA Report would be submitted to OPIC in June 2007.

1.4. Organization of the EIA Report.

This EIA Report consists of the following main Chapters:

- ***Chapter 1. Introduction.***

- ***Chapter 2. Policy, Statutory and Institutional Framework.*** The major factors of the National Environmental Strategy, the existing national policy and the resulting legislation for sustainable development and environmental protection are briefly developed in the different sections of the chapter. The legislative requirements, that need to be followed, while conducting this EIA Study are also presented in this chapter.

- ***Chapter 3. Project Description.*** A description of the proposed project, including presentation of the project location, the project proponents, as well as full description of the plant's logistics, the infra-structure and the applied technologic and waste processing equipment, are developed in this chapter.

- ***Chapter 4. Baseline Conditions in Area Potentially Affected by Project ("Project Area").*** A detailed description and analysis of all existing physical, biological and socio-economic conditions are developed in this chapter. The different sections of the chapter are focused mainly on the geomorphology, the soils, the water resources, the flora and fauna, the air quality and the human environment, existing in the project area.

- ***Chapter 5. Waste Treatment and Disposal Measures - Technologies and Equipment for Waste Processing. Logistics of the Waste.*** The main phases and the equipment, applied in the waste treatment technologies, as well as all important logistics activities, including the material handling, the transportation and the storage of the generated waste, are developed in details in this very important chapter of the EIA report.

- ***Chapter 6. Project Impacts and Mitigation Activities.*** A detailed description and analysis of all potential impacts on the environment are developed in this chapter. All necessary mitigation activities and minimization measures, that have to be applied to reduce the "potential" of the project impacts are also developed in details. Results, from an already developed stakeholders consultations are also presented in the chapter.

- ***Chapter 7. Analysis of Alternatives.*** Some considered project alternatives, related mostly to the plant's infrastructure and the plant's logistics chains are presented in the chapter.

- ***Chapter 8. Conclusions.*** The main conclusions of the proposed project are summarized in this chapter.

- ***References.***

- ***Appendices.***

Chapter 2. Policy, Statutory and Institutional Framework

The adoption of modern technology in agriculture, industry and everyday life, and the appearance of densely populated territories and megalopolises, precondition also the negative impact of anthropogenic factors on the environment, and more specifically, on its main components, such as water, air, soil, natural resources, radiation background, biodiversity and landscape.

In order to regulate the relationships existing between human beings and the nature and to preserve the favourable living conditions on our planet we created the ecological science, which subjects to evaluation and monitors and manages the impact of each of the more significant human activities on the environment.

Over the past decades in the course of planning and implementing all kinds of regional policies applied in managing the development of larger or smaller areas, the so-called "priority environmental objectives" have been identified and implemented accordingly.

The paragraphs below list the priorities identified in the relevant policies on the protection of the environment of the Republic of Bulgaria, which form an integral part of the National Regional Development Plan over the 2000 – 2006 period.

2.1. Statutory Requirements of Bulgaria.

2.1.1. Overview.

The development of statutory and other instruments for environmental management has steadily gained priority in Bulgaria since the late 1990s.

The Environment Protection Act was passed by the Parliament of the Republic of Bulgaria in 1991 and it constitutes the first regulatory document governing the activities involved in environmental protection and melioration. Over the past several years this Act has been subject to a number of amendments in view of harmonization with the relevant EU and world standards, as well as in order to ensure coherence with the relevant legislation of neighbouring states on the Balkans.

Passing the Environment Protection Act was followed by the establishment of the Executive Environment Agency, which is governed by the requirements laid down in its Rules of Organization. The Executive Environment Agency is charged with the task to monitor the enforcement of legal provisions concerning the quality of the environment and to control the protection of the environment against pollution and disturbance.

Regional Environment and Water Inspectorates were established at the same time with the task to assist the Executive Agency in discharging its duties in individual regions within Bulgaria.

Regional Testing Laboratories have been attached to those units to control the properties of the environment: air, waters, soils, etc.

The main legislative body on the government level in the field of environment protection and control is the Ministry of Environment and Waters. The relevant properties of the environment subject to monitoring and control, and the methods according to which those activities are conducted, are regulated by laws defining the requirements applicable to the impact on individual components of the environment (*see Appendix 2.1*), as well as by the related regulations and guidelines adopted by the secondary legislation of the Council of Ministers.

The Ministry of Environment and Waters has been appended the Environment Protection Management Company. It is a state-owned undertaking which may not have interest in business companies or partnerships without the written consent of the Minister of Environment and Waters. The main objects of the company is to implement environmental projects and activities towards the realization of national and municipal environmental strategies and programs.

The programs on preservation and control of individual components of the environment form an integral part of and are derived directly from the Bulgarian National Regional Development Plan.

A National Environmental Strategy is already in place, and now the 2007 – 2013 Environmental Operative Program is being developed and discussed, and is to be adopted on the governmental level.

The features of the National Strategy, and of the Operative Program, are discussed below in this chapter.

The bodies controlling the implementation of projects and programs designed to protect the relevant properties of the environment, are as follows:

- On the national level: the Supreme Council of Environment Experts, which suggests the decisions on Environmental Impact Assessments, as well as the decisions on the reports on the assessment of environmental damage caused through past acts or failure to act, including a program to remedy such past environmental damage. The SCEE suggests also programs aimed at bringing the activity of privatized companies to compliance with the relevant environmental legislation etc.

- On the regional level: Councils of Environment Experts with the Regional Environment and Water Inspectorates. Those are specialized bodies of the Regional Environment and Water Inspectorates, which discuss Environmental Impact Assessment Reports and attached documentation, the procedure on the assessment of environmental impact etc. on the regional level.

2.1.2. National Environmental Strategy

The National Environmental Strategy consists of the following sections:

1. Analysis of the condition of individual components of the environment, of the factors affecting them, of the trends, causes and sources of pollution and environmental damage by individual sectors of national economy, as well as of the institutional framework, and the administrative and economic tools whereby the policies are implemented.

2. Assessment of options and limitations in international and domestic terms.

3. Objectives and priorities.

4. Tools whereby the objectives will be attained.

5. Options to realize the strategies, while at the same time the possible positive and negative impacts and consequences in international and domestic terms are assessed.

6. Five-year action plan identifying specific institutional, organizational and investment measures, deadlines, responsible institutions, required resources and funding sources.

7. Scheme of organization, monitoring and reporting on the performance of the action plan in order to evaluate results and take corrective action where necessary;

The main criteria in identifying priorities in the National Environmental Strategy are:

A) Compliance with the principles of sustainable development;

B) Prevention or abatement of risks for the human health and the environment;

C) Prevention or abatement of risks for the biodiversity;

D) Abatement of adverse consequences for individual environmental components as a result of natural processes and phenomena;

E) Optimal use of natural resources and energy.

National plans and programs by individual environment components, and the factors affecting those, are developed on the basis of the principles, objectives and priorities identified in the National Environmental Strategies, and in compliance with the requirements of specific environmental laws.

The plans and programs on regional development, economic development or development of individual branches of economy on the national and the regional level ensure the integral protection of the environment in compliance with the principles and purposes of the law and the National Environmental Strategy.

Local administrative units attached to the relevant ministries and government agencies which collect and manage environmental information, support program development through the services of their experts and the provision of information.

Representatives of Non-Governmental Organizations (i.e., NGOs), companies and industrial organizations are also involved in the development, extending and updating of the programs.

2.1.3. "Environmental Operative Program 2007 – 2013" (pending approval)

The main strategic aim of the Program is to improve, protect and restore the natural environment and develop environmental infrastructure.

The specific strategic aims are related to the preservation and improvement of the condition of waters; improvement of waste management and soil protection; preserving biodiversity and protecting nature;

The main objectives which the Program is aiming to attain, are the following:

1. Waste management.
2. Reclamation of polluted land.
3. Water supply.
4. Municipal wastewater treatment.
5. Air-quality control.
6. Integrated Pollution Prevention and Control (IPPC).
7. Boosting biodiversity and environmental protection.
8. Providing assistance to SMBs to introduce new environmentally friendly technologies and environment management systems.
9. Energy efficiency and renewable energy sources.

The implementation of the Operative Program on environment protection involves the following activities:

- Analysis of the condition of the environment sector;
- Strength, Weakness, Opportunities and Threats (SWOT) Analysis of the environment sector;
- Building strategic aims and priority trends in the protection and control of the environment sector;
- Creating monitoring indicators and a mechanism to collect and process information;
- Ensuring compliance with EU legislation and policies;
- Development of an indicative financial plan;
- Compiling a list of large-scale projects within the framework of the Operative Program;
- Conclusions from the ex-ante assessment and the environmental assessment.

Priorities of the Environment Protection Program:

Priority 1. Improvement and development of wastewater and drinking-water infrastructure of settlements of above 2,000 population equivalents.

Priority 2. Improvement and development of waste-treatment infrastructure.

The main objectives identified in Priority 2 of the Environment Protection Program are:

- Improvement of waste management in Bulgaria in accordance with a defined waste-management hierarchy (prevention, recovery and ultimate disposal).

- Improvement of the condition of soils and groundwater and reduction of that part of the territory of the country which is covered by old household-waste landfills.

Priority 3. Biodiversity preservation and restoration.

The main objective identified in *Priority 3* is minimizing and checking biodiversity loss in Bulgaria.

A User Assistance Handbook has been developed alongside with the Environment Protection Program. This Handbook determines the main stages in the implementation of the Operative Program, which are as follows:

- Programming;
- Project evaluation and selection;
- Awarding public contracts;
- Monitoring and reporting;
- Program evaluation;
- Financial management, settlement and accounting;
- Financial control and auditing;
- Irregularities and financial adjustments;
- Information and publicity;
- Keeping documents.

2.1.4. Statutory Framework.

The main law of the Republic of Bulgaria governing the rules applied in drafting an Environmental Impact Assessment – EIA and, which is applied in the implementation of specific projects (including in the case at hand, the Hot Dip Galvanizing Facility project), is the **Environment Protection Act**.

This act is the basic legislative tool empowering the government to frame regulations for the protection of the environment.

This act regulates:

- the protection of the environment;
- the preservation of biodiversity in accordance with Bulgaria's natural biogeography;
- the protection and use of environment components;
- the control and the management of factors damaging to the environment; exercising control on the condition of the environment and the sources of pollution;
- the prevention and abatement of pollution;
- the establishing and the functioning of the National Environmental Monitoring System;
- the strategies, programs and plans on environment protection; the collection of and access to environmental information;
- the economic organization of environment protection activities;
- the rights and obligations of the government, the municipalities, the legal and natural persons in terms of environmental protection.

The act is applicable to a broad range of issues and extends to air, water, soil, land, and noise pollution, as well as to the handling of hazardous wastes. The key features of the law that have a direct bearing on the proposed Project relate to the requirement for an initial environmental examination.

Section III, Art. 92 of the Act regulates environmental impact assessments of investment proposals in terms of construction, activity and technology, and investment proposals in terms of construction, activity and technology having cross-border impact on the environment.

The additional requirements for the quality of individual environmental components are listed in the relevant regulatory documents (acts, rules, regulations etc.). These include:

1. The Environment Protection Act

2. The Protection from the Adverse Effects of Chemical Substances and Preparations Act

3. The Water Act

4. The Waste Management Act

5. The Clean Air Act

6. The Protection of Water and Soil from Pollution Act

7. The Agricultural-Land Protection Act

8. The Biodiversity Act

9. The Medicinal Plants Act

10. The Genetically-Modified Organisms Act

11. The Protected Areas Act

12. The Protection against Noise in the Environment Act

The specific methodology applied in delivering the Environmental Impact Assessment of the site is governed by the Regulations laying down the conditions and the procedure applicable in delivering environmental impact assessments.

National Environmental Quality Standards (NEQS).

The NEQS specify the following standards:

1. Emission norms on the permitted content of harmful and dangerous substances in wastewater released in water bodies.

2. The quality of coastal marine waters.

3. Norms on the quality of water designed for drinking and household purposes and the quality requirements for surface waters designed for drinking and household water supply.

4. Waste-classification norms.

5. Norms on harmful emissions in the air released by various sources.

6. Standards on the recovery of wastewater-treatment sludge

7. Permitted limits of pollutant-content in the soil

8. Maximum noise levels

The complete set of NEQS is given in **Appendix 2.2**.

2.2. Requirement of IFC and World Bank.

The IFC and the World Bank require that all projects funded by these agencies have to be constructed and operated in an environmentally responsible manner. All projects that receive IFC funding must therefore comply with appropriate World Bank Group environmental policies and guidelines. As the project proponents are likely to seek funding from the IFC for the proposed expansion project, the EIA has been carried

out to comply with both national and IFC guidelines. The key documents of the IFC are discussed below.

2.2.1. Social and Environmental Review Procedures.

IFC's Environment and Social Review Procedure (ESRP) outlines the process through which IFC staff implement the Corporation's commitment to promoting projects that are environmentally and socially sustainable. This commitment is a fundamental part of IFC's mission and is elaborated on in IFC's Policy and Performance Standards on Social and Environment Sustainability (PPS) as well as in IFC's Policy on Disclosure of Information (the Disclosure Policy).

The ESRP applies to the full range of IFC's investment activities: direct lending to private enterprises (including both corporate and project finance); lending to financial intermediaries; minority equity/shareholding in companies, financial institutions, and other entities; structured finance products (guarantees, securitizations); and municipal finance. The ESRP also describes IFC's approach to its technical assistance and advisory activities, including both investment-related work and capacity building to help support private sector development in emerging markets. The ESRP also describes the application methodology that IFC staff must follow in order to implement IFC's institutional disclosure requirements in accordance with the Disclosure Policy.

The application of the PPS varies according to the nature of IFC's intervention with the client and the nature of the client's business (for example, industrial companies versus financial institutions). The ESRP covers IFC's review and supervision responsibilities for environmental and social performance throughout the project life cycle.

The timing of an IFC investment in relation to a client's business activities and project implementation process varies from project to project. IFC does not control the timing of its entry into a project; IFC's engagement, more times than not, occurs well after the project is conceived, with the site selected and development started. When considering whether or not to participate in a transaction, IFC's review takes into account any project development work undertaken beforehand. IFC has a range of other tools to help staff assist its clients in improving the environment and social outcomes of their projects.

Other sources of information that complement the PPS include the Guidance Notes for the Performance Standards; IFC Environmental Health and Safety Guidelines, which provide specific benchmark criteria in line with good international practice; and a diverse range of best practice material. The ESRP therefore does not provide technical support or guidance for specific environmental and social issues. Instead it is a defined and structured process that helps IFC maintain consistency and quality of its review process and ensure that policy requirements are identified and committed to. It thus helps fulfil the Corporation's commitment to sustainable outcomes in the operations it invests in or supports.

Assessing and managing environmental and social impacts in a manner consistent with the PPS is the responsibility of the client. IFC's responsibility is to review the work of

the client, identify opportunities to improve outcomes, and ensure consistency with policy requirements. IFC's approach is to take full advantage of any work undertaken by the client before IFC's own entry into the transaction, thus minimizing additional processing burdens where it is possible to do so while still meeting the Corporation's policy requirements. Of particular importance in the PPS is the adequacy of the client's ESMS. IFC's investment or advisory support is used to influence and improve performance whenever possible.

The ESRP includes an amended categorization methodology, which categorizes projects according to potential adverse impacts after IFC's review rather than during initial screening. Categorization was previously used as a determinant of certain procedural requirements for the client relating to assessment, community engagement and disclosure.

The ESRP recognizes that all process requirements of the client have now been captured in the PPS and that categorization is now used only to determine IFC's institutional disclosure requirements. IFC's environmental and social specialists are essential and integral parts of the process the Corporation uses to optimize outcomes.

The ESRP is not a substitute for professional judgment and expertise but provides a framework for the consideration and documentation of key issues and decisions that are made during the project cycle. It also provides staff with a process for document preparation.

2.2.2. IFC Performance Standards on Social and Environmental Sustainability.

IFC applies the Performance Standards to manage social and environmental risks and impacts and to enhance development opportunities in its private sector financing in its member countries eligible for financing[2]. The Performance Standards may also be applied by other financial institutions electing to apply them to projects in emerging markets. Together, the eight Performance Standards establish standards that the client[3] is to meet throughout the life of an investment by IFC or other relevant financial institution:

- Performance Standard 1: Social and Environmental Assessment and Management System
- Performance Standard 2: Labour and Working Conditions
- Performance Standard 3: Pollution Prevention and Abatement
- Performance Standard 4: Community Health, Safety and Security
- Performance Standard 5: Land Acquisition and Involuntary Resettlement
- Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management
- Performance Standard 7: Indigenous Peoples
- Performance Standard 8: Cultural Heritage
- Performance Standard 1 establishes the importance of: (i) integrated assessment to identify the social and environmental impacts, risks, and opportunities of

projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) the client's management of social and environmental performance throughout the life of the project. Performance Standards 2 through 8 establish requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment, and to improve conditions where appropriate. While all relevant social and environmental risks and potential impacts should be considered as part of the assessment, Performance Standards 2 through 8 describe potential social and environmental impacts that require particular attention in emerging markets. Where social or environmental impacts are anticipated, the client is required to manage them through its Social and Environmental Management System consistent with Performance Standard 1.

In addition to meeting the requirements under the Performance Standards, clients must comply with applicable national laws, including those laws implementing host country obligations under international law.

A set of Guidance Notes, corresponding to the Performance Standards, offers helpful guidance on the requirements contained in the Performance Standards, including reference materials, and on good sustainability practices to help clients improve project performance.

2.2.3. World Bank Guidelines on Environment.

The Pak-EPA recommends using World Bank (WB) environmental guidelines for areas where there may be a gap in the national guidelines. The principal World Bank publications that contain environmental guidelines are listed below.

- Pollution Prevention and Abatement Handbook 1998: Towards Cleaner Production[1]
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectoral Issues[2]
- Environmental Assessment Sourcebook, Volume II: Sectoral Guidelines[3].

The first two publications listed above provide general guidelines for conducting an EIA, and address the EIA practitioners themselves as well as project designers. While the Sourcebook in particular has been designed with Bank projects in mind, and is especially relevant to impact assessments of large-scale infrastructure projects, it also contains a wealth of information useful to environmentalists and project proponents.

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[1] World Bank, UNIDO, and UNEP. 1999. *Pollution Prevention and Abatement Handbook, Towards Cleaner Production.* Environment Department, The World Bank; UNIDO; UNEP.

[2] World Bank. 1991. *Environmental Assessment Sourcebook, Volume I, Policies, Procedures, and Cross-Sectoral Issues.* World Bank Technical Paper No. 139. Environment Department, The World Bank.

[3] World Bank. 1991. *Environmental Assessment Sourcebook,* Volume III, Sectoral Guidelines. World Bank Technical Paper No. 140. Environment Department, The World Bank

The Sourcebook identifies a number of areas of concern that should be addressed during impact assessment. It lists activities that may have significant negative consequences for biodiversity, and mentions loss of habitat resulting from mining and mineral exploration as one such activity. It sets out guidelines for determining the project impact in such cases, provides a checklist of tools to identify possible biodiversity issues, and suggests possible mitigation measures. Possible project development effects on wild lands, wetlands, forests, etc., are also identified, and mitigation measures suggested. The Sourcebook also highlights core concerns in social impact assessment and emphasizes the need to incorporate socioeconomic issues into environmental impact assessment exercises.

The Environmental Assessment Sourcebook dealing with sectoral assessment is more specific. It contains sections on dams, reservoirs, watershed development, and flood protection. In addition to these documents, several other World Bank operational policies and directives that provide guidelines for environmental assessment were used during the assessment.

2.3. Non-Governmental Organizations.

A number of NGOs have been registered within the Republic of Bulgaria over the past years, whose primary object is environment protection.

The more important of those, such as the Ecoglasnost National Movement, the National Association for Environmentally-Friendly Agriculture, the Green Balkans, the Ecoforum Association etc. take active part in discussing the National Environment Strategies and the activities of the Supreme Council of Environment Experts and the Councils of Environment Experts attached to the Regional Environment and Water Inspectorates (see **Appendix 2.3** for the list of some important NGOs in Bulgaria).

Chapter 3. Project Description.

The new Hot Dip Zinc Galvanizing plant will be installed on the premises of a former metallurgy facility, (which comprised a foundry and electro-galvanizing facility) and will be located in Oryahovo, a port on the Danube River with a customs office and a ferryboat complex.

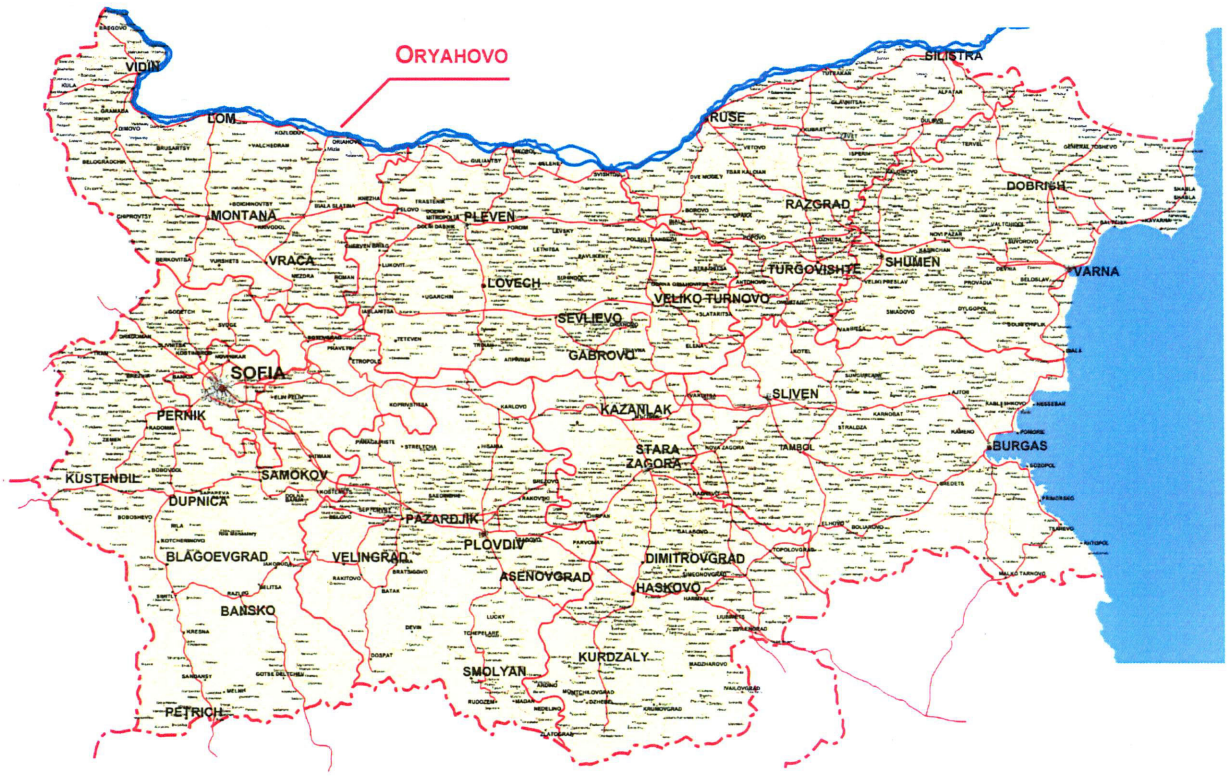
The average Plant's capacity will be 6,000 t p.a. assuming a one-shift processing schedule.

The use of hot dip galvanized products is extensive and there is a growing demand on the local market which cannot be met by the existing capacities. Furthermore, domestic prices of galvanized products provide for ample profit margins and are at the same time more competitive than those in the neighboring countries thus creating a significant potential for attracting foreign customers.

3.1. Project Location

Oryahovo Municipality is located in the North-Western part of Bulgaria, on the Danube River (please see *Exhibit 3.1.*, and *Exhibit 1.1.*).

Exhibit 3.1. Project Location



The new Hot Dip Zinc Galvanizing plant will be situated in the *industrial zone* of the town of Oryahovo, BG, i.e., about 3 miles away from the town and about 6 miles away from the Danube river (i.e., not in proximity to residential quarters).

3.2. Project Proponents.

A special entity (i.e., a "Special Purpose Corporation", or "SPC") will be incorporated to implement the Project with the participation of a Bulgarian and an American partner.

The ***Bulgarian Partner*** in this project is **"TRE-P" EOOD**, a Bulgarian company, which has acquired land, production, storage and administrative buildings, the related infrastructure and machinery and equipment located in the town of Oryahovo. "TRE – P" EOOD holds clean title over assets acquired against a consideration below the investment cost for setting up a similar plant which contributed to the lower overall cost of the Project.

The ***American partner*** in this project is **"GTI Engineering Inc",** - an U.S. corporation with more than 14 years of experience in manufacturing galvanizing equipment. GTI has been selected to supply the Plant's machinery and equipment.

The assistance of GTI will be continuous as GTI experts were involved in the process of customizing the Plant's galvanizing equipment in order to optimize performance and streamline operations at the same time.

GTI experts will supervise the construction works and the installation of the galvanizing equipment and of the auxiliary equipment. The Plant's workers will be trained on-site prior to launching operations. The training will include operating procedures and maintenance and it will also address the implementation of adequate safety procedures. An additional training will be conducted 45 to 60 days after launching the Plant's operations; the training will be on a more advanced level and will cover galvanizing process specifics and the overall operation of a galvanizing business. GTI will assist the Plant's experts in fine-tuning the operations as well as address any issues that might have come up immediately Plant launch.

GTI's expertise will be utilized to select and procure the best suited air pollution control equipment and waste liquids treatment equipment.

3.3. Existing Assets, Past Operation History and Current Operations.

The assets acquired to date by "TRE-P" (i.e., the Bulgarian Partner), include land, production, storage and administrative buildings together with the related infrastructure. The Plant has an existing connection to the National Electricity Transmission Company high-voltage grid, a transformer station on the territory of the Plant and all related utilities.

In order to secure the production process, the Plant only needs access to industrial quality water, i.e. no access to tap water or purification station is required for the production process. The Plant has its own industrial water source.

The new Hot Dip Zing galvanizing plant will utilize some of the existing infra-structure of the former electro-galvanizing facility, especially the existing facility buildings, industrial water sources, inter-plant roads, offices, warehouses, etc..

The configuration of the Plant's galvanizing equipment has been carefully analyzed and customized to reflect the optimal combination between investment cost, technological characteristics and processing capacity.

Furthermore, a number of the required auxiliary parts, workshop infrastructure and other elements shall be manufactured locally, in compliance with specifications and technical drawings provided by GTI and under strict quality assurance procedures which minimize the risks and ensure a reduction in the overall Project cost.

At present, "TRE – P" EOOD owns and operates *also* ***a metal processing facility***.

The new hot dip zinc galvanizing facility will own part of the former metallurgy plant's existing infrastructure and a considerable part of the steel works manufactured by the "TRE – P" EOOD metal-working facility will be galvanized by the new Plant.

The availability of a steel manufacturing plant and a hot dip zinc galvanizing plant provides options for accepting complex orders from customers, i.e. orders for galvanized steel products as opposed to just orders to provide galvanizing services.

3.4. Proposed Project.

3.4.1. Process Overview.

The protection of steel from corrosion by hot dip zinc galvanizing has been practiced for many years, and the technique is still unequalled for the long term protection of structural articles, that may be subjected to physical abuse during shipping and installation. This is because of the nature of the alloy coating formed when chemically clean steel is immersed in molten zinc. The coating formed, is an alloy between iron in the base metal and zinc, and it is therefore much more resistant to mechanical damage than surface coatings such as paint, electroplating, anodizing or flame-spray overlays. Further, poorly accessible areas are completely protected, and even if small areas are left uncoated or are scratched by handling, these areas are still protected. This is because of the electrochemical difference between iron and zinc which means that the zinc is consumed by oxidation preferentially to iron or is "sacrificed" to save the base metal.

If, for reasons of appearance or extremely corrosive environments, a paint coating is desired, the surface of the galvanized article can be treated to enhance paint adhesion by dipping in solutions that are generally based on phosphoric acid. Coating life is dependent on the environment and the rate of corrosion of the zinc layer is approximately 0.1 to 0.2 mils per year (1 mil = 1/1000 inch). This means that a normal 3 mil coating weight which is equal to 2 ounces of zinc per square foot of

surface area can be expected to give a 20 to 30 year product life. Painted galvanized structures can have much longer life, and the paint coating can be renewed to give indefinite life.

In order to obtain the alloying reaction, the article to be galvanized must first be clean. This can be accomplished by mechanical means such as grit blasting or by chemical process which is the most commonly used, particularly for large articles. At times, a combination of the two methods is used, such as the removal of weld slag by blasting before chemical cleaning.

Grease and paint are first removed by soaking in a hot alkali solution such as caustic soda combined with an emulsifying agent and a detergent. Several companies market proprietary mixtures, or the galvanizer may blend his own. Solution temperature is usually 180 F, and chemical concentration is maintained at approximately one pound per gallon of water. Little maintenance is required of this bath except the periodic addition of chemicals to maintain solution strength, and the daily addition of water to replace evaporation loss. Once or twice a year, sludge is removed from the tank bottom.

Water rinsing follows, and the use of a dual rinse system is far more effective than a single tank. Fresh water is introduced into the second rinse tank which overflows to the first rinse tank which in turn flows to the alkali tank. Water flow is regulated to be equal to the evaporation rate so that no waste has to be treated. This system helps to prevent the carry over of emulsified oil to the acid tanks which in turn causes product quality problems such as black spots and un-galvanized areas.

Acid pickling next removes oxidation (rust) from the metal surface. Hydrochloric acid and sulphuric acid are commonly used for this purpose, and both have their pros and cons, (a subject, which will be discussed later). In either case, the work should be thoroughly rinsed after pickling to prevent contamination of the next chemical bath.

In order to promote uniform wetting of the steel surface by molten zinc, a wetting agent or *flux* is used. This may be done by dipping the work in a solution of zinc ammonium chloride, or by using a layer of this chemical, which floats on the surface of the molten zinc bath. Although both systems have their proponents (and special cases may require one or the other), the flux solution method generally results in a better and more consistent finish. This method is referred to as "dry galvanizing" as opposed to "wet galvanizing" in which the "wet" flux floats on molten zinc.

Finally, the prepared article is dipped into a bath of molten zinc, which is kept at a temperature of approximately 840F. Other metals are mixed in with zinc to perform certain functions such as aluminium to improve coating uniformity and reduce zinc loss through oxidation. A small amount of lead is alloyed with the zinc to promote drainage, and other metals are present as impurities in purchased zinc. None of these have been found to create a hazardous environment for plant personnel in the quantities present.

After dipping, the product is cooled by quenching in water or allowed to air cool depending on product type, inspected for defects, weighed, and stored until ready for shipment or use.

It is important, that articles should not be stacked closely and stored wet because oxidation or "white rust" can occur and will rapidly destroy the zinc coating. To minimize the risk of this occurrence, a treatment with a surface *passivation* chemical can be used.

3.4.2. Plant's Logistics and Infrastructure. Technologic and Waste Processing Equipment.

A. Plant's Logistics and Infrastructure.

The new Hot Dip Zinc Galvanizing Plant in Oryahovo will use an existing asset base comprising land, buildings, related infrastructure and will operate galvanizing equipment under a customized configuration, manufactured by GTI Engineering Inc.

The infrastructure of the new Galvanizing Plant is presented in *Exhibit 3.2.*

The plant's infrastructure consists of the following main components:

- *Hot Dip Zinc Galvanizing Facility* ;
- *Warehouse for Black Steel Works (to be galvanized) ;*
- *Warehouse for Galvanized Steel Works (finished products);*
- *Sorting and packing area(s);*
- *HAZMAT Buildings for temporary storage of the already containerized waste (waiting for transportation and definitive disposal);*
- *Maintenance and repair workshop;*
- *Warehouse for raw materials and spare parts;*
- *Garage for Fork-lift loaders;*
- *Offices (administration);*
- *Inter-plant roads & sites.*

The "In – Flows" of the new zinc galvanizing plant will consist of steel works, that shall be submitted to galvanizing. The "Out – Flows" of the plant will respectively consist of the already galvanized steel works.

Several, specially designed warehouses will become an essential part of the plant's logistics chain – respectively a warehouse for the black steel works (to be galvanized), a warehouse for the already galvanized steel works (the finished products), a warehouse for temporary storage of the generated hazardous waste (i.e., the HAZMAT Buildings), a warehouse for raw materials and spare parts, and a warehouse for spare Hazmat Containers.

Most of the material-handling, transportation and technologic activities inside the main facility building shall be performed by a specially designed bridge cranes, equipped with monorail systems.

Fork-lift loaders and universal galvanizing racks will provide options for transportation, manipulation, sorting and packing of the steel works inside and outside of the facility building, warehouses and sorting & packing areas.

The plant infra-structure comprises also a garage for the fork-lift loaders, a workshop, designated for maintenance & repair activities and two small buildings for administration & sales personnel.

B. Layouts of the Technologic Equipment and Waste Treatment Systems

Full layouts of the galvanizing equipment, the auxiliary equipment and the waste treatment systems of the new Plant, are shown in *Exhibit 3.3*.

C. Main Components of the Plant's Equipment.

- **Galvanizing Technologic Equipment.**

The specially designed, built and installed zinc galvanizing technologic equipment of the new plant shall be able to create an uniform zinc coating (with the required technical characteristics) on all steel works, that will be submitted to hot dip zinc galvanizing.

The main components of the zinc galvanizing technologic system (see *Exhibit 3.3.*) are :

a) *Caustic and Caustic Rinse Tanks ;*
b) *Acid, Acid Rinse and Flux Tanks ;*
c) *Galvanizing Furnace (Galvanizing Kettle) ;*
d) *Pre-Heater (Dryer) ;*
e) *Centrifuge System* (for small and/or complex parts galvanizing);
f) *Quench Tank;*
g) *Dross Clamshell (for collection of the zinc dross);*
h) *Sludge Clamshell (for collection of the sludge)..*

Complete description, specifications, pictures and drawings of the Hot Dip Zinc Galvanizing equipment are presented in ***Appendix 3.***

- **Waste Treatment Equipment.**

The waste processing systems comprise a ***waste liquids treatment equipment*** and an ***air pollution control equipment*** .

The waste liquids treatment system, is capable to treat the waste liquids from plant's pickle area, and to maintain a proper chemistry in the process tanks.

The air quality and kettle air control equipment, collects and filters the particulate emission (i.e., the smoke), which escapes from the surface of the molten zinc as the steel work to be galvanized is dipped in the kettle.

Exhibit 3.2.

Hot Dip Zinc Galvanizing Facility "Oryahovo" – Bulgaria
PLANT INFRA-STRUCTURE

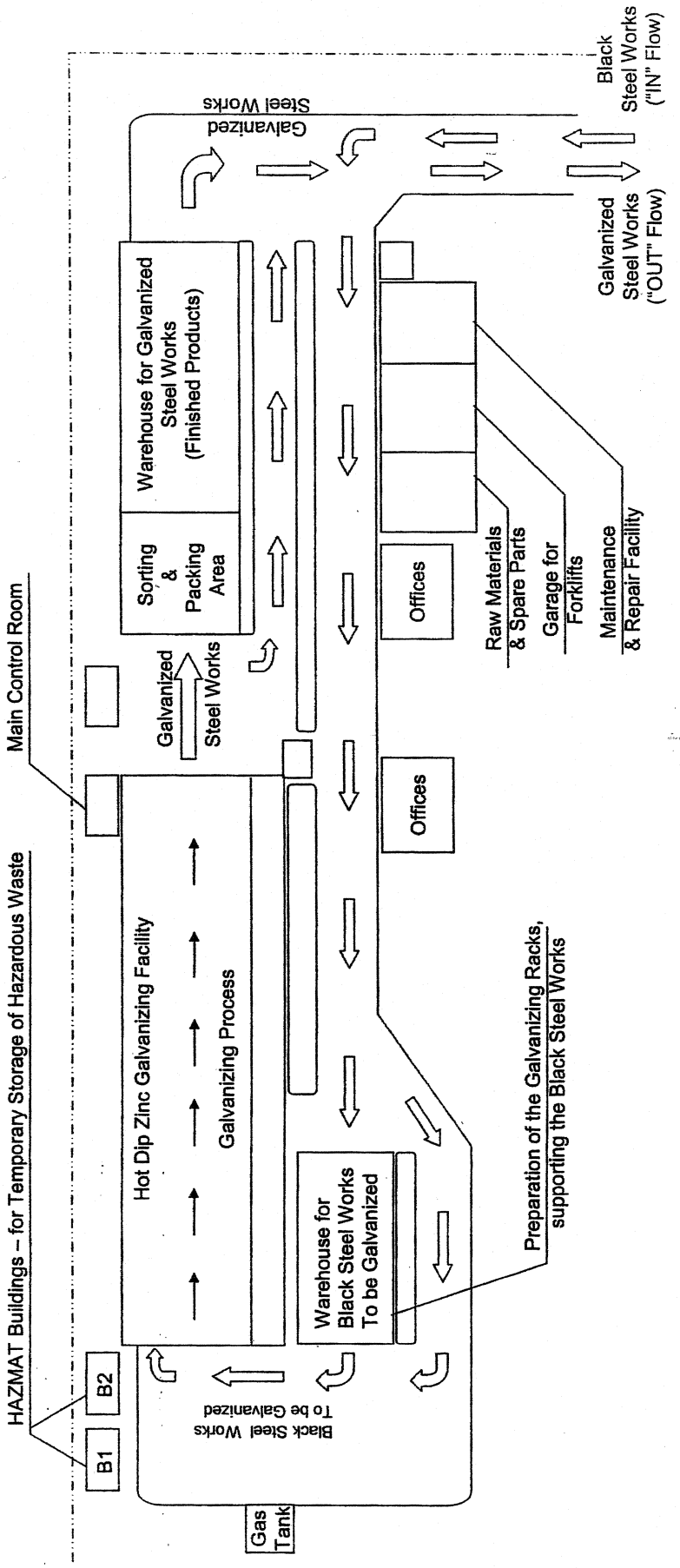
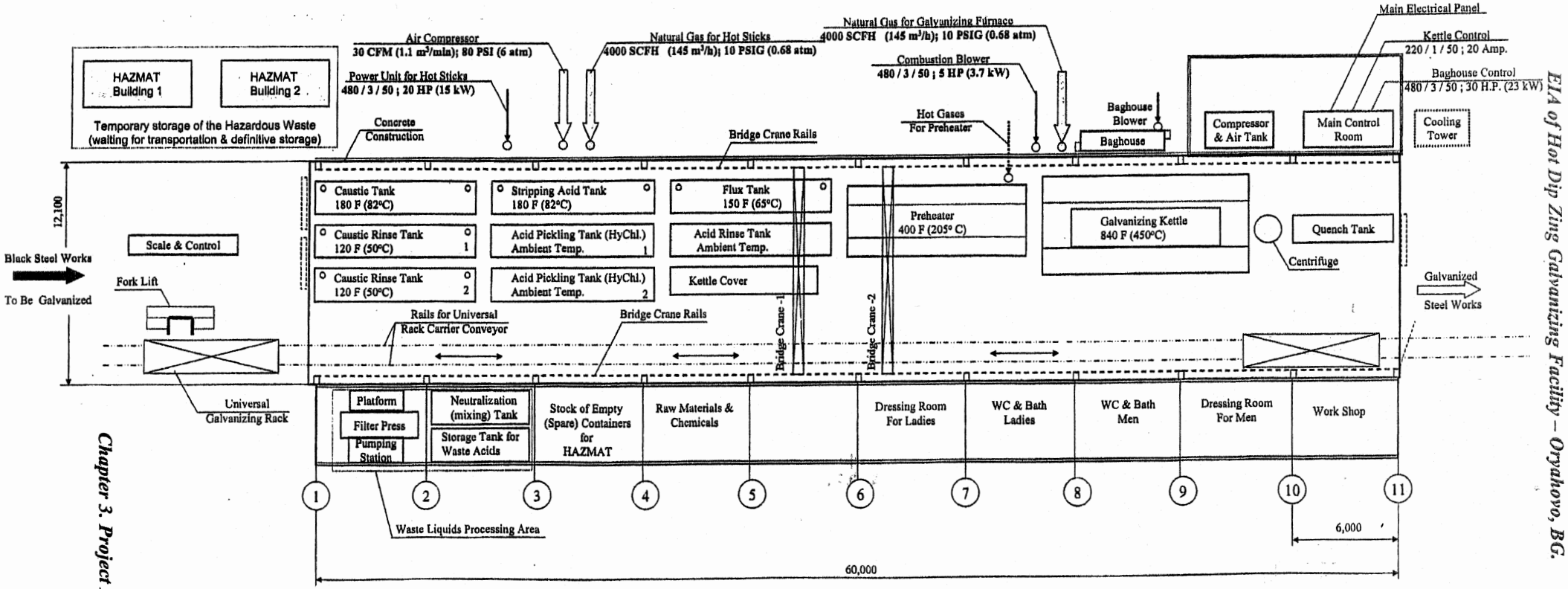


Exhibit 3.3.

Hot Dip Zinc Galvanizing Facility "Oryahovo" – Bulgaria
EQUIPMENT LAYOUT – Variant 2



The waste treatment equipment (see *Exhibit 3.3.*) consists of the following specific modules:

a) Waste Filters and Filter Press for Liquid Waste;
b) Central Pumping Station;
c) Chemical Reaction Tank Mixers;
d) Neutralization and Storage Tanks for Waste Acids;;
e) Air Quality & Kettle Air Control Equipment – Hood Enclosure and Baghouse.

Complete description, specifications, pictures and drawings of the Waste Processing Technologies & Equipment (for treatment of the liquid & solid waste) are presented respectively in **5.1., 5.2.** and **5.3.**

- **Auxiliary Equipment**

The auxiliary equipment will provide safe and efficient performance of all logistics activities, specific technologic cycles and waste management activities, developed in the new zinc galvanizing plant.

The plant's auxiliary equipment (see Exhibit 3.3.) comprises the following main components:

a) Bridge Cranes with Monorail Hoists (special design) for handling the steel works inside the galvanizing area;
b) Fork Lift Loaders ;
c) Compressor Station & Air Tank;
d) Universal Galvanizing Rack (for inter-facility transportation of the steel works);;
e) Scale & Control Equipment;

3.4.3. Process Stages and Materials.

The components of the hot dip zinc galvanizing process flow diagram are presented in *Exhibit 3.4.*

The galvanizing process comprises the following stages:

A. Chemical cleaning of the steel works to be galvanized.
   - Grease and paint are removed by soaking in a hot alkali solution (caustic soda + detergent).
   - Solution temperature is 180 F (82 C^{o});
   - Concentration – 1 pound per gallon of water.
   - Maintenance – periodic addition of chemicals (to maintain solution strength) and daily addition of water to replace evaporation loss. Once a year a sludge is removed from the tank bottom.

B. Water rinsing – dual rinsing system is far more effective than a single tank.
   - Fresh water is introduced into the second rinse tank, which overflows to the first rinse tank, which in turn flows to the alkali tank.

- Water flow is regulated to be equal to the evaporation rate, so that no waste has to be treated.

C. Acid pickling – removes rust (i.e., oxidation) from the metal surface.
- Hydrochloric Acid is preferably to be used (please see notes for details).
- Ambient temperature.

D. Rinsing of the steel works after pickling (at ambient temperature).

E. Wetting of the steel surface – i.e., dipping the works in the flux tank(s).
- Solution of zinc ammonium chloride is used for the purpose.
- The temperature is 150 F (65 C^o).

F. The steel work is heated in the preheater at 400 F (205 C^o)

G. The prepared article (i.e., the steel work) is dipped in a bath of molten zinc (i.e., in the kettle).
- The temperature is 840 F (450 C^o).
- Other metals are mixed with zinc (i.e., aluminum to improve coating uniformity and lead to promote drainage).

H. Cooling of the product (by quenching in water, or allowed to air cool). A Quench tank is used for the purpose

3.4.4. PROCESSING CAPACITY

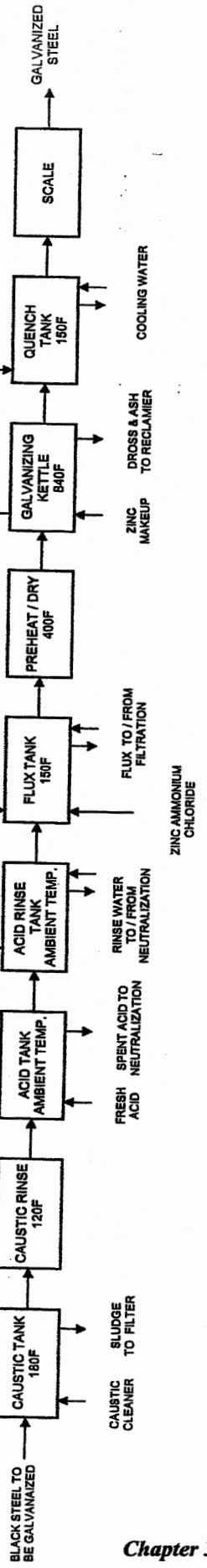
Based on the plant layout, plant's logistics and the GTI galvanizing equipment specifications, the Plant's processing capacity will be as follows:

- The theoretical production rate of the system is about 18,000 pounds per hour, i.e. approximately 8.1 tons of galvanized works per hour.
- The conversion ratio 'theoretical to operational' production rate is 80%, i.e. the actual achievable production rate will be 6.6 tons per hour on average.
- In order to come up with the base case scenario for the Plant's processing capacity, longer processing cycles are assumed which result in effective production rate of 50% of the operational one, i.e. 3.3 tons per hour.
- This would equal a revised galvanizing system capacity of 500 tons per month, assuming a single-shift schedule, an 8-hour shift and no overtime.

The hot dip zinc galvanizing process is not a continuous process i.e. it does not require a continuous three-shift operating schedule. There are, however, no limitations to operating the Plant's galvanizing facilities on a continuous basis and a three-shift working regime. The Plant's logistics allow for the proper storage and process flows of steel works to be galvanized, of raw materials and other production consumables, and of finished products. Therefore, the organization of the Plant's operations will allow for optimization of the workload in view of galvanizing orders and the available alternatives to efficiently group individual items for processing.

Exhibit 3.4.

HOT DIP ZINC GALVANIZING PROCESS FLOW DIAGRAM



3.4.5. STEEL WORKS TO GALVANIZE

Based on prior experience of the Plant's technical experts and a review of the product range of the customers, who have provided signed Agreements to place regular monthly order for galvanizing of steel works, the production scope of the Plant is broadly categorized in three groups: galvanization of regular steel works, complex parts (e.g. frames and compound steel structures) and small items.

The complex structures usually require more process time and / or lead to incurring a higher cost per unit due to the resulting higher zinc pick-up. Small parts are also less efficient to galvanize unless the Plant is properly equipped to process those with minimal losses.

The configuration of the galvanizing equipment supplied by GTI, takes into consideration the existing galvanizing capacities on the domestic market, the concentration of demand in certain product groups (the so-called long products – bars, tubes, poles, pillars, etc.) and also provides specialized solution to galvanizing small items (a centrifuge which will ensure uniform coating and minimal zinc loss).

The distribution of steel works to be galvanized among the three major groups is as follows:

Regular works	70%
Complex parts	20%
Small items	10%

The above product mix is not a driver of the Plant's profitability, however, the capacity to process the above parts and the ability of the Plant to offer galvanizing services for the whole range of steel works, i.e. small, regular and complex is an important competitive advantage of the Plant.

3.5. Construction and Installation Activities

All construction and installation works for the proposed project will be carried out within the existing plant's boundaries. No new area for the new zinc galvanizing plant will be acquired. All existing buildings and related infra structure will be utilized. Once all specific civil drawings have been prepared, the underground infrastructure will be installed and the foundations for the process equipment will be laid.

The main activities, developed during the ***civil construction stage*** are described below:

- Soil survey under the new and/or specific foundations (the analysis is needed for the foundation's specifications);
- Construction of the foundations for the furnace, for the tanks and for the pre-heater/dryer (as per recommendation of the soil survey and under GTI's supervision);

- Foundations for the HAZMAT Buildings, specially designated for temporary storage of the already containerized waste (waiting for transportation & definitive storage);
- Repairing of roofs (of the main facility building and of the warehouses as well);
- Masonry works on the façade of the two warehouses - the one for the steel works to be galvanized and the one for the finished products (i.e., the already galvanized steel works);
- Masonry works on the façade of the main facility building ;
- New windows for the main facility building ;
- New covering on the floors ;
- New covering on the inter-plant roads.

GTI Eng. will prepare ***installation drawings*** and foundation layout drawings, showing the exact placement of the main technologic equipment and the location of necessary the foundations within Plant's building, and in the area adjacent to the building where auxiliary and air control equipment will be located. GTI Eng. will furnish an experienced supervisor to assist with the supervision of ***installation and fabrication*** of galvanizing racks, jigs and fixtures. The supervisor will be at the facility site for approximately 4 weeks.

The main ***installation activities*** of the proposed project are :

- Installation of new rails for the new (specially designed) Bridge Cranes;
- Installation of rails for the Universal Galvanizing Racks;
- Erection of the Kettle Air control equipment (the fume collection chambers);
- Erection of the Baghouses;
- Installation of the Zinc Galvanizing Furnace (i.e., the galvanizing kettle) in a specially fabricated concrete-lined pit and on supporting foundations;
- Installation of all process tanks in the already fabricated concrete-lined pits and on supporting foundations;
- Installation of the Pre-Heater/Dryer in the specific concrete lined pit;
- Installation of the HAZMAT Buildings on its foundations;
- Installation of the Waste liquids treatment system in the specially designed processing area;
- Erection of the Air tank and installation of the compressor system and air-pipes;
- Installation of all pipes, transfer pumps and piping connections for the waste liquids processing systems;
- Installation of the gas pipes, piping connections, valves and pumps, necessary to provide fuel (i.e., natural gas) for the furnace and for the tank heating systems;
- Installation of all electrical power components (electrical control panels, electrical cables, boxes, transmitters, etc.);

3.6. Energy Conservation

- Natural gas will be the greatest energy expense in the plant, and proper furnace design will be used to reduce this expense. A modern furnace is approximately 65% efficient which means that 65% of the heating value in the purchased natural gas does useful work. This is accomplished by the selection of insulating materials that virtually eliminate heat loss from the furnace walls, and proper application of burners that convert the gas into heat energy.
- Energy for the heating of pickle solutions is the other main consumer of natural gas. The caustic tank is heated to 180F to insure removal of oil, and the rinse tanks are operated at 100F to allow the work to be moved into the pickle tanks while warm. This improves pickling rate.
- The choice of pickling acid also has an impact on energy cost. Sulfuric acid must be heated to a 140 - 150F in order to pickle properly, and in a plant of this size amounts to an operating cost of $10 per hour if efficient tank heating means are used. It is for this reason as well as others discussed below, that the use of unheated hydrochloric acid is recommended. .
- Electrical energy is a less significant cost, primarily being lighting for the building and energy for cranes, monorail hoists, air compressor, and baghouse fans. A total connected load of 50 kW would be typical for a medium sized plant.

Chapter 4. Baseline Conditions in Area Potentially Affected by Project ("Project Area")

The actual Chapter describes the environmental setting of the areas that could be affected by the proposed Project, i.e. the so-called "**Project Area**". For the purpose of this report, the *project area* is defined as the area where the project-related activities will be developed, i.e. *the geographic area*, in which the construction and operation activities of the new plant will be carried out, and in which the environmental impact of these activities could possibly happen.

All descriptions, methodologies and technical parameters provided in this Chapter are based on published information, on previous studies in the area, and on field survey specially developed for the purpose of this study. The field survey activities on the project area (i.e. a core sampling data collection, analysis and evaluation), were conducted in the period: November 2006 – January 2007.

4.1. Designation of Project Area Parameters - Oryahovo Region

Oryahovo Municipality is located in the North-Western part of Bulgaria, on the Danube River, and forms an integral part of the Vratza Region.

Oryahovo Municipality borders to the south on the Byala Slatina and Knezha Municipalities, to the east on the Dolna Mitropolia Municipality, to the west and southwest on the Moesia Municipality, and to the north on the Danube (*see Exhibit 1.1. Project Location).*

Oryahovo Municipality contains seven settlements: the town of Oryahovo, which is the municipal centre, and six town councils, Selanovtsi, Ostrov, Leskovets, Gorni Vadin, Galovo, and Dolni Vadin, occupying a total of 329 000 000 sq. m (please see below the map of Oryahovo region).

The geographic location of Oryahovo Municipality provides also opportunities for carrying out water transportation of passengers and cargo. The existing Port and Ferry Complex of the town of Oryahovo are used for the purpose. (The Port & the Ferry complex are shown on the pictures below).

The reconstruction and rehabilitation of the transportation infrastructure in the region is the number one priority of the Strategic Plan for the development of the Municipality in the period 2007 through 2013. It is also an important focus of the national Development Strategy of the Ministry of Transportation.

It is expected that within three years the first private bridge facility on the territory of the country will be entirely functional. The bridge will connect Oryahovo with the Romanian town Becket. The construction project has been approved by the local

authorities and the Romanian Government. Currently the project is being reviewed by the Bulgarian Ministry of Public Works and Regional Development. Estimated investment costs of the construction of the bridge total 35 million EUR financed through an in-kind capital contribution by the Municipality and by Romanian and other foreign corporations. The Oryahovo bridge will be part of the strategic route "E-4" and thus – the shortest connection between Western Europe and the Middle East, Israel and Turkey. The Industrial Zone of Oryahovo has also easy access to the BG national railroads and the roadways.

4.2. Physical Geography – Climate, Soils, Geology, and Topography.

4.2.1. Climate.

In terms of geographic location the project area belongs to the Moderate-Continental sub-zone of the European-Continental zone. The Moderate-Continental sub-zone is subdivided in five climate regions, where the territory of the town of Oryahovo belongs to the Northern Climate Region of the Danube Hilly Plains and the Middle Climate Region of the Danube Hilly Plains, which are described in brief below.

4.2.1.1. Northern Climate Region of the Danube Hilly Plains

It comprises the lowest part of the Danube Hilly Plains. The climate there is most pronouncedly continental: winter is cold with a minimum precipitation, and summer is hot, with precipitation reaching its maximum, where the difference between summer and winter precipitation is 15-20% of the annual volumes. Climate conditions allow certain steppe plant varieties to develop in some places.

4.2.1.2. Middle Climate Region of the Danube Hilly Plains

It lies parallel to the Northern Climate Region and comprises the middle section of the Danube Plains. The more significant differences in temperature from the Northern Region are observed mainly in summer, which is less hot here. Precipitation, in particular in summer, is considerably higher, due to the influence from the Balkan Mountain Range.

Exhibit 4.1, *Exhibit 4.2*, and *Exhibit 4.3* contain data, collected from long-term climatic and agro-climatic observations in the studied area.

Exhibit 4.1. Monthly average and year total precipitation in the Project Area (mm/m^2)

Months → **↓ Stations**	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year total
Lom	40	37	39	48	56	72	41	37	35	45	52	46	548
Oryahovo	37	33	35	42	58	62	49	34	40	43	44	40	517
Knezha	33	29	32	50	73	83	59	46	44	47	45	38	579
Gabare	44	36	40	58	87	91	66	52	50	55	52	49	680

Exhibit 4.2. Monthly average and year air temperature in the Project Area (t °C)

Months → **↓ Stations**	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year average
Lom	-2.1	0.6	5.6	12.6	17.7	21.2	23.4	22.8	18.5	12.2	6.2	0.8	11.6
Oryahovo	-2.2	0.8	5.9	13.2	18.3	22.0	24.3	23.6	19.2	13.0	6.7	1.0	12.2
Knezha	-3.6	-0.7	4.3	11.3	16.8	20.3	22.7	22.2	17.8	11.2	5.5	-0.3	10.6
Gabare	-1.8	0.7	5.0	12.0	16.9	20.6	22.6	22.6	18.5	12.1	6.5	1.2	11.4

Exhibit 4.3. Monthly average and year levels of relative air humidity in the Project Area (%)

Months → **↓ Stations**	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year average
Lom	84	80	73	67	69	68	64	63	69	78	84	86	74
Oryahovo	86	82	75	67	67	66	62	62	67	76	84	84	73
Knezha	86	83	77	68	70	69	63	61	67	76	86	88	82
Gabare	82	79	74	67	68	66	62	60	69	75	83	84	72

Based on the data shown in *Exhibits 4.1, 4.2 and 4.3.,* the seasons of the year in the area of the site could be described as follows:

- *Winter* is quite cold. January is the coldest month, with an average monthly temperature of –2 °C. The lowest measured air temperature is –32,7 °C, which comes to show that, if the snow cover is not sufficiently thick winter crops may be damaged by frost.
- *July and August* are the hottest months.
- The year-average air temperature is 11,2 °C.
- Precipitation is unevenly distributed over the year.

4.2.2. Geology and topography.

In geological terms the region of the town of Oryahovo lies in the Bulgarian section of the Moesian Platform, south of the Danube, and more specifically in its southwest section, near the Forebalkan. The top (platform) complex in the upper sections of the crust in flat areas is represented mainly by sedimentary rock, whereas the other, consolidated (geosyncline), complex is made up of highly metamorphic folded and solid rock complexes of various compositions. The lower complex is normally termed "crystalline foundation".

The summarized analysis of data about the physical properties of deposits in the studied territory shows that five main complexes can be distinguished: tertiary; cretaceous without the valanginian; malm-valanginian carbonate; red terrigenous and mid-Triassic carbonate *(please see Exhibit 4.4).*

Exhibit 4.4. (??????????????)

These complexes have a different degree of specificity in terms of *their lithological composition, density, stratum velocity and electric resistance.* They occur on the compacted bedrock, which is unevenly dislocated. Some complexes are not to be found in all places, and that reduces the geological and geophysical section.

The highest degree of heterogeneity and relatively low physical properties are typical of the tertiary and cretaceous complexes down to a depth of approximately 1500 m. As the thickness of the tertiary complex increases and we come nearer the Fore-Balkan, the difference between the density and the velocities of individual strata reduces and they form a "physically" homogeneous complex.

The oldest rocks whose density has been studied within North Bulgaria belong to the clayey-sandy formation of the Ordovician, Silurian and lower Devon. Those are solid and highly compacted rocks.

The analysis of data about the density of the rocks included in the lower-Paleozoic structural stratum shows that it has a well-defined density boundary. The upper-Paleozoic structural stratum is built up of sediments from the upper Carbon and the Permian. The Permian terrigenous-volcanogenic formation is built up of argillite, sandstone, extrusive rocks, and breccia conglomerates. Triassic sediments start with a gradual transition above the Permian, as the same sedimentation conditions existed during the lower Triassic: a thick variegated series of breccia conglomerates and sandstone was deposited. Following a fast transition the mid-Triassic and upper-Triassic carbonate rocks are found above the lower Triassic. The upper Triassic (the Norian and the Rhaetian) constitutes a variegated complex of sediments (argillite, aleurolite, sandstone etc. in different colours). The Jurassic-Cretaceous-Paleogene structural tier is represented by the sediments of the Jurassic, the Cretaceous and the Paleogene. Jurassic sediments occur transgressively and exhibit a clear angular misalignment with reference to the materials building up the first and second structural tiers. Sedimentation starts with terrigenous sediments during the lower and mid Jurassic, such as sandstone and aleurolite, and ends with carbonate sediments constituting the malm-valanginian carbonate complex.

The Eocene in the area of the site is developed mainly within the limits of the Lom Depression and it is built up exclusively of marl and clay varieties with occasional streaks of limestone, sandstone and aleurolite. The Neogene profile starts with the depositing of the tertiary sediments. Those rest on a highly diverse and variegated stratigraphic base. They are represented by clay, marl, sand, aleurolites, sandstone and gypsum. The most typical of lithological elements are clay and marl. Sarmatian sediments spread over a larger area compared to other Neogene sediments. They develop into a clayey-sandy and clayey-limestone facies with the typical fast lithological changes both in vertical and in horizontal direction. In lithological terms the Sarmatian is represented by clay, sand, sandstone, aleurolite, marl and sandstone. The Pliocene's profile is fully developed and it is built up mainly of clay and sand. The most typical element found in the Quaternary cover of the Moesian platform is the loess, which reaches up to 100 – 150 m in thickness over the Bulgarian section of the platform.

Landforms in the Project Area are typical of the Danube Hilly Plains. About 80% of the area is lower than 200 m above seal level, i.e. it belongs to the lowland altitude belt. The remaining 20% of the territory is between 200 m and 300 m above sea level.

The horizontal variation of landforms reaches up to 2,0 km/km^2, however the most typical variations occur over 1,0 to 1,5 km/km^2. Most typical are the territories where land forms vary between 50 and 100 m/km^2, however, along the steep western and northern slopes of the levelled sections between lowland areas the variation is up to 150 and 170 km/km^2. The degree of variation of land forms is shown in Exhibit 4.5.

Exhibit 4.5. Degree of variation of land forms in the Project Area

No.	Degree	Height [m]	Percentage [%]	Area [km^2]
1	I	0÷20	32,8	201
2	II	20÷40	15,36	95
3	III	40÷60	19,66	120
4	IV	60÷80	14,91	91
5	V	80÷100	9,62	59
6	VI	100÷120	3,93	24
7	VII	120÷140	1,84	11
8	VIII	140÷160	0,78	5
9	IX	160÷180	0,65	4
10	X	Above 180	0,45	3

Most of the area is occupied by quaternary sedimentary-alluvial gravel and sand in lowlands along rivers, and loess in the levelled sections between lowland areas and along the southern low-grade slopes of those levelled sections. Sarmatian and Cretaceous limestone and sand are exposed only along the high-grade western and northern slopes. The loess cover of levelled sections between lowland areas reaches 40 to 60 m in thickness, forming specific loess-type micro landforms.

All landscapes in the area are of the moderate-continental semi-dry steppe- and grassland-steppe type. Depending on the specifics of landforms those are divided in four types: flat uplands between valleys; eastern low-grade slopes of uplands between valleys; western and northern high-grade slopes of uplands between valleys; and river valleys and lowlands along the Danube.

Uplands between valleys are characterized by the overall spread of loess and carbonate chernozem soils. This type of landscape is widely used for plant growing, and the areas are only poorly populated accordingly.

Eastward slopes spread over a larger area than the flat uplands between valleys. Larger grades and higher vertical varieties are typical of them. This leads to increased

erosion. Natural vegetation is almost fully destroyed, but for few exceptions. The area is mostly arable land occupied by grain crops, vineyards, orchards and forage crops.

Western and northern steep slopes of uplands between valleys are characterized by the highest grades in the area, as well as by the highest variety of landforms, both vertical and horizontal. The bedrock is made up of Sarmatian and Cretaceous limestone and sand which are also exposed on the surface in many places. All existing woods and shrubs are contained in this type of landscape. The Cerris-oak ecosystems are prevailing, and yoke-elm ecosystems are also to be found in scattered places.

River valleys and lowlands along the Danube form the fourth landscape type in the area. A completely different bedrock made up of alluvial gravel and sand dating back to the Quaternary and the very small grade of the land are the factors determining the formation of alluvial-grassland and alluvial-chernozem soils occupied by water-loving grass, shrubs and natural trees, in most part destroyed to clear up arable land. Major parts of the area tend to swamp.

Plant communities are represented by swamp and water-loving trees (willows, poplars, alder-trees). Agricultural cultivated landscapes prevail, and that is why natural vegetation is almost completely destroyed outside swamp areas.

The facility site and the Project Area respectively lie in a landscape of the fourth type.

Conclusions:

Geological and Hydro-Geological conditions in the Project Area can be summed up as follows:

1. The area is flat, typically with slight sloping to the north.

2. The geological structure includes lithological formations of the following types: clayey-sandy, carbonate, terrigenous and carbonate, variegated and carbonate.

3. No development of adverse physicogeological phenomena and processes has been detected in the region of the town of Oryahovo.

4. Underground water has been detected in all drillings conducted in the area. It is accumulated in the Neogene-Quaternary clayey-sandy formations.

4.2.3. Soils.

The soil-generating materials in the Project Area are loess and alluvial deposits. The soil cover is quite varied /please see Exhibit 4.6./, however, the most typical soil varieties are the Calcaric Chernozems, the Haplic Chernozems, and the Mollic Fluvisols. Gleyic Chernozems and Eutric Gleysols (Koynov, V., Iv. Kabakchiev, K. Boneva, 1998[1]; Soil Map of Bulgaria, 1968[2]; Bulgaria's Soils, 1960[3]) are much less

[1] Koynov, V., Iv. Kabakchiev, K. Boneva – Bulgarian Soil Atlas, Zemizdat, S., 1998

common. The more common soil varieties have the following typical physicochemical properties:

4.2.3.1. Calcaric Chernozems

These are typical of the northernmost part of the Danube Plains, arranged in the form of a long spindle-like strip spreading from Lom to Rousse. They were formed under the influence of grass vegetation. The soil-generating material is typically loess and loess-like sediments, and less typically the product of the weathering of hard carbonate rocks.

Depending on the depth of the humus horizon those soils are divided in low-depth, mid-depth and deep soils.

Most typical are the mid-depth carbonate chernozems formed on a loess base. The profile of a mid-depth carbonate chernozem is described below:

$A^{I}_{к}$	0 - 20 cm	Dark-gray-brown (10 YR 4/2), dry, loose, sandy-clayey, crumbly and grainy structure, fermenting in contact with hydrochloric acid, well-defined transition to the next horizon.
$A^{II}_{к}$	20 - 50 cm	Brownish-black (10 YR 3/2), dry, loose, sandy-clayey, crumbly and grainy structure, carbonate filaments, reacts with hydrochloric acid, gradual transition.
$B_{к1}$	50 - 72 cm	Dark-yellow-brown (10 YR 3/3), dry, loose, sandy-clayey, crumbly structure, multiple carbonate filaments, reacts violently with hydrochloric acid, gradual transition.
$B_{к2}$	72 - 96 cm	Yellowish-brown (10 YR 5/4), fresh, loose, sandy-clayey, crumbly and fine-lumpy structure, multiple carbonate filaments, carbonate concretions, reacts violently with hydrochloric acid, gradual transition.
$C_{к1}$	96 -125 cm	Light-yellow-brown (10 YR 6/4), fresh, loose, sandy-clayey, amorphous, carbonate filaments and concretions, reacts violently with hydrochloric acid.
$C_{к2}$	125-160 cm	Light-yellow-brown (10 YR 6/4), fresh, loose, yellowish sandy-clayey, amorphous, carbonate concretions, reacts violently with hydrochloric acid.

Carbonate chernozems are characterized by a morphologically undifferentiated soil profile. The "A" humus horizon is 40-60 cm deep, whereas the transition is 20-30 cm.

These soils contain carbonates already on the surface. Carbonate content in the surface stratum is 1 to 5 %, and rising as we go deeper, able to reach up to 25-27% in deeper strata /150-200 cm/. Moreover, they contain some typical formations termed

[2] Soil Map of Bulgaria, Scale 1:400 000, published by the Head Office of Geodesy and Cartography, Sofia, 1968
[3] Bulgaria's Soils (monograph), Zemizdat, S., 1960

carbonate filaments (pseudo-filaments), deposited from 20 to 150 cm in depth, most common between 50 and 100 cm in depth.

Carbonate chernozems formed on a loess bed are mid sandy-clayey in terms of mechanical composition. They have a not so high alluvium (18 to 25%) and clay (25 to 40 %) content. The mechanical composition is dominated by coarse dust (particles from 0.05 to 0.01% mm). Dust content varies between 35% and 45%.

Carbonate chernozems formed on a bed of loess-type sandy-clayey material, such as the ones found between the Osam and Yantra rivers and in some other regions of the country have a heavily sandy-clayey mechanical composition. It is quite typical of the mechanical composition of carbonate chernozems to remain highly homogeneous along the entire profile.

Reactions are low alkaline to alkaline. pH of surface horizons remains around 8.0, a little higher as we go deeper (8.2-8.5).

Carbonate chernozems have a not so high humus content, which varies between 2.0 and 2.5% in the top horizon.

The mean sorption capacity (T) is 20-30 mequ per 100 g soil. Soil colloids are exceptionally saturated by available Ca and Mg.

The specific weight of carbonate chernozems is 2.65 to 2.73, and volumetric weight is 1.10 to 1.30. Their structure is loose and the overall porosity is high (above 50%).

4.2.3.2. Haplic Chernozems.

Typical chernozems are found in the form of a broken strip south of and parallel to carbonate chernozems. The morphology of a typical mid-depth chernozem is described below:

$A^{I}_{к}$	0 - 23 cm	Brown (10 YR 5/3), dry, loose, sandy-clayey, crumbly and grainy structure, does not react with hydrochloric acid, visible transition.
$A^{II}_{к}$	23 - 50 cm	Dark-gray-brown (10 YR 3/4), dry, loose, sandy-clayey, crumbly and grainy structure, does not react with hydrochloric acid, gradual transition.
$A^{III}_{к}$	50 - 65 cm	Dark-gray-brown (10 YR 3/2), fresh, loose, sandy-clayey, crumbly and grainy structure, gradual transition, reacts with hydrochloric acid.
$B_{к}$	65 - 95 cm	Dark-yellowish-brown (10 YR 4/4), fresh, loose, sandy-clayey, crumbly structure, multiple carbonate filaments, reacts violently with hydrochloric acid, gradual transition.
$C_{к1}$	95 - 140 cm	Yellowish-brown (10 YR 5/4), fresh, loose, sandy-clayey, amorphous, multiple carbonate filaments, reacts violently with hydrochloric acid.

As seen from the morphological description, typical chernozems do not differ considerably from carbonate chernozems. Carbonate chernozems contain carbonate already on the surface, and the carbonate content of typical chernozems is washed down a little deeper (25-60 cm), however still within the limits of the humus horizon. The depth of this horizon varies in a considerably wide range, but most often it is between 50 and 70 cm. The transitional horizon is not very well defined and it is not particularly deep (20-30 cm). The "C" horizon is well defined and it has a considerable content of tubular and granular limestone concretions.

In terms of mechanical composition typical chernozems are almost homogeneous along the entire profile. Their have a sandy-clayey mechanical structure in general, but that depends strongly on the soil-forming rock. These soils, as in the case of carbonate chernozems, are dominated by the "coarse-dust" particles. Alluvium content is 15 to 35 %, and clay content is 25 – 45%.

Typical chernozems are characterized by a higher humus content (2.5-4%) compared to carbonate chernozems, that is why the total organic content in the meter-deep active soil stratum is higher.

The soil reaction is neutral in the surface carbonate-free horizon, and low-alkaline to alkaline in the carbonate horizon.

Specific weight is between 2.6 and 2.75, whereas volumetric weight is between 1.2 to 1.4, the lowest values being in the fallow. Porosity is high.

The typical chernozems' composition and properties are quite similar to those of the carbonate chernozems, that is why these soil varieties have been grouped together in a single agricultural production group.

In terms of humus content and total nitrogen these soils rank on one of the top places in the country. The total phosphorus content is relatively high. They are well supplied with available potassium.

4.2.3.3. Mollic Fluvisols

Alluvial-grassland soils are found in river valleys and they occupy typically the first flooding terrace and the terrace immediately above the flooding level.

These soils form in the presence of high ground water whose level is tied to the river level. Ground water is typically close to the surface, around 0.5 to 1.0 m in the flooding terrace and 1.0 to 3.0 m in the terrace immediately above the flooding level, and it varies considerably depending on the fluctuations in river level.

A relatively high groundwater level facilitates the development of lush grassland vegetation, which is among the basic factors for the formation of alluvial-grassland soils.

The morphology of alluvial-grassland soils is shown below:

A_{fallow}	0 - 18 cm	Gray, fresh, loose, slightly sandy-clayey, dispersed structure, does not react with hydrochloric acid.
A^{I}	18 - 40 cm	Gray-brown, moist, loose, slightly sandy-clayey, loosely bound crumbly and grainy structure, does not react with hydrochloric acid.
Stratum I	40 - 67 cm	Gray-yellow, varied with gley spots, moist, sandy-clayey, amorphous, does not react with hydrochloric acid.
Stratum II	67 - 96 cm	Gray, varied with multiple gley spots, moist, slightly sandy-clayey, amorphous, some fine gravel, does not react with hydrochloric acid.

Alluvial-grassland soils lack a homogeneous profile. The depth of the humus horizon varies, but stays 10-40 cm on the average. The colour is dark-gray, in lighter or darker shades depending on humus content. The structure is most often grainy-crumbly in virgin land and dispersed in tilled land. Below follow the strata of various mechanical and petrographic composition, structure and compaction. Some of these strata (former humus horizons) have a higher humus content. Very often there occur rusty-bluish gley spots at a certain depth in the profile due to the high level of groundwater or the regular elevation of groundwater in given year periods. In terms of mechanical composition theses soils are quite varied, from sandy to heavily sandy-clayey. The most homogeneous in their mechanical composition are the alluvial-grassland soils in the upper part of the river basin, whereas in the lower part they are relatively better homogenized and heavier.

Alluvial-grassland soils are relatively highly fertile and have favourable water and physical properties. They are loose, well ventilated and do not form a crust. In cases when groundwater is found at 1.5 – 2 m below the surface plants can make use of capillary water to a considerable extent.

The humus content of the surface horizon of virgin land is between 1.5 and 6%. The soil reaction is most often neutral to low alkaline.

4.3. Natural Events History – earthquakes, floods, fires and storms.

Bulgaria is divided in eight seismic zones, grouped in three seismic regions:

A). The Rila and Rhodope Region comprising the Struma and Rhodope zones;

B). The Sredna Gora Region comprising the Sofia, Maritza, and Bourgas zones;

C). The Northeastern Region comprising the Vidin, Gorna Oryahovitsa and Shabla zones.

Six of the seismic zones are relatively highly active. These are the Maritza, Shabla, Struma, Gorna Oryahovitsa, Sofia and Rhodope zones.

The remaining two zones, the Bourgas and the Vidin zones, where also the facility site is contained, are much less active. The most active seismic zone in Bulgaria is the Struma zone, south of Sofia.

The seismicity in the Project Area over a period of 1000 years has been rated 9 on the MSK-64 scale. The seismicity quotient is Ks = 0,27.

Landslide processes have been observed and have activated over the past few years in the district of Oryahovo, which, however, do not affect the galvanizing facility.

Studies of the possible maximum level of flooding on the site have been conducted in order to estimate the danger of flooding, based on the natural regime of the Danube (exceptional floods). In this case, according to the key curves drawn on the basis of observations over a period of 75-150 years, a water flow (at P=0,01%+Q) Q=21800 m^3/s was established, which corresponds to a 26,03 m water level at the town of Oryahovo.

Based on those results a general conclusion was drawn to the effect that even in the most adverse case of flooding the maximum water level will remain below ground level on the facility site.

4.4. Biological Environment.

4.4.1. Proximity to national parks and other protected areas.

Protected areas in Bulgaria account for 5% of the territory of the country and comprise 7,34% of all woodland. Those are divided into 6 categories:

a) 3 national parks – Pirin, Rila and the Central Balkans;

b) 10 sanctuaries;

c) 55 reserves;

d) 35 maintained reserves;

e) 457 natural landmarks;

f) 175 protected localities.

Most protected areas in Bulgaria (about 86%) are on the UN List of National Parks and Equivalent Reserves.

The Srebarna Natural Reserve and the Pirin National Park are on the UNESCO World Heritage List.

Two protected zones along the lower course of the Ogosta River have been suggested for including in the "Natura 2000" system. The *Daneva mogila* locality on the right river bank at the village of Sofronievo is a protected territory, so designated in order to preserve the typical river flora and fauna (Vratsa District Environment Inspectorate, 1982).

Lists of the most important reserves and protected localities within Bulgaria *are presented in Appendix 4.1.* and *Appendix 4.2.* This comes to show that, the Project Area is **not included in these lists** and **is outside** the scope of any National Parks, reserves or protected territories.

4.4.2. Flora.

Bulgarian flora contains more than 3800 advanced species /moss varieties excluded/ (Dimitrov, 2002[4]). Bulgaria is subdivided into 20 Floristic Areas (Kozhuharov, 1995). The town of Oryahovo and environs are part of the floristic area of the Danube Plains. This area is characterized by spaces almost entirely free of woods used to grow agricultural crops and vineyards.

There are sparse remnants of devastated woodland, mainly including the Turkey oak (*Quercus cerris*) and more rarely the *Quercus pubescens* variety. Secondary forest communities of *Carpinus orientalis* and *Fraxinus ornus* have developed in some places. Deforested areas have developed secondary grassland formations dominated by *Crysopogon gryllus*, *Poa bulbosa* and *Dichantium ischaemum* (Bondev, 1997[5]). Some rare and protected plant species can be found in the floristic area of the Danube Plains (there are 34 protected species under the Biodiversity Act), some of which are typical of this floristic area only (Dimitrov, 2002) (*see Appendix 4.3.1.*).

According to the studies conducted by Bondev[6] (1991) the Oryahovo environs are dominated by agricultural land in the place of former mixed *Quercus cerris* and *Qetcus virgilliana* woods interspersed with *Quercus pedunculiflor*. There are manna-ash and *Tilia tomentosa* communities east of the town, and the artificially planted *Robinia pseudoacacia* has a more significant role in a number of places. The Skat River runs southwest of the town of Oryahovo and into the Danube. Agricultural land in place of former *Ulmus minor*, *Fraxinus oxycarpa*, and *Quercus pedunculiflora* woods dominates the area along the rivers. Southeast of the town of Oryahovo there are some smaller areas occupied by mixed *Quercus cerris* and *Fraxinus ornu* woods. Meso-xerothermic grass vegetation can also be found, dominated by the *Poa bulbosa,*

[4] Dimitrov, D. (ed.) 2002. Outline of Advanced Plants in Bulgaria. Joint Bulgarian-Swiss Program of Biodiversity Preservation, Sofia

[5] Bondev, I. 1997. Geobotanic Subdivision, in Bulgarian Geography, Physical Geography, Socioeconomic Geography (Yordanova, M, D. Donchev ed.), Prof. M. Drinov Academic Publishing House, Sofia, 283-305

[6] Bondev, I. 1991. Bulgaria's Vegetation. Map to scale 1: 600 000 with explanatory notes. St. Kliment Ohridski University Publishing House

Lolium perenne, Cynodon dactylon, *Dichantium ischaemum,* and *Chrysopogon gryllus,* mainly on rural pastures.

Studies reveal 20 formations, 48 associations, 5 cultures and 40 tree species.

The following trees and shrubs have been propagated artificially: Pinus nigra Arn., Fraxinus Americana, Populus euroamericana (Regenerata, Cedrus atlantica, Vernerubens No. 214), Acacia aurea, Acer platanoides, Quercus rubra, Amorpha fruticosa etc.

Small-size forest ecosystems prevail, scattered among agricultural fields. The main tree species which make up the typical appearance of the area are the acacia, the poplar tree and the willows, followed by oak-trees. 93% of all woodland is located within the environmental belt of oak woods, 3% in the environmental sub-belt of river woods, and 4% in the sub-belt of mixed deciduous woods growing in hilly and foothill areas.

Agricultural land occupies the area formerly occupied by woods dominated by *Quercus cerrus* and *Quercus pubescens*.

Existing woods occupy areas which are not fit for agricultural activity.

Most of the marshland which once existed in the region of the town of Oryahovo has been reclaimed. Swamp and marshland hygrophyte and hydrophyte vegetation can be found mainly around the Ogosta River mouth, the *Blatoto* area, and in some lower flooded areas by the Danube between Oryahovo and Kozloduy, and to the east near the village of Ostrov. The most common species are *Phragmites australis, Typha angustifolia, T. latifolia*, and *Schoenoplectus lacustris, S. tabernemontanae* etc.

Some black-alder, willow and poplar (*Alnus glutinosa, Salix alba, S. fragilis, Populus nigra, P. alba*) woods have been preserved in smaller areas along rivers which flood on a regular basis. The Esperanto Isle is interesting to note, as it is covered by the same type of vegetation, flooded woods.

4.4.3. Fauna.

The Oryahovo area is part of the Lower-Danube Biogeographic Province, where the steppe and forest-steppe type of communities are dominant, part of the Aestiduriherbosa biome (Gruev, Bl., B. Kuzmanov, 1999[7]). This predetermines the xerophilous fauna types in most of the area, with a rich water fauna along the bank and in the Danube (*see Appendix 4.3.2*.).

Most of the Lower-Danube Biogeographic Province, part of which is the area of the town of Oryahovo, is occupied by agricultural crops, which suggests that anthropophyte and synanthropic fauna elements have penetrated the area. A moderate continental climate with an average year temperature of 10-12°C and an average year

[7] Gruev, Bl., B. Kuzmanov. General Biogeography. 1999

precipitation of 650 mm is typical for the Danube biogeographic area in general. The area is notable for the diversity of water animals (Simeonov, S., T. Michev, D. Nankinov, 1990[8]; Karapetkova, M., M. Zhivkov, 1995[9]).

The slow flowing large water volume of the Danube allow zooplankton to develop; 124 species of the Protozoa subkingdom, Rotatoria type, have been described.

About 305 bottom invertebrate species have been found in the Bulgarian stretch of the Danube, of which 275 in the river itself. Those are Oligochaeta, Gastropoda, Bivalvia, orders Amphipoda, Ephemeropotera, Coleoptera, Trichoptera, Diptera.

About 58 fish species are found in the Bulgarian stretch of the river. They represent almost half of the fresh-water fauna in the area. Among them are species of the Acipenseridae family which enter the Danube to spawn and feed, such as the Acipenser sturio, the Huso huso, which is an exceptionally rare species which has been caught in the rivers from the Danube catchment area near Nikopol, Acipenser nudiventris, the Acipenser ruthens, the Acipenser gueldenstaedti. The Chalcarburnus chalcoides, Cyprinus carpio, Anguilla anguilla, Lota lota, Pungitius platygaster. Due to the fact that those are endangered species, they have been included in The Bulgarian Red Book (Georgiev, V., Z. Hubenov et al., 1993[10]). Some rare species which inhabit the river valley are the Lucioperca volgensis, the Neogobius kessleri, and the Bentophiloides brauneri, which have also been included in the Bulgarian Red Book.

Some insignificant populations of Acipenser stelatus, Zingel streber, Zingel zingel, and Neogobius fluviatilis have been found in the river.

Alongside with those species there are also the Barbus barbus, which has become the most significant species for industrial fishing in the Danube in recent years, the Tinca tinca, the Esox lucius, the Rutilus rutilus, and the Leuciscus cephalus, whose significance is mainly in terms of recreational fishing, as well as some species which do not have particular economic significance, due to the low number of their populations or the slow growth rate, such as the Alburnoides bipunctatus, the Abramis ballerus, the Vimba vimba, the Pelecus cultratus, the Gymnocephalus baloni, the Gymnocephalus schraetser, and the Gymnocephalus cernuus, which does not have any particular economical significance and is rather an unwanted pest species.

The Eudontomyzon danfordii is a species of the Petromyzonidae family, which has been described along the Tisa River and could be found in the entire catchment area of the Danube in the past. It has been included in the Bulgarian Red Book as it now is considered extinct. The Lampetra planeri was also typical of the Danube and the

[8] Simeonov, S., T. Michev, D. Nankinov. Bulgaria's Fauna - Aves. Published by the Bulgarian Academy of Science, Vol. 20, Section I, 1990

[9] Karapetkova, M., M. Zhivkov. Fish in Bulgaria. Gaea-Libris, Sofia, 1995.

[10] Georgiev, V., Z. Hubenov et al. Insecta: in: National Strategy for the Preservation of Biodiversity. Main Reports, Vol. 1, 1993

Danube's tributaries in the past, which is now also considered extinct and has been included in the Red Book.

Amphibians are represented mainly by the Bombina bombina, the Pelobates fuscus, the Pelobates syriacus, the Rana esculenta, the Bufo viridis, and the Hyla arborea. The Triturus cristatus and the Triturus vulgaris are also common.

Testudo graeca and Testudo hermani have been found in the karst zones of the Lower-Danube area. The Emys orbicularis is common to the frequently flooded areas around the Ogosta River mouth. The most common of lizards are the Lacerta viridis, the Lacerta muralis, the Lacerta praticola, and the Podarcis taurica, and common snakes are the Natrix natrix and the Natrix tessellate (water snakes), and the Elaphe situla and the Elaphe quatrolineata sauromates. One venomous snake which can be found here is the Vipera ammodites.

The bird life of the Lower-Danube Biogeographic Province is exceptionally abundant (Ivanov, B., 1995[11]). Many species have been protected on the European level, such as the Pelecanus crispus, the Phalacrocorax pygmaeus, and the Aythya nyroca, which are typical rather of the eastern part of the province. Due to the proximity of the Danube the region of the town of Oryahovo is inhabited by the Ardea purpurea, the Egretta garzetta, the Ardeola ralloides, the Nycticorax nycticorax, and the Ardea cinerea – all of which are protected species, as well as the Plegadis falcinellus, the Anser anser, and the Cygnus cygnus. Habitats of protected species of the Podicipedidae family have been registered. Those are the Podiceps criststus, the Podiceps grisegena, and the Tachybaptus ruficolis. Single specimens of the Falco columbaris and the Falco cherrug, which is threatened by extinction, have been detected in migration and during winter stay in the flat parts of the area. The Perdix perdix is closely connected to the agricultural areas in the vicinity, and it is one of the main game varieties in our country. The Coturnix coturnix nests in grain crops, as well as in swamped non-arable land and grasslands. The Rallidae family is represented by the Rallus aquaticus, which is threatened by extinction but does not have any particular economic significance, as well as by the Crex crex, which has been included in the Red Book. Representatives of the Porzana, the Gallinula, and the Fulica genus have been detected in the area, but their habitats have not been studied in depth. Pigeons are represented by the Columba livia, by mixed flights of hybrid forms of wandering domestic pigeons, by the Columba oenas, and by the Columba palumbus. The Streptopelia turtur and the Streptopelia decaocto are also common. The Strigidae family is represented by the Otus scops, the Bubo bubo, the Athene noctua, and the Asio otus. One very common species associated with human settlements is the Ciconia ciconia, whereas the Ciconia nigra is much less common. Both stork species are protected.

Given the biogeographic specifics of the area, the most common mammals are the Erinaceus concolor, the Sorex araneus, the Sorex minutus, the Neomys fodiens, the Neomys anomalus, and the Crocidura leucodon.

[11] Ivanov, B., Studying the Size of Populations of Some Water Birds along the Danube, Ecology No. 5, 1995

Typical mammal species are the Lepus capensis, the Cricetus cricetus, the Mus spicilegus, the Mus musculus, and the Apodemus agrarius.

The Meles meles is common to water bodies in the Danube area. The Vulpes vulpes and the Canis aureus can also be found in the area.

Invertebrate fauna is diverse and contains species which are trophically associated with agricultural crops. The variety of species includes representatives of the Orthoptera order, such as the Callimenis longicolis (Bradyporidae), found only on the Balkans, and the Bradyporus dasypus of the same family. Only here can be found the Ceraclea fulva and the Setodes punctatus of the Trichoptera order, as well as the Hydroporus piceus of the Coleoptera order.

The Triturus cristatus dobrogicus subspecies can be found here. One specific fish representative is the glacial relict Lota lota. The Sabanejwia bulgarica is a fish species found exclusively in the area.

Conclusion:

The Project Area does not contain any specific plant or animal species (rare, specific to this area only etc.), whose populations could in any manner be threatened by the operation of the hot-dip zinc galvanizing facility.

4.5. Human Environment

4.5.1. Distribution of residential and occupational population in the Project Area.

The region of Oryahovo has a population of over 16,000, of which more than 95% Orthodox Christians from Bulgarian nationality.

The official language in the region is Bulgarian. The alphabet is Cyrillic.

The leading industry sector in Oryahovo region is machine building, followed by construction and agriculture. A number of entities in the region manufacture machine parts for agricultural machinery and equipment and for automobile producers.

The major part of the residential population in the Project Area are employed in more than 260 industrial and trade organizations & companies, established in various business sectors.

All enterprises from Oryahovo region (i.e. industrial and trade companies, municipal and state administration, banks, insurance companies, etc.,), respect the terms of the ***Equal Employment Opportunity Policy*** (***EEO Policy***), which *states, that every*

applicant for employment must be considered solely on the basis of his or her qualifications.

The EEO Policy states also that every person has the same human rights and privileges, without regard to his or her race, color, religion, sex, age, handicap, marital status, national origin, or disability. The applied EEO policy is consistent with BG State Laws, prohibiting EEO discrimination in the workplace. The primary responsibility for formulating, understanding, implementing, coordinating and enforcing EEO policy, resides with the management staff. (Specifically, company management's role includes ensuring that all supervisors are aware of and understand the company's EEO policy and, that they have a duty to notify the President of the company, as well as the municipal authorities promptly of any possible case of EEO discrimination).

The proposed project site is situated in ***the industrial zone*** of the town of Oryahovo, and ***inside the boundaries of the existing assets*** (i.e. the metal-processing facility, owned and operated by TRE-P). The site is situated some 3 miles outside of the town and about 6 miles away from the Danube River.

The project site is bordered by empty land to the east and the south, by a power plant to the west and by an industrial zone to the north, (i.e. the project site is not in proximity to residential quarters).

4.5.2. Description of previous, current and planned land use activities in or near the Project Area.

The analysis of the structure of the area under crops in the territory belonging to the Oryahovo Municipality shows that more than half (55,5% of the arable land in the area) is occupied by grain crops. Wheat accounts for the most significant share in grain crops, over 68%. Barley and maize account for approximately equal shares, 16% each. Forage crops, with a 23,9% share, rank second in the structure of arable land. Silage-grade corn accounts for the largest share of the land occupied by forage crops, more than 50% of the land under forage crops. Grass growing on natural grassland accounts for an insignificant share of the forage balance due to its limited area. Industrial crops account for a large share in the structure of arable land, 14,1%. Over 75% is occupied by sunflower crops, about 18% by sugar beets etc. Perennial crops occupy 4,8% of all arable land, whereas vegetables, potatoes, water melons and melons account for the smallest relative share, 1,7%.

Plant growing in the region of Oryahovo Municipality accounts for over 42% of the total agricultural production, and animal breeding accounts for 56,9%. The remaining 1,7% is derived from agricultural services. Plant-growing in the area is focused on grain production, but industrial and perennial crops are also important. The well-developed animal breeding is facilitated by the relative high share of forage crops.

There are a number of businesses, departments and facilities in the Oryahovo area active in the food industry, which process agricultural raw materials.

The Project Area lies within the industrial zone of the town of Oryahovo, which is allocated for the purpose of building industrial enterprises.

The relatively small size of the Project Area (about 20,000 m^2) does not allow the development of any agricultural activity therefore erecting the hot-dip zinc galvanizing facility on the plot is not inconsistent with Oryahovo Municipality's plans for economic development of this zone.

4.6. Environment Quality of the Project Area

4.6.1. Ambient air conditions.

Oryahovo Municipality is an administrative unit within the territory of the Vratsa District. The quality of ambient air within the district is controlled through the readings taken from several stationary monitoring points /seven/, part of the National Automated Environmental Monitoring System, using also the Mobile Automated Station of the District Environment and Water Inspectorate of the town of Pleven.

The following properties are monitored: dust, heavy-metal aerosols, sulphur dioxide, nitrogen dioxide, carbon monoxide, hydrogen sulphide, ammonia, nitrogen oxide and ozone.

Due to the specifics of industrial and household pollutants, the following peak 24-h average concentrations of air pollutants in settlements within the territory of the Vratsa District have been registered:

1. ***Lead aerosols*** – the main source of pollution is automobile traffic which is heaviest in the town of Vratsa. The peak level read there over a 24-hour period is 0,399 microgr/m^3 at a 24-hour average permitted limit of 0,9 microgr/m^3. Therefore, no concentrations of this pollutant above the permitted limit have been registered.

2. ***Sulphur dioxide*** – sources of this pollutant are heating plants, households, and Eliseyna EAD. The peak 24-h averages read in the town of Vratsa (250 microgr/m^3) and in the village of Eliseyna (390,9 microgr/m^3) (air volume), are in excess of the 24-h average permitted limit by 125 microgr/m^3.

3. ***Nitrogen oxide*** – pollutant emitted from the operation of internal-combustion engines. The peak 24-h averages of this pollutant which have been read do not exceed in any of the cases the 24-h average permitted limit.

4. ***Carbon monoxide*** – pollutant emitted from internal-combustion engines. No levels in excess of the 24-h average permitted limit of 10 mg/m^3 have been registered.

5. ***Hydrogen sulphide*** – only one of the stations within the town of Vratsa has registered a level of 0,0102 mg/m^3 air, which exceeds the 24-h average permitted limit of 0,008 mg/m^3 for this particular pollutant.

6. ***Ammonia*** – this pollutant is typical of the area of the town of Vratsa. The readings for this gas exceed the 24-h average permitted limit of 0,1 mg/m^3. The highest reading is 0,44 mg/m^3. The source of pollution is Himco AD.

7. ***Nitrogen oxide*** – no values in excess of the permitted limits have been registered.

8. ***Ozone*** – no concentrations in excess of the permitted limits for this gas have been registered.

There are a total of 74 emission sources over the entire district of Vratsa. The largest are: Himco AD (production of fertilizers), Eliseyna EAD (production of converter copper), Varchim EOOD (production of quicklime and slacked lime), Toplofikatsia EAD (thermal energy), Holcim Bulgaria AD (production of Portland cement), and Sunnytext AD (steam plant).

Air pollution from Himco AD and Eliseyna EAD is temporarily not on the agenda as those companies have suspended their operations for economic reasons.

Emissions from pollution sources in all other settlements within the district are insignificant. In certain cases forest and field fires, motorways and households can present a problem in this respect.

The study conducted shows that the Project Area has no excess /above the permitted limit/ levels of the controlled atmospheric pollutants. This is owing to the lack of industrial capacities generating large volumes of gas and the relatively light automobile traffic.

4.6.2. Water Supply, Quality and End Use.

The following rivers run through the territory of Oryahovo Municipality:

- The Danube runs about seven miles north of the Project Area.
- The Studena, Yantra, Osam, Ogosta, Iskar and Vit rivers run at a comparatively higher distances from the Project Area (i.e. 50 to 80 miles).

The Danube is the largest water body in the Project Area, and that is why the hydrological properties of the river are reviewed individually below.

The Osam River runs to the northwest and into the Danube some 3 km upstream of the town of Nikopol. The river bed has been adjusted in a number of places. The mean year flow of the river according to sources from the Hydrological and Metrological

Service measured at the village of Izgrev is about 16 m^3/s. Flow conditions are determined mainly by the smaller left tributaries. Due to that fact it has a very small contribution to the conditions along the Danube and has no impact whatsoever on the Project Area.

The Studena River runs to the northeast and into the Yantra River some 1 km downstream of the village of Novgrad. The flow is comparatively regular, however small, and it is virtually made up of groundwater from the aquifer. The river has no impact whatsoever on the Project Area.

The Yantra River runs into the Danube at a considerable distance downstream of the Project Area and has virtually no impact on it. The same applies to the Lom, Tsibritsa, Ogosta, Iskar and Vit rivers.

The General Conclusion is, ***that, the rivers running through the Project Area cannot have any impact from the operation of the new Hot Dip Zinc Galvanizing Facility***.

The areas along the smaller rivers contain small dams with various functions: some are retention dams designed to dampen the extreme fluctuations of rivers tending to flood, while others are used in irrigation.

The most significant small dams are: Dragash Voyvoda, capacity 808000 m^3 and 159000 sq. m flooded area; the Kulina Voda, capacity 639000 m^3 and 236 000 sq. m flooded area; the Tatari, capacity 828000 m^3 and 258 000 sq. m flooded area; and the Bozhurluka, capacity 744000 m^3 and 300 000 sq. m flooded area.

Along the Dragomirovo Ravine (or Barata) are the following small irrigation dams: Ovcha mogila, capacity 85000 m^3 (irrigating an area of 1800 000 sq. m), Dragomirovo, capacity 700000 m^3 (5500000 sq. m), Bankova vodenitsa-1, capacity 580000 m^3, and Bankova vodenitsa – 260000 m^3 (irrigating a total area of 6000000 sq. m). Around the Barata springs are 3 small dams of little capacity, mainly for retention purposes.

The Lozite (Kyukluka) dam, capacity 350000 m^3, which in fact is filled by the Osam river; this dam, along with water from the Osam river, irrigates a total of 15900000 sq. m; the Novachene dam is entirely blocked with mud; the Slavyanovo dam, capacity 830000 m^3 (for 1100 000 sq. m); the Slavyanovo-3 dam, capacity 170000 m^3 (for 80000 sq. m); the Totleben dam, capacity 900000 m^3 (for 2580 000 sq. m); and the Obnova dam, capacity 1282000 m^3. The largest dam within the region is the Malchika, capacity 12000000 m^3, filled through the Kamenets dam. There are a total of 21 dams in the region.

The hydrological conditions typical of the area facilitate the accumulation of groundwater, mainly groundwater in porous ground accumulated in alluvial deposits from rivers (in the Danube alluvium in particular) and in Pliocene sand and gravel, and, and groundwater in karst fissures in the Sarmatian and the Maastricht limestone

making up the more elevated parts of plateaus (around the Osam River and south of Nikopol).

The groundwater level was determined on the basis of drillings conducted on the facility site. It was found that groundwater lies 5 – 6 m deep on an average, therefore, ***there is no danger of contamination from draining surface water.***

Draining systems

Due to the comparatively high level of groundwater over a large area, draining systems have been built in lowlands to take up also the water volumes carried by the gullies running down the northern slopes of plateaus. The draining systems include 3 types of canals: draining, collecting and main canals. Water from main canals is transferred through pump stations over the embankments and into the Danube. There are such draining systems with pump stations in the Belene and Svishtov sections of the lowlands, as well as in the Vardim section, and in some other sections. A total of 30000000 sq. m of land in the area is drained.

Irrigation systems

Certain irrigation systems are built within the region: the Belene-Svishtov irrigation system; the Vardim irrigation system; the irrigation system supplied by the Malchika dam of 60 km total canal length; and the irrigation system along the Studena river, of about 30 km total canal length, supplied by the Al. Stamboliyski dam, built on the Rositsa River.

Groundwater has been found in all drillings conducted in the area. Groundwater is accumulated in Neogene-Quaternary clayey-sandy formations, and the groundwater suitable for water supply typically lies between 80 and 120 m deep.

Hydrological properties of the Danube

The total catchment area of the river is 817000 km^2, and the river is 2857 km long in total. The town of Oryahovo, where the facility site is located, lies on the right bank at the lower course of the river. The area is flat, with 16 to 24 m absolute elevation, tending to swamp in some places. The river bed of the Danube is between 800 and 1300 m wide. Fairway depth reaches 14 m, whereas the lowest depth in case of level drop is 1,8 m. The speed of the river flow reaches up to around 2,5 m/s (9 km/h).

The lower course of the Danube has two complete floodgates complexes, with another four planned, as follows:

A). The "Zhelezni vrata-1" floodgate complex, Q=10000 m^3/s maximum operating water capacity, situated about 370 km upstream of the site. This is the main facility controlling the hydraulic properties of the Danube;

B). The "Zhelezni vrata-2" floodgate complex, 8700 m^3/s maximum operating water capacity, situated about 280 km upstream of the site. This complex is smaller than the Zhelezni vrata 1, and it is not capable to create any critical situations along the Danube;

C). The "Nikopol – T. Magurele" floodgate complex (under design), Q=10000 m^3/s design maximum operating water capacity. It is again too small to have any considerable impact on the flow of the Danube;

D). The "Silistra – Kalaras" (conceptual design), Q=13000 m^3/s design maximum operating water capacity, to be built in the area of Silistra.

The maximum registered water temperature is 28,2 °C.

The average year highs are in the range of 23,6÷26,7 °C.

Exhibit 4.6. Average water temperature (°C) of the Danube

m o n t h s												**Year**
01	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**average**
1,4	1,9	5,0	11,3	17,0	20,8	23,2	23,1	19,8	14,0	8,3	3,5	**12,4**

Exhibit 4.7. Chemical composition of water in the Danube

Property	**Value**
Hardness (carbonate content)	3,60 mgeq/l
Hardness, total	4,00 mgeq/l
Potassium,, K^+	0,08 mgeq/l
Sodium, Na^+	0,15 mgeq/l
Calcium, Ca^{2+}	3,15 mgeq/l
Magnesium, Mg^{2+}	1,27 mgeq/l
Chloride, CI^-	0,72 mgeq/l
Sulphate, SO_4^{2-}	0,79 mgeq /l
Bicarbonate, HCO_3^-	3,51 mgeq/l
Silicate, SO_3^{2-}	0,40 mgeq/l
Free CO_2	-
pH	7,4
Oxidizability, O_2	4,54 mg/l
Salt content	258 mg/l.
Organic matter	4,50 mg/l
Insoluble matter	0,240 g/l

Conclusions:

1. There are no Hydrological phenomena in the area, which could have a negative impact on the properties of the Project Area.

2. It is not possible, that the project activities, in the Project Area can generate any impacts on the water conditions along the Danube.

3. The Project Area cannot be flooded even in the worst-case scenario of bursting of floodgates, upstream of the Project Area.

4.6.3. Noise levels.

The environmental properties in terms of noise are determined as per the requirements of the Protection against Environmental Noise Act, as promulgated in the State Gazette issue 74 from 13 September 2005, in effect since 1 January 2006; as amended and promulgated in issue 30 from 11 April 2006, in effect since 12 July 2006; and the properties shown in *Exhibit 4.8*. (Regulations No. 6 from 26.06.2006 on environmental noise properties with reference to the degree of discomfort during different parts of the day, the limit levels of environmental noise properties, the methods of evaluation of noise properties, and the adverse effect of noise on human health, as promulgated in the State Gazette issue 58 from 18 July 2006).

The developed measurements evidence, that the noise-pollution levels in the Project Area are below the permitted limits, due to the absence of powerful noise sources, as well as the absence of aircraft in the airspace of the town of Oryahovo.

Noise levels registered in the Project Area, which is part of the industrial zone of the town of Oryahovo, are as follows:

- daytime level – 61 dB;
- evening level – 59 dB;
- night-time level – 52 dB.

Those levels *are below* the adopted standard, as shown on line 6 of *Exhibit 4.8.*

Exhibit 4.8. Permitted noise levels in various territories and zone types within and outside urban areas

Territories and zone types within and outside urban areas	**Equivalent noise level, dB(A)**		
	Daytime	Evening	Night-time
1. Residential zones and territories	55	50	45
2. Downtown areas	60	55	50
3. Territory affected by heavy automobile traffic	60	55	50

4. Territory affected by railway transportation and tramcars	65	60	55
5. Territory affected by aircraft noise	65	65	50
6. Industrial and storage territory and zones	70	70	70
7. Public and individual recreation zones	45	40	35
8. Hospital and sanatorium zones	45	35	35
9. Research and education zones	45	40	35
10. Quiet zones outside urban agglomerations	40	35	35

In conclusion it can be pointed out that the Project Area does not belong to any zone where noise levels exceed the permitted limits.

4.6.4. Soil conditions including contamination from previous or current activities.

A field and analytical study was performed by experts with the Ministry of Environment and Waters, the Vratsa Regional Testing Laboratory, and the N. Pushkarov Institute of Soil Studies of the City of Sofia, in order to establish any possible existing contamination of soils in the vicinity of the Project Area.

Core sampling was performed in accordance with the methods adopted within the relevant soil-monitoring system: mean sample of 9 cores extracted by a soil probe for each of the samples collected.

Core sampling was performed on the soil surface (ground zero), as well as at 0-30 cm and 30-60 cm (i.e., at 1 and at 2 feet) below the surface, respectively.

Core-sampling locations are shown in *Exhibit 4.9.* and *Exhibit 4.10*. respectively, and were determined depending on the specifics of the ground and the soil cover.

Groundwater level was established by drilling. Groundwater was found to be between 5 – 6 m (i.e., 17 – 20 feet) below the surface on average, *which does not pose any contamination threat in case of surface-water draining*.

4.6.4.1. Sample Analysis Methodology

The samples so collected were dried and prepared for analysis of heavy-metal content as per the relevant ISO standards.

The analysis was conducted by the Regional Testing Laboratory with the Environment Executive Agency which is part of the structure of the Ministry of Environment and Waters.

The soil samples were analyzed according to the following methodology:

- Using analytical scales, measure out 1 g of soil which is already crushed to powder with an agate pestle. Place the sample on a platinum dish and fire in a muffle for 1 h at 500 °C.
- When the dish has cooled down add carefully 10-20 drops of distilled water and 10 drops of concentrated sulphuric acid. Using a (plunger) pipette add 5 ml of perchloric acid and leave the dish to heat on a sand bath turned to "2" to evaporate until the soil is dry. Add 10 ml of hydrofluoric acid (proceed carefully, using a plastic cup and gloves) and evaporate again until dry.
- Reapply hydrofluoric acid and evaporate until dry, and if in doubt about whether the soil has fully decomposed, apply the hydrofluoric-acid treatment once more. Add 10 ml 2 n HCl and return the dish to the sand bath to heat up to boil. Transfer the sample quantitatively using hot 0.8 n HCl to a 50 cm^3 measuring flask.
- Top up to the mark and then transfer the sample to a plastic vial through white-ribbon filter paper. Prepare a blank test in an identical manner which will be used to adjust results.
- Trace elements are analyzed according to the atom-absorption spectrophotometric method.
- Results are calculated in mg/kg (μg/g) according to the following formula:

$$\text{Trace elements} = \frac{\gamma \cdot 50 \cdot 1000 \cdot V}{1000 \cdot g \cdot v_1},$$

Where:
γ – reading on the instrument, in mg/l;
g – sample weight, in g;
V – volume, up to which the sample was diluted (if diluted), in ml;
v_1 – the aliquot volume which was diluted (if diluted), in ml.

The analytical data so obtained has undergone certain statistical adjustments, and the final results are shown in Report No. 61/26.01.2007, Report No. 63/26.01.2007, Report No. 64/26.01.2007, Report No. 65/26.01.2007, Report No. 66/26.01.2007, Report No. 67/26.01.2007, Report No. 68/26.01.2007, and Report No. 69/26.01.2007.

All reports were made by the Regional Testing Laboratory with the Environment Executive Agency, the Ministry of Environment and Waters, and are shown in *Exhibit 4.11 and Exhibit 4.12* respectively.

Insert here

Exhibit 4.9. Map 1. Location of core sampling in the Project Area, on the Facility Site, and the surrounding land.

Exhibit 4.10. Map 2. Oryahovo. General Layout of the Metal Working and Metal Forming Plant (Project Area & Facility Site)

MINISTRY OF ENVIRONMENT AND WATERS

REGIONAL TESTING LABORATORY, TOWN OF VRATSA

EXECUTIVE ENVIRONMENT AGENCY, SOFIA

BG-3000, Town of Vratsa, 81 Exarch Joseph St., tel. 092 66 66 32, fax 092 66 66 32, email lab_vr@m-real.net

Exhibit 4.11. Analytical data.

Information Sheet

Results from core soil sample testing conducted by TRE-P EOOD of the City of Sofia in accordance with the requirements of Regulations No. 3 laying down the norms on the permitted content of harmful substances in soil /State Gazette issue 39/2002/

Report No.	Sampling location	pH	Manganese mg/kg		Copper mg/kg		Lead mg/kg		Zinc mg/kg		Chromium mg/kg	
			result	norm	result	norm	result	norm	result	norm	result	norm
61/26.01.2007	Soil sample obtained next to transformer booth under the former foundry of the plant (Pos.1)	8,21	699	-	56,3	<280	53,7	<80	204	<370	93,4	200
63/26.01.2007	Soil sample obtained east of the fountain (Pos. 2)	8,08	544	-	34,6	<280	17,1	<80	82,1	<370	74,5	200
64/26.01.2007	Soil sample obtained next to workshop (Pos.3)	7,96	631	-	164,2	<280	28,9	<80	341	<370	81,4	200
65/26.01.2007	Soil sample obtained opposite plant gateway (Pos..4)	8,04	487	-	20,3	<280	11,6	<80	125,2	<370	83,8	200

MINISTRY OF ENVIRONMENT AND WATERS

REGIONAL TESTING LABORATORY, TOWN OF VRATSA

EXECUTIVE ENVIRONMENT AGENCY, SOFIA

BG-3000, Town of Vratsa, 81 Exarch Joseph St., tel. 092 66 66 32, fax 092 66 66 32, email lab_vr@m-real.net

Exhibit 4.12. Analytical data.

Information Sheet

Results from core soil sample testing conducted by TRE-P EOOD of the City of Sofia in accordance with the requirements of Regulations No. 3 laying down the norms on the permitted content of harmful substances in soil /State Gazette issue 39/2002/

Report No.	Sampling location	pH	Manganese mg/kg		Copper mg/kg		Lead mg/kg		Zinc mg/kg		Chromium mg/kg	
			result	norm	result	norm	result	norm	result	norm	result	norm
66/26.01.2007	To the north of the Project Area (Pos. 5)	7,62	523	-	62,1	<280	17,2	<80	147,3	<370	67,6	200
67/26.01.2007	To the east of the Project Area (Pos. 6)	7,76	475	-	83,5	<280	21,6	<80	96,7	<370	73,8	200
68/26.01.2007	To the south of the Project Area (Pos. 7)	8,05	615	-	102,7	<280	27,2	<80	112,2	<370	87,1	200
69/26.01.2007	To the west of the Project Area (Pos. 8)	7,83	327	-	28,3	<280	14,9	<80	85,8	<370	63,9	200

The final results so obtained were submitted to the experts with the N. Pushkarov Institute of Soil Studies for analysis and evaluation.

4.6.4.2. Evaluation of the Empirical Results.

Heavy-metal content /copper, lead, zinc and chromium/ in samples was evaluated as per the requirements of Regulations No. 3 setting the standard permitted limits for harmful substances in soils, State Gazette issue 36, 1979, and issue 5, 1996, as well as the Regulations supplementing Regulations No. 3 setting the standard permitted limits for harmful substances in soils, State Gazette, issue 54, 1997.

As regards manganese content, there are no official regulations on the matter, and that is why evaluation was delivered according to expert opinion.

Heavy-metal content was evaluated also with reference to existing standards in the UK, Germany, the Netherlands and the EU.

The analysis of the statistical results obtained, as shown in *Exhibit 4.11* and *Exhibit 4.12*., regarding the samples collected from the area of the hot-dip zinc galvanizing facility show unequivocally that copper content (**Cu**) varies from 13,8 (Sample No. 4) to 5,0 (Sample No. 1), and that it is several times lower than the legally permitted limit. Only sample No. 3 had a higher concentration, but this copper content was also well below (1,2 times) the permitted limit.

As regards the results obtained about lead content (**Pb**), the absence of pollution is clearly evidenced, as the established concentrations vary from 6,9 (Sample No. 4) to 1,5 (Sample No. 1), and are also several times lower than the permitted limit.

Similar results were obtained also as regards zinc (**Zn**), where levels vary from 4,5 (Sample No. 2) to 1,1 (Sample No. 3), and are also several times lower than the permitted limit.

Analytical data obtained about chromium content (**Cr**) is also in support of the trend below the legal requirements, as the levels vary from 2,7 (Sample No. 2) to 2,1 (Sample No. 1), and are also several times lower than the permitted limit.

Manganese content (**Mn**) has not been officially regulated, therefore, drawing on our expert experience, we find that the analyzed samples do not contain any toxic concentrations.

The analysis of the statistical data about the samples obtained from the area within one kilometre of the hot-dip zinc galvanizing facility (as shown in *Exhibit 4.12*), also confirms the absence of heavy-metal pollution, as individual levels are several times lower than the legally permitted limits.

Conclusions:

- *Permitted limits, as appear in the regulatory documents referred to, evidence **the absence of toxic concentrations of heavy metals in the soils collected from the area** of the Hot-Dip Galvanizing Facility of the town of Oryahovo, Bulgaria.*

- *It was found that the concentration of the elements under review is **several times lower than the permitted levels** according to the relevant regulations.*

4.6.4.3. Analysis of Results for EU Compliance – comparing obtained results with the relevant EU requirements.

The statistical results obtained in analysis and further adjusted have been analyzed and evaluated to test compliance with the adopted standards on heavy-metal content in soils valid in some EU member-states, in particular the UK, Germany, the Netherlands, and the EU in general.

The results and evaluations of EU-compliance are shown in *Exhibit 4.13, Exhibit 4.14, Exhibit 4.15, Exhibit 4.16 and Exhibit 4.17.,* (presented below).

Exhibit 4.13. Content of heavy metals (Cu) in soil samples collected from the Project Area, Zinc Galvanizing Facility and the surrounding land, Oryahovo.

Sample N^{o}	Measured value mg/kg	Permitted Limits – Cu (mg/kg)				
		Bulgaria	UK[1]	Germany[2]	The Netherlands[3]	EU[4]
1	56,3	280	130	160	30-200	50-140
2	34,6	280	130	160	30-200	50-140
3	164,2	280	130	160	30-200	50-140
4	20,3	280	130	160	30-200	50-140
5	62,1	280	130	160	30-200	50-140
6	83,5	280	130	160	30-200	50-140
7	102,7	280	130	160	30-200	50-140
8	28,3	280	130	160	30-200	50-140

[1] Environmental Committee, 1990
[2] Federal Soil Protection and Contaminated Sites, Ordinance, 1999
[3] W. Wisser, 1993; J. P. A. Lijzen, E. A. Swartjen, 2000
[4] EU Directives: EEC 278/86 – EEC, 1996. Directive on the protection of the environment and in particular of the soil, when sewage sludge is used in agriculture. O.J.L1814.7.86

Remarks:

1. The EU does not apply any special legislation on the protection of soil. The main, and probably the only, regulatory documents referring to soil protection are the EC Directives. The main purpose in applying those

directives is to support the harmonization between national legislations of member-states.

2. Directives become legally valid once incorporated in the national legislation, and each state may elect to adopt more suitable forms and methods when applying such directives.
3. Currently there is only one EU Directive which concerns soils directly. It is Directive EEC 278/86 on the protection of the environment and in particular of the soil, when sewage sludge is used in agriculture. That is why the standards contemplated in the said Directive are used as basis for this comparative evaluation of data.

Exhibit 4.14. Content of heavy metals (Pb) in soil samples collected from the Project Area, Zinc Galvanizing Facility and the surrounding land, Oryahovo.

Sample No.	Measured value mg/kg	Permitted limits – Pb (mg/kg)				
		Bulgaria	UK[1]	Germany[2]	The Netherlands[3]	EU[4]
1	53,7	80	-	200	100-800	50-300
2	17,1	80	-	200	100-800	50-300
3	28,9	80	-	200	100-800	50-300
4	11,6	80	-	200	100-800	50-300
5	17,2	80	-	200	100-800	50-300
6	21,6	80	-	200	100-800	50-300
7	27,2	80	-	200	100-800	50-300
8	14,9	80	-	200	100-800	50-300

[1] Environmental Committee, 1990

[2] Federal Soil Protection and Contaminated Sites, Ordinance, 1999

[3] W. Wisser, 1993; J. P. A. Lijzen, E. A. Swartjen, 2000

[4] EU Directives: EEC 278/86 – EEC, 1996. Directive on the protection of the environment and in particular of the soil, when sewage sludge is used in agriculture. O.J.L1814.7.86

Exhibit 4.15. Content of heavy metals (Zn) in soil samples collected from the Project Area, Zinc Galvanizing Facility and the surrounding land, Oryahovo.

Sample No.	Measured value mg/kg	Permitted limits – Zn (mg/kg)				
		Bulgaria	UK[1]	Germany[2]	The Netherlands[3]	EU[4]
1	204	370	300	300	100-350	100-300
2	82,1	370	300	300	100-350	100-300
3	314	370	300	300	100-350	100-300
4	125,2	370	300	300	100-350	100-300
5	147,3	370	300	300	100-350	100-300
6	96,7	370	300	300	100-350	100-300
7	112,2	370	300	300	100-350	100-300
8	85,8	370	300	300	100-350	100-300

[1] Environmental Committee, 1990
[2] Federal Soil Protection and Contaminated Sites, Ordinance, 1999
[3] W. Wisser, 1993; J. P. A. Lijzen, E. A. Swartjen, 2000
[4] EU Directives: EEC 278/86 – EEC, 1996. Directive on the protection of the environment and in particular of the soil, when sewage sludge is used in agriculture. O.J.L1814.7.86

Exhibit 4.16. Content of heavy metals (Cr) in soil samples collected from the Project Area, Zinc Galvanizing Facility and the surrounding land, Oryahovo.

Sample No.	Measured value mg/kg	Permitted limits – Cr (mg/kg)				
		Bulgaria	UK[1]	Germany[2]	The Netherlands[3]	EU[4]
1	93,4	200	-	200	200-300	-
2	74,5	200	-	200	200-300	-
3	81,4	200	-	200	200-300	-
4	83,8	200	-	200	200-300	-
5	67,6	200	-	200	200-300	-
6	73,8	200	-	200	200-300	-
7	87,1	200	-	200	200-300	-
8	63,9	200	-	200	200-300	-

[1] Environmental Committee, 1990
[2] Federal Soil Protection and Contaminated Sites, Ordinance, 1999
[3] W. Wisser, 1993; J. P. A. Lijzen, E. A. Swartjen, 2000
[4] EU Directives: EEC 278/86 – EEC, 1996. Directive on the protection of the environment and in particular of the soil, when sewage sludge is used in agriculture. O.J.L1814.7.86

Exhibit 4.17. Content of heavy metals (Mn) in soil samples collected from the Project Area, Zinc Galvanizing Facility and the surrounding land, Oryahovo.

Sample No.	Measured value mg/kg	Permitted limits – Mn (mg/kg)				
		Bulgaria	UK[1]	Germany[2]	The Netherlands[3]	EU[4]
1	699	-	-	-	-	-
2	544	-	-	-	-	-
3	631	-	-	-	-	-
4	487	-	-	-	-	-
5	523	-	-	-	-	-
6	475	-	-	-	-	-
7	615	-	-	-	-	-
8	327	-	-	-	-	-

[1] Environmental Committee, 1990
[2] Federal Soil Protection and Contaminated Sites, Ordinance, 1999
[3] W. Wisser, 1993; J. P. A. Lijzen, E. A. Swartjen, 2000
[4] EU Directives: EEC 278/86 – EEC, 1996. Directive on the protection of the environment and in particular of the soil, when sewage sludge is used in agriculture. O.J.L1814.7.86

Conclusions:

1. This comparative evaluation is evidence of the *absence of toxic content* of the measured properties, *including with reference to the applicable EU standards and* ***norms.***

2. The processes and the changes in physicochemical properties of soils and heavy-metal content *will not be affected* by the building of the zinc-galvanization facility.

4.7. Archaeological, Historical and Cultural Resources.

4.7.1. Archaeology and History.

The region of the town of Oryahovo has been inhabited by human beings since ancient times. Archaeological studies have proven the existence of settlements dating back to all historical ages: from the early neolith to the late Middle Ages. Some remarkable finds are connected with the Thracians, such as late-Mycenaean bronze swords and fragments of horse ammunition. The town of Oryahovo was on the important Roman road connecting Belgrade and Constantinople, the so called "Via Singiduno usque ad Constantinopolim per ripam Danubii".

The Kamaka mediaeval fortress built in IX c. which remained in existence until XIV c. lies 1 km east of the town of Oryahovo. The armies of two crusades passed through the town, those led by the Hungarian kings Sigismund (in 1396) and Ladislaus Jagiello (1444). Today the fortress commands a view to a rectangular two-floor tower dating back to the Second Bulgarian Kingdom. During the National Renaissance period the town of Oryahovo became the established administrative and economic centre of the so-called *kaaza* (district). The town of Oryahovo became the main point of supplying the Turkish Empire with goods. Already then the town had a functioning port where Austrian, French, Russian and English ships made calls. A book printed in 1726 in Brussels specifies Oryahovo as one of the more-important towns on the Danube.

Following the Liberation from Turkish occupation in 1877 the town of Oryahovo started developing its own specific local colour; it became the centre of active trading along the Danube, as well as of a rich cultural and educational life, and marked the first industrial achievements. The town of Oryahovo remained the Governor's seat for three months. Then over a course of 10 years, during the 1878-1882 and 1884-1889 periods, the town of Oryahovo was also a district centre. The Oryahovo region included at that time two districts: the District of Oryahovo and the District of Byala Slatina, with a total population of 74000.

At the turn of the XX c. part of the town's appearance was made up by complex of buildings whose architectural style combines both the typically Bulgarian and a strong western influence. Many of those buildings have been preserved today (some of them are shown on the pictures below).

Some more important events from that period were: the building of the Cherven Bryag – Oryahovo railroad (1926); the unveiling of the new Church of the Assumption (1930) and the completion of the building of the community centre designed by the two eminent architects Ivan Vasilyov and Dimitar Tsolov (1936).

38 monuments of national heritage are contained on the territory of the Oryahovo Municipality, two of them of national historic significance: the Kamaka fortress (IX – XIV c.), and the St. George church dating back to the time of the National Renaissance (1837). The church has a nave and two isles, with a saddle roof. To the east it terminates on a semi-circular apse both on the inside and on the outside, corresponding to the nave (the St. George church is shown on the picture below).

The remnants of the Variana antique fortress (by the village of Leskovets), and of the Valeriana fortress (by the village of Dolni Vadin) also attract historical interest (a fragment of an antique fortress wall is shown on the picture below).

4.7.2. Religion.

The main religion in the area is Christian Orthodox.

4.7.3. Museums and art galleries

The town of Oryahovo has two functioning historical museums, the Municipal Museum of History and the Ethnographic Museum, as well as several art galleries (the

picture below shows the building housing the Ethnographic Museum of the town of Oryahovo).

The Municipal Museum of History has three permanent exhibitions, Archaeology, The Renaissance, and Icons. The Museum of History of the town of Oryahovo keeps a collection of over 6 000 artefacts, two of which, the Statue of the Good Shepherd and the Stone Cross dating back to IV c., are of an incalculable historic value.

The Ethnographic Museum of the town of Oryahovo offers two permanent exhibitions, Town Life and Folklore Dress and Fabric.

4.7.4. Regular cultural and municipal events:

The traditional fair days of the town of Oryahovo are held every year around August 18th.

Every year (from August 9th to August 18th) the town of Oryahovo hosts an art meeting and an exhibition dedicated to the eminent Bulgarian artist Marin Varbanov (Prof. Marin Varbanov taught at the N. Pavlovich Art Academy, as well as at the Paris Academy of Art. He is among the founders of the Department of Textiles at the Art Academy in Huang-Ju in China. Prof. Varbanov was in fact among the first artists to lead the art of textiles out of the standard 2-D plane, transforming it into a 3-D art form).

Every year (around August 20th) the town of Oryahovo hosts a swim contest across the Danube, from the Bulgarian to the Romanian bank.

Chapter 5. Waste Treatment and Disposal Measures - Technologies and Equipment for Waste Processing. Logistics of the Waste.

The technologic equipment delivered by GTI comprises also a state of the art ***Environmental Protection Equipment***, i.e. *an air control component equipment, a waste liquids treatment equipment and a flux filtration & transfer pump.*

GTI will deliver the following machinery and equipment specifically designated to ensure environmental protection:

KETTLE AIR CONTROL EQUIPMENT

GTI will provide the design of the equipment for air pollution control for the galvanizing kettle in the Plant. The system consists of a hood enclosure and baghouse, with ductwork of PVC.

WASTE LIQUIDS TREATMENT EQUIPMENT

GTI will furnish a waste treatment system, which is capable of treating the waste liquids from the plant's pickle area.

The Plant's environmental exposure mitigation plan foresees that a waste disposal company will be used to properly handle liquid waste (see Appendix 5 for details).

5.1. Treatment of the Liquid Waste.

The primary liquid waste is a spent pickling acid. It is recommended, that *hydrochloric acid* should be used in the new plant.

As the articles to be galvanized are pickled, the acid solution becomes saturated with iron from the rust, that is dissolved and is no longer useful.

It is possible to completely neutralize this spent acid, filter the resulting sludge and discharge the treated water to the sewer. The waste liquids treatment system, is capable to treat the waste liquids from plant's pickle area, and to maintain a proper chemistry in the process tanks. The capacity of the system is based on a batch processing of spent acid tanks. The system is also designed to purify the flux tank by batch processing on a scheduled basis.

Here are the factors to consider:

A. Rinse water – The Plant will refresh the acid rinse tank with periodic withdrawal of 500 – 1000 gallons of water and the addition of fresh water.

The rinse will be neutralized, filtered and stored for reuse (or discharged). This will result in a small amount of sludge to be disposed to a landfill.

B. Flux – The Plant will adjust the ***pH*** of the flux using aqua ammonia, and then - filter the liquid (actually, the flux filtration system operates continuously). This too results in a small amount of sludge.

C. Pickling Acid – The spent pickling acid will be removed from the process tank and stored for treatment. A batch of 500 gallons or so will be combined with rinse water for treatment as in #"A". Some sludge will be generated and can be disposed to a landfill.

D. Stripping Acid – One of the acid tanks will be designated for stripping zinc from galvanized work that must be reprocessed (defective). The sewage plant can handle the waste easily, if it will be metered out over time

- All waste acids will be processed by the waste processing equipment. A neutralization tank and a storage tank will be used for the purpose.

- GTI Eng. will furnish shop drawings (for construction by the plant's personnel on-site) for the storage tank, for the waste acid, and for the mixing (i.e., neutralization) tank, as well as for simple structural operating platforms.

After neutralization, an easily handled iron oxide sludge is produced, which can be landfilled without hazard.

- The remained slurry will be processed through the filter press, (used to remove the liquid from the sludge).
- The resulting press cake will be semi-dry (about 30% solids & no free liquid).
- The resulting liquid is free of heavy metals and can be reused in the plant or discharged to the sewer or ground water.

5.1.1. Waste Liquids - Processing Technologies and Equipment.

- **Neutralization of the spent acids**

Hydrochloric acid (used for pickling steel prior to galvanizing), becomes inactive as the iron concentration approaches 12% by weight and must be replaced in order to maintain plant throughput.

The chemical reaction of pickling, produces ferrous chloride in solution, which will inhibit the pickling reaction. As the iron level increases, disposal becomes necessary. *After neutralization, the iron is precipitated as ferrous hydroxide, and further oxidation produces the red ferric oxide sludge.*

The *spent acid* will be treated by *neutralization* using relatively simple equipment and readily available neutralizing chemicals.

The spent acid will be neutralized with lime chips.

After neutralization, an easily handled iron oxide sludge is produced which can be *landfilled without hazard*. The resulting liquid is free of heavy metals and can be reused in the plant or discharged to the sewer, or ground water depending on local regulations.

In general, the pH must be between 5 & 9, and the suspended solids & dissolve solid must be within prescribed limits. These limits vary by location, and will be published by the local sewer authority.

A ***Filter Press*** is used to remove liquid from the sludge, and the press cake is semi-dry (about 30% solids & no free liquid). In the operation of the proposed system, stripping of zinc from sub-standard product will be done in only one pickle tank.

This operating method ensures that *only iron* will be present in the other pickle tank, and *the resulting sludge and liquid can meet environmental standards for discharge without further treatment.*

- **Flux and Waste Filters & Filter press**

GTI will deliver Plate & Frame type Filter Press for flux filtration in the plant (*see Exhibit 5.1*). The press may also be used in other applications such as acid or acid rinse filtration.

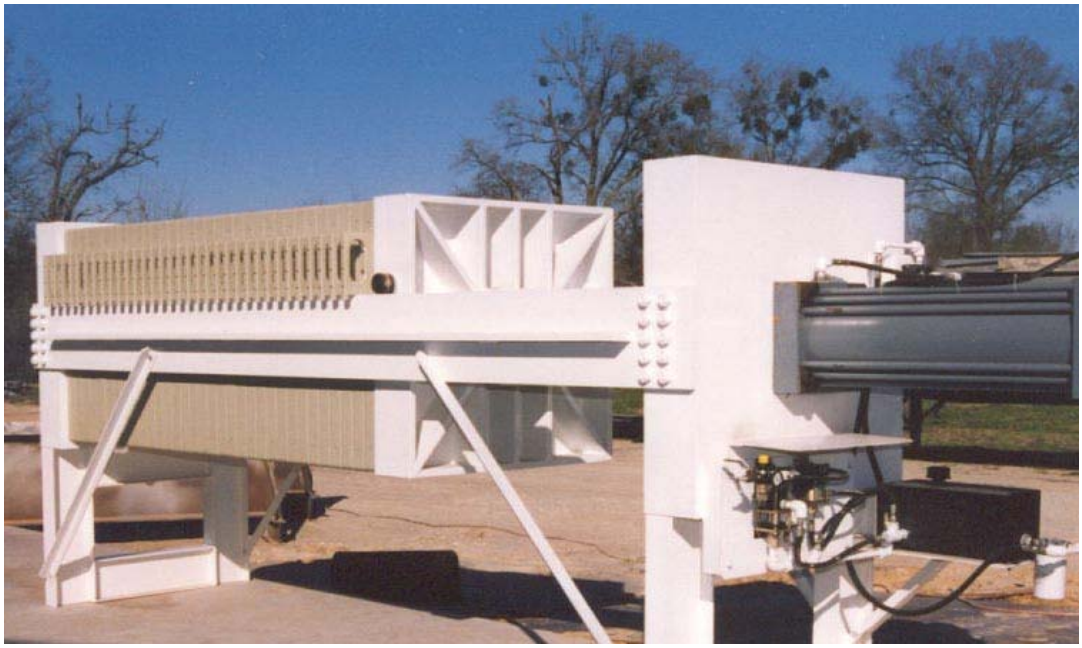
Filter plates are 18" square polypropylene, that are 2 1/2" thick with a 1 3/4" cake cavity. Slurry feed is through the center of the plate, and filtrate is discharged at the four corners of the plate. Filter cloth is polypropylene monofilament rated at 3 CFM. Closure is by an 18" stroke hydraulic cylinder with a capacity of 20 tons. The hydraulic power unit is air driven.

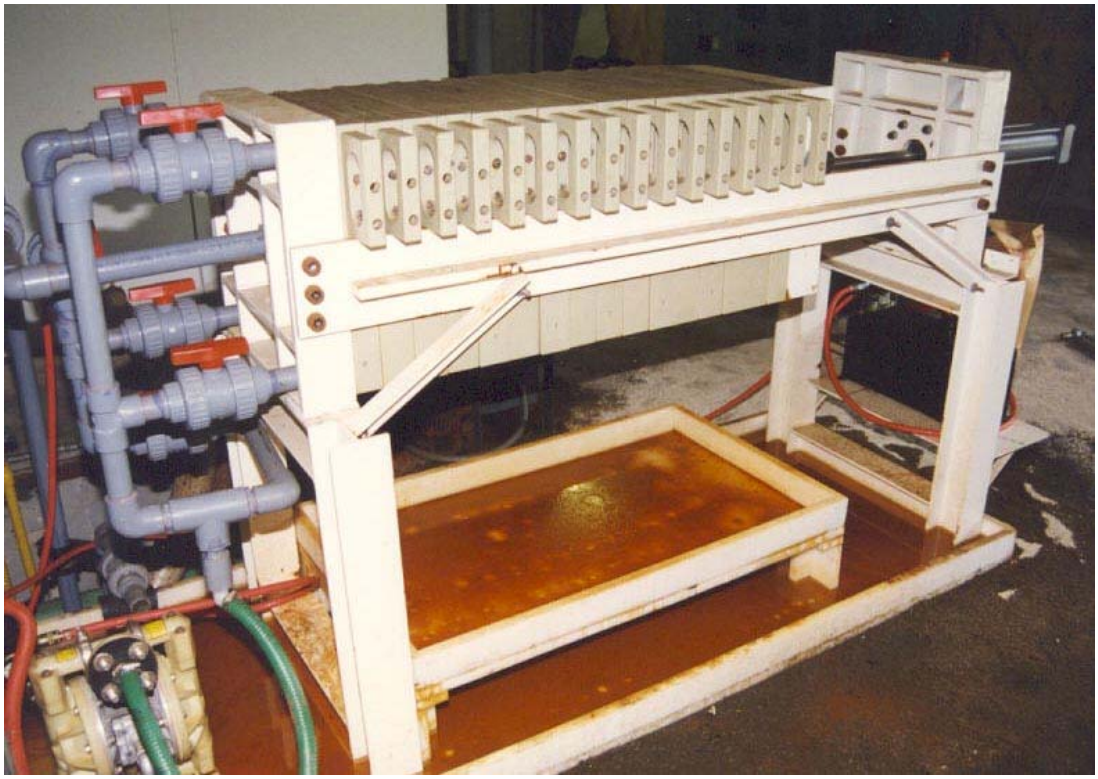
The press framework is fabricated of 3/4" steel plate, and the closure plates are reinforced with 3/4" steel ribs. After fabrication, the press is epoxy painted. A polypropylene air operated diaphragm pump capable of 15 gallons per minute at 60 psig is also furnished. The CPVC piping from the filter to the pump and tank is included.

The approximate dimensions of the press are:

Capacity (Cubic Feet)	Number of Plates	Length (Feet)	Width (Feet)	Height (Feet)
2	16	6	2.5	4

Exhibit 5.1. Filter Press.





- **PORTABLE TRANSFER PUMP**

GTI will supply a 2" air operated diaphragm pump, capable of 30 gallons per minute at 60 psig and constructed of polypropylene with teflon balls & diaphragms for use as

a portable liquid transfer pump. The pump will be mounted on a small skid with a lifting eye, and will be provided with a 20' hose for both suction and discharge. The air filter / regulator / will also be provided.

- **Chemistry of the acid neutralization process**

Several options for acid neutralization can be applied.

The chemical reactions depend by the neutralization method applied and are as follows:

a) Acid neutralization with Caustic:

$Na(OH) + HCl \rightarrow NaCl + HOH$
$2Na(OH) + Fe(Cl)_2 \rightarrow 2NaCl + Fe(OH)_{2,}$

or,

b) Acid neutralization with Ammonia:

$NH_4(OH) + HCl \rightarrow NH_4(Cl) + HOH$
$2NH_4(OH) + Fe(Cl)_2 \rightarrow 2NH_4(Cl) + Fe(OH)_2$

or,

c) <u>Acid neutralization with Lime</u>

$Ca(OH)_2 + 2HCl \rightarrow Ca(Cl)_2 + 2HOH$
$Ca(OH)_2 + Fe(Cl)_2 \rightarrow Ca(Cl)_2 + Fe(OH)_2$

In the USA, the Federal EPA has discussed treatment by neutralization in 40CFR and communications to various agencies. The text of these discussions is attached as an Appendix (GTI's report).

Neutralization using common alkali such as ***sodium hydroxide*** or ***lime*** is the primary technique, that shall be applied in this Project.

NEUTRALIZATION OF THE SPENT ACIDS WILL BE BASED ON THE MIXING OF LIMESTONE CHIPS WITH THE SPENT ACIDS.

Neutralization is the process whereby acids and alkalis (wastes) can be rendered harmless. Limestone (marble) chips or lumps are used in numerous applications to help neutralize and/or dilute chemical bearing wastes (e.g. acid wastes).

After years of successful neutralization and dilution, many state and environmental plumbing codes call for the addition of limestone chips into acid neutralization basins,

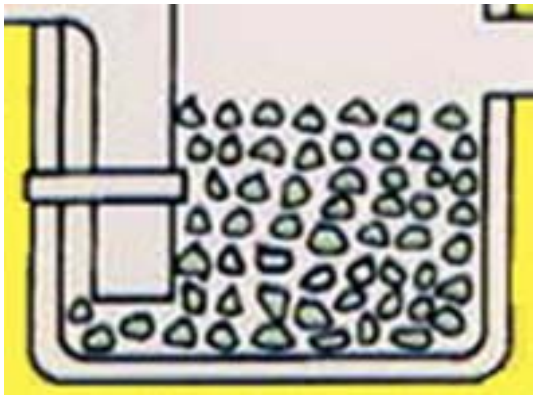
tanks, or sumps. Water is also added to the tanks to initiate the dilution process. The limestone chips exceed application requirements.

The following two requirements are vital to proper limestone performance:

- the limestone must be in the one to three inch (1" – 3") diameter size range;
- the lime stone must contain a high calcium carbonate content in excess of 90%.

The use of limestone and tanks is frequently the best and least expensive means to protect pipes and sewers from damage and to meet stringent environmental and the plumbing codes as well.

The **Limestone Chips** are sold in 50 lb. bags. The chart below is used to identify the amount of limestone needed.



* Water must be added to the tank first before adding limestone.
* Special dolomitic limestone is available and required for wastes that are primarily concentrated battery acids or sulfuric acid.

Sizes & Specs

TANK CAPACITY (GAL)	AMOUNT OF LIMESTONE REQUIRED
5	50 lb.
15	100 lb.
30	200 lb.
55	500 lb.
100	1,000 lb.
150	1,750 lb.

200	2,500 lb.
275	3,200 lb.
350	4,000 lb.
500	5,000 lb.
1200	11,000 lb.
1500	15,000 lb.
2000	16,000 lb.

The iron is further oxidized to the ferric state by peroxide or air sparging.

This simple neutralization will reduce the iron concentration below 5 mg/l, and none of the other heavy metals will be present in excess of most discharge regulations, assuming that the stripping of sub-standard product is confined to one tank as mentioned above.

5.1.2. System Design.

Each of the ***acid, acid rinse,*** and ***flux tanks*** are connected to a ***central pumping station*** by PVC or CPVC piping.

The central pumping station is connected to the storage tanks for waste, treated water, and fresh acid (if desired), to the tanks used for neutralization, and to a plate & frame filter press.

5.1.3. Operation.

Waste acid shall be pumped to storage (i.e., for temporary storage "on site"). GTI Eng. will furnish shop drawings for construction by the plant's personnel (on-site) for the storage tank for the waste acid and for the mixing tank, as well as for simple structural operating platforms.

The process tank will be recharged with fresh acid.

The waste acid shall be processed in smaller batches by the operator. The advantage of batch processing is that a predetermined recipe may be followed. The operator charges the neutralization tank with a certain quantity neutralizing reagent (i.e., lime) and then adds waste acid until the pH reaches neutral. Another advantage is, that it is not necessary to have automatic pH control with automatic valves, which greatly reduces maintenance cost.

The operator has only to take a sample after he has added the prescribed quantity of waste acid and check the pH to see if it is within limits. Polymer is then added to the

tank, and the slurry is run through the filter press. The liquid from the press is sent to the final adjustment tank, and "touched up" if necessary before discharge or reuse.

Waste acid from the stripping tank may be neutralized with ammonia, and used to recharge the flux tank. The flux solution in the process tank may be circulated through the filter press to remove suspended iron particles, and the pH of the flux may be controlled by the addition of ammonia.

5.1.4. Equipment Furnished.

1. All necessary PVC & CPVC piping – Schedule 80.
2. Central pumping station complete with CPVC piping, sample drum, chemical dosing pumps, pH & ORP instruments and polypropylene air operated diaphragm pumps, with TFE diaphragms & check valves. The pumps are 2" NPT size, and the pH/ORP instruments are Omega model PHCN-33 or equal.
3. Chemical reaction tank mixers to be mounted on the operating platform. These mixers are manufactured by GTI and are 1 Hp each.
4. GTI Filter Press.
   Filter plates are 30" square polypropylene that are 2 ¼" thick with a 5/8" cake cavity. Slurry feed is through the center of the plate, and filtrate is discharged at the four corners of the plate. Closure is by a 30" stroke hydraulic cylinder with a capacity of 50 tons. The hydraulic power unit is air driven. The press framework is fabricated of 1" steel plate, and the closure plates are reinforced with 1" steel ribs. Capacity is 18 cubic feet of sludge. After fabrication, the press is epoxy coated.
5. Drawings – GTI will furnish shop drawings for construction by the plant's personnel of simple structural operating platforms, and for the storage and mixing tanks. Pipe supports will be field fabricated of simple structural steel shapes.

5.2. Air Quality and Kettle Air Control Equipment.

A particulate emission (i.e., smoke) escapes from the surface of the molten zinc as the steel work to be galvanized is dipped. This emission is caused by the volatilization of the flux and is primarily ammonium chloride, although zinc oxide is also present (See EPA AP-40).

Pollution control agencies in general have ruled that, these fumes must be collected using the best available technology. This is done by using *a tightly enclosed fume hood* around the molten zinc bath (galvanizers refer to this bath as the "kettle") and a specific type of air filter known as a *baghouse*. This filter is equipped with a powerful suction fan and cloth bags, through which the air is filtered, and it may be thought of as a very large vacuum cleaner. The fume hood also makes a significant contribution to personnel safety by containing the splatter of hot zinc, that sometimes results when work is dipped.

The combination, made of a fume hood and a baghouse will capture 99 % of the particulate emission.

GTI Eng. quotes the design of the equipment (described below) for air pollution control of the galvanizing kettle in the new plant. The system consists of a hood enclosure and baghouse, with ductwork of PVC.

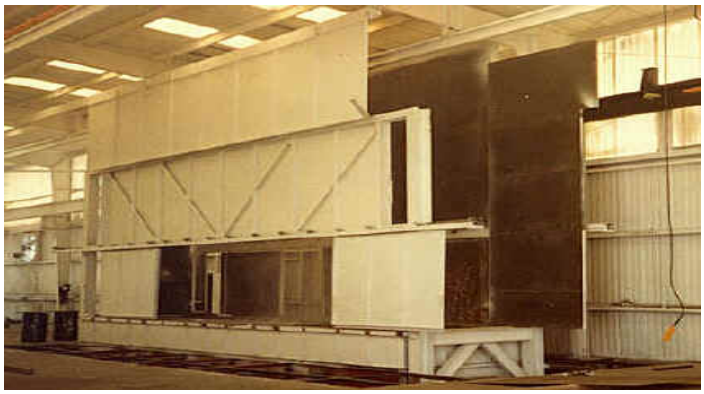
System components will be supplied by GTI, and fabrication & installation will be by plant's personnel, under GTI supervision.

5.2.1. Hood Enclosure.

The hood structure is composed of three or four parts depending on kettle orientation.

a) Floor Mounted Structure – see Exhibit 5.2.. The floor mounted truss structure is supported on columns on the working side of the kettle, which in turn supports sliding doors along the side of the kettle. The opposite side of the kettle is enclosed by a similar structure which also supports sliding doors, and the ends of the kettle are served with gate type doors which open away from the working side. The sliding doors are suspended on ball bearing rollers mounted in track, and the end doors are mounted in ball bushings for ease of operation.

Exhibit 5.2. Floor Mounted Hood Enclosure



b) Crane Mounted Curtain (applied in perpendicular arrangement only). The bridge crane supports a hanging curtain fabricated from PVC warehouse door strips that reach down to the top of the floor mounted truss. When the bridge crane is in position over the kettle, this hanging curtain forms the middle portion of the hood.

c) Roof Mounted Curtain. A similar arrangement of PVC strips or sheet metal panels encloses the area from the ceiling down to the top of the bridge crane (or the top of the floor mounted hood in the case of a parallel kettle). When the crane is in position above the kettle, this hanging curtain completes the hood enclosure.

d) Roof Mounted Plenum. A plenum constructed of the same material as the building roof which is approximately 4 feet square and the length of the kettle is positioned on the roof above the kettle. A slot 8 to 12" wide is cut in the roof along the length of the kettle, and fumes from the kettle are drawn into the plenum by the baghouse suction.

5.2.2. Baghouse.

The mostly utilized types of baghouses are shown in *Exhibit 5.3*. and *Exhibit 5.4*. The baghouse blowers are sized based upon 7 air changes per minute of the hood volume. This flow rate is based on recommendations found in EPA Manual AP-40 & Industrial Ventilation published by The American Conference of Governmental Industrial Hygienists.

A stack approximately 20 feet in height will be designed by GTI for attachment to the blower discharge, and the stack will be supported by braces attached to the building.

The baghouse is sized according to the hood volume, and GTI baghouses are made in modules with a capacity of 8,000 SCFM each. The air flow may be determined by multiplying the hood volume in cubic feet by 7. This will give the recommended number of air changes each minute.

Exhibit 5.3. Two – Module Baghouse of Zinc Galvanizing Facility

Bags - 156 bags in each chamber - 5" dia. by 9'-2" polyester fabric

Approximately 2000 sq. ft. cloth area each chamber

Bag Cleaning - manual shaking based on pressure drop combined with a sonic horn

Blower - 8,000 cfm @ 6"wc - 15Hp 480/3/60 with weather cover

Precoat - Furnished with GTI automatic precoat unit

Manometer - 0 - 8" wc

Finish - interior and exterior epoxy painted

Exhibit 5.4. Three-Module Baghouse

Electrical - motor starters (25Hp & 1Hp) are furnished by plant's authorities. Ductwork - 24" diameter PVC ductwork will be specified from the roof mounted plenum to the baghouse inlet.

5.2.3. Equipment Furnished.

1. Baghouse - Two Chamber Unit – 2 Units Required
2. Bags - 156 bags in each chamber - 5" dia by 9'2" polyester fabric approximately 2000 sq. ft. cloth area each chamber
3. Bag Cleaning - manual shaking based on pressure drop combined with acoustic horn
4. Blower - 16,000 cfm @ 6"wc - 25Hp 480/3/50 Fiberglass with weather cover
5. Precoat - GTI continuous precoat addition
6. Manometer - 0 - 8" wc
7. Finish - interior and exterior epoxy painted
8. Electrical - motor starters (25Hp & 1Hp) to be furnished by client with interlock, so that both motors can not be run at the same time
9. Ductwork - 18" diameter PVC ductwork will be used

The solid waste from the baghouse (used for air quality control) represents a particulate emission (smoke), which escapes from the surface of the molten zinc bath (as the article to be galvanized is dipped).

Such kind of solid waste remains collected in the bags (placed in the baghouse chambers) and should be disposed of. *The so-collected quantities of particulates shall be disposed of as a solid hazardous waste.*

Specific kinds of HAZMAT containers, designated for transportation & storage of solid and liquid hazardous waste shall be used for this purpose (please see Chapter 5 for details).

5.3. Materials, Used in the Waste Treatment Technologies.

5.3.1. Sodium Hydroxide.

Otherwise known as ***caustic soda***, this basic chemical is used in combination with other basic alkalis for grease and paint removal. It is a commodity chemical and a stable market.

5.3.2. Ammonium Hydroxide.

This chemical forms the basis for the flux system, and is sold as a proprietary mixture of *the triple salt with zinc*.

5.3.3. Pickling Acids.

Both *sulphuric* and *hydrochloric acid* are in common use for the pickling of steel to be galvanized, but ***hydrochloric acid*** offers several ***advantages*** and *is recommended for use in new plants.*

There are several reasons for this, and some are outlined below:

1. *Energy consumption* – As mentioned above, sulphuric acid must be kept at elevated temperature while *hydrochloric is used at ambient temperature*. (hydrochloric must be 70F or above to pickle at an acceptable rate so that some heating may be required in the winter months).

2. *Operator Skill* – Because of its nature, sulphuric acid, even when used with an inhibitor, will work its way under the surface rust or scale and attack the base metal of the article being pickled. On the other hand, hydrochloric with the proper inhibitor will remove rust or scale and not attack the base metal. This means that an article may be left in hydrochloric acid solution for extended times without damage and therefore is easier for an operator to use.

3. *Zinc Pickup* – As mentioned above, sulphuric acid readily attacks the base metal and generally results in a rougher surface on the pickled article. This rough surface results in more ounces of zinc being used per square foot of surface area than the relatively smooth surface produced by hydrochloric acid pickling.

4. *Water Treatment Costs* – In order to prevent contamination or the flux solution, articles pickled in sulphuric acid must be thoroughly rinsed before immersion with the attendant cost of treatment and disposal of the rinse water. With the use of hydrochloric acid, while rinsing is recommended, it does not have to be as thorough, and the flux bath can be easily adjusted chemically.

5. *Personnel Safety* – Hydrochloric acid is not without disadvantages, for example, more tankage is required because the pickling rate is 1/3 slower, and the price of the acid per ton pickled is higher than sulphuric. Also, spent sulphuric acid can be reclaimed by refrigeration based processes whereas no current process effectively recycles hydrochloric. However, the true cost of using either acid is a compilation of the factors mentioned.

5.3.4. Chemical Additives (Optional).

Summarized below is information on the performance of certain chemical additives which can be used in the galvanizing process to improve production performance and further reduce acid fumes and minimize hazardous residue in waste liquids.

GTI Engineering, Inc., is also the North American Distributor Sales Agent for the METFIN CHEMICALS. GTI began to import the METFIN CHEMICALS in May 2000, and have conducted tests and monitoring of commercial usage since that time. At present, GTI have approximately 20 plants testing and using the above chemicals in tank sizes ranging up to 20,000 gallons.

The new Plant has obtained GTI's commitment to further review the environmental management plan and to assist in determining the feasibility of the application of the above products in the Oryahovo Hot Dip Zinc Galvanizing Plant.

- **METFIN AD01**

This non hazardous additive is used with hydrochloric acid and with sodium hydroxide to form a good cleaning bath. It will remove grease effectively in a heated tank. In unheated hydrochloric acid, it will handle a moderate amount of oil, but will not remove grease. It will eliminate oil scum on the surface of acid tanks and eliminate "black spots" caused by this scum. ***IT WILL ALSO REDUCE ACID FUMES BY 40 TO 50%***.

- **METFIN AD11**

This additive is used with unheated hydrochloric acid as an extender/inhibitor. It works by preventing attack on base metal and removing oxide only. ***IT HAS BEEN***

SHOWN TO INCREASE ACID LIFE BY ABOUT 10%. Of course, this also reduces disposal cost by the same amount. It has been successfully in an unlined steel tank, but the caustic cleaner (if used) must be sodium hydroxide + AD01 or METFIN AK10. Anionic surfactants negate the effect of the inhibitor, thus destroying an unlined tank. AD11 IS NOT CLAIMED TO BE A FUME SUPPRESSANT, BUT IT HAS A NOTICEABLE EFFECT ON FUMES AROUND THE TANK.

- **CH06**

This additive is a very effective preventative for "white rust". It is a corrosive chemical (hexavalent chromic acid) in the quench tank, but the coating formed on the work is the trivalent form that is not a carcinogen. It has been very effective on difficult small parts such as fasteners.

5.4. Quantities of the Generated Waste - Liquids, Sludge and Solids.

Galvanizing facilities are not large generators of waste.

For example, the proposed plant will process approximately **1,000,000 pounds** (i.e., about 500 tons) ***per month*** of galvanized steel works ***during the 5-th year*** of the Project, (please see Appendix VII of the Business Plan for details). This equates to a use of 70,000 pounds of zinc per month, and the removal of approximately 5,000 pounds of rust (ferric oxide) from the steel by the pickling acid (AGA & GTI data).

If, the iron saturation is 12% by weight, then the average waste disposal is approximately 110 – 120 gallons per day (waste liquids) and approximately 200 - 250 pounds of sludge (dry basis).

So, the ***maximal waste load*** (during the 5-th year of the project) will be ***2 800 gallons (i.e., about 10,500 liters)*** *per month* (22 days month) of ***liquid spent & neutralized hydrochloric acid, plus 2 cubic yards*** *per month* ***of iron oxide sludge and solids.***

Respectively, during the 1-st year of the Project, the proposed plant will process approximately 660,000 pounds (i.e., about 300 tons) per month of galvanized steel works (please consult Appendices VII of the Business Plan for details). The waste load ***per month*** will be ***1,400 gallons of waste liquid, plus 1 cubic yard of iron oxide sludge and solids***.

The calculated quantities of spent & neutralized waste liquids, as well as the quantities of the iron oxide sludge (dry basis), generated during the first five years of the Project are presented in *Exhibit 5.5*.

Exhibit 5.5. Processed Steel Works and Quantities of Generated Liquid & Solid Waste over the Project Years.

Project year	**Processed Steel works (Plant capacity) per month**	**Quantities of Waste (liquids, sludge & solids) per month**	**Containers needed per month**
N^{o}	Pounds, (tons)	Gallons & cubic yards (liters & cubic meters)	Quantities (pcs.)
1-st year	**660,000 pounds** (i.e., 330 tons)	**1,400 gallons** of liquid waste, ***plus* 1 cubic yard** of sludge & solids (i.e., **5,000 liters** of liquid waste, ***plus* 0.76 cubic meters** of sludge & solids)	20 barrels ***plus,*** 1 Waste-away container - specs. are provided in Option 1,p. 5.6.1. **or** 11 pcs. with capacity of 500 liters each one - specs. are provided in Option 2,p. 5.6.1.
2-nd & 3-rd year	About **800,000** pounds (i.e., about 400 tons)	**1,920 gallons** of liquid waste, ***plus* 1.6 cubic yards** of sludge & solids (i.e., **7,300 liters** of liquid waste, ***plus* 1.23 cubic meters** of sludge & solids)	25 to 27 barrels, ***plus*** 2 "Waste-away containers" - specs. are provided in Option 1,p. 5.6.1. **or** 15 to 17 pcs**.** with capacity of 500 liters each one - specs. are provided in Option 2,p. 5.6.1.
4-th & 5-th year	**About 1,000,000 pounds** **(**i.e., about 500 tons)	**2,400 gallons** of liquid waste, ***plus* 2 cubic yards** of sludge & solids (i.e., **10,500 liters** of liquid	30 to 35 barrels, ***plus*** 2 "Waste-away containers"- specs. are provided in

		waste, ***plus* 1.66 cubic meters** of sludge & solids)	Option 1,p. 5.6.1. **or** 18 to 20 pcs**.** with capacity of 500 liters each one - specs. are provided in Option 2, p. 5.6.1.

The generated waste shall be packed in ***"Hazmat Containers"***, specially designed for storage and transportation of solid & liquid waste (UN approved) – barrels & hazpack boxes. Full details are developed in the next paragraph.

5.5. Logistics of the Waste – Storage, Transportation and Disposal Options.

5.5.1. On-site Logistics - Material Handling and Temporary Storage of the Generated Waste. HAZMAT Containers and HAZMAT Buildings.

A complete and very detailed descriptions and technical characteristics of all selected types of ***HAZMAT containers***, designed for material handling, transportation and storage of the generated hazardous waste are provided in **Appendix 5.1.**

Two main options for packing of the generated hazardous waste (liquids, sludge & solids) could be developed :

- **Option 1**.

About 20 to 35 barrels ***per month***, will be needed for packing of the liquid waste. Each one of the barrels must have capacity of 55 gallons - Spec. **GCC: N355HF-S**, or **GCC: N855FRC18-DU**, or **GCC: N355FRC-H** (*see Appendix 5.1. for details).*

Two hazmat containers for packing of the solid waste & iron oxide sludge will also be needed - Spec. **WasteAway Container, B.A.G. Corp**., or Spec. **GCC: MHAZMAX** (*see Appendix 5.1. for details).*

- **Option 2**.

About 11 to 20 hazmat containers ***per month***, with a capacity of 500 liters (i.e., 132 Gallons) each one will be needed for storage of the generated waste. The containers are manufactured by "Techno-Plast" Ltd. BG, Spec.: "Vertical Containers" and "Cubic Containers" (*see Appendix 5.1. for details).*

A specially designed "***Warehouse for Stock of Spare Hazmat Containers***" will be designed and built in the main facility building.

The storage capacity of this Warehouse (i.e., the number of the spare Hazmat Containers put "On Stock"), will provide possibilities for permanent supply of the waste treatment system(s) with all necessary quantities & types of spare Hazmat Containers, during a 6-month period of Plant's operation. The Warehouse for spare Hazmat Containers represents an important part of the Zinc Galvanizing Plant's infrastructure (*see Exhibit 3.3. Equipment Layout, for details).*

A special purpose ***HAZMAT Buildings, designed for Temporary Storage*** of the ***already containerized waste***, will be installed and included in the Plant's logistics chain.

Full descriptions and technical parameters of the ***HAZMAT Buildings*** **(**included in the logistics chain of the new plant**),** are provided in ***Appendix 5.2.***

In total, two HAZMAT Buildings of the type HAZMAT model : (26' x 8' x 8'6"), were selected for the new plant. The HAZMAT buildings will be situated near the main building of the facility and close to the waste processing area (*see Exhibit 3.2. Plant Infra-Structure and Exhibit 3.3. Equipment Layout for details*), and will be mounted on a concrete-lined foundations..

Handling and transportation of the already containerized waste inside and/or outside the main facility building, as well as its positioning in the interior of the HAZMAT buildings will be effectuated by 2 fork-lift loaders.

The calculated ***capacity*** of the HAZMAT buildings provides the required options for temporary storage of the already ***containerized waste*** (that waits for transportation and definitive disposal), during a two-month period of Plant's operation. The anticipated processing capacity of the Plant will respectively be about 1,000,000 pounds, (i.e., 500 tons) of galvanized steel works per month.

The entire floor space of the *Waste Liquids Processing Area* **(***see Exhibit 3.3. Equipment Layout*), will be concrete lined and will have an additional cover, made of ***Spill Containment Modular Platforms & Ultra Spill Deck(s).*** Descriptions and dimensions of the appropriate ***spill containment platforms,*** are shown in ***Appendix 5.3.***

The modular spill containment platforms and spill decks shall be configured for the Plant's exact containment requirements and will provide full compliance with the appropriate storage regulations 40 CFR 264.175 .

Spill Containment Platforms will provide ***full protection*** of the Waste Processing area, in case, if some kind of *accidental hazardous spillage* could eventually occur during the waste treatment and waste handling procedures. Spill containment

platforms will also provide options for hazardous waste collection from the waste processing area (in case of some accidental spillage).

Several HAZMAT modular platforms model N^{o} 1688 and model N^{o} 1634, as well as GCC model N^{o} 1072 (*see Appendix 5.3*)**,** will be installed over the floor space of the waste processing area.

5.5.2. Transportation of the Waste.

All types of Hazmat Containers, selected for storage and transportation of the hazardous waste (liquids & solids), are in full compliance with the **ADR Convention** requirements i.e., ***European Agreement***, concerning the *International Carriage of Dangerous Goods by Road, Volume I, ADR -2007, Chapter 3.2, Volume II, ADR – 2007, Chapter 4.1.4.1.* (please see **Appendix 5.4.** for details).

The selected types of Hazmat Containers will be placed on a flat and/or metal (or metal cage) pallets and will be manipulated by a specialized material-handling equipment - i.e., by fork-lift loaders at the factory site, by crane-manipulators of the transportation vehicles (if necessary) and by fork-lift loaders at the landfill.

The transportation schedule of the already containerized waste from the factory site (i.e., from the HAZMAT buildings) to the certified landfill (designated for a definitive storage of the waste), will be made on a monthly basis.

In compliance with the ADR requirements, the necessary mark on the Hazmat Containers must be a specific ***sign for dangerous goods***. This sign must be N^{o} 9, and must have dimensions 100 x 100 mm.

Samples of signs for dangerous goods are provided in *Chapter 5.2.2.2.2., Volume II* of ADR convention (*see Appendix 5.1.).*

- The ***UN number and the categorization*** of the packing group for ***the liquid waste*** was selected in accordance with the definitions and characteristics, provided in Table "A", of ADR convention, Chapter 3.2., Volume I, and must be as follows: ***UN 3082, "Substance, Hazardous for the Environment, Liquid, Non-Specified", Class 9, Packing Group III.*** The relevant Packing Instruction is P001, (Chapter 4.1.4.1., Volume II, ADR, Special Regulation N^{o} 274).

- Respectively, the ***UN number and the categorization*** of the packing group for ***the solid waste*** must be : ***UN 3077, Substance, Hazardous for the Environment, Solid, Non-Specified, Class 9, Packing Group III***. The relevant Packing Instruction is P002, (Chapter 4.1.4.1., Volume II, ADR, Special Regulation N^{o} 274).

All vehicles, utilized for the transportation of the waste, must have two neutral, light-reflecting orange plates, mounted on the front and on the back side of the vehicle – ADR, Volume II, Chapter 5.3.

In compliance with ADR requirements, a *specific* ***set of documentation***, must be issued and provided during the transportation stage of the containerized liquid and solid waste. The set must contain the following types of documents:

1. *Transport document* – containing full definitions of the cargo, the UN number, the appropriate packing group, quantities of the transported waste, full name and address of the sender and the recipient, contact telephone numbers (ADR, Volume II, Chapter 5.4. & Chapter 8.1.).

2. *ADR Certificate for the driver of the vehicle* (ADR, Volume II, Chapter 8.2.).

3. *Written instructions, in case of an accident* (ADR, Volume II, Chapter 5.4.3.).

Important Notes:

- "TRE-P" EOOD signed a Contract with a BG company named, "BalBok Engineering" (**www.balbok.com**). The company "BalBok" Eng. is certified by the BG Ministry of Environment and Water for collection, transportation, supplementary treatment (if required) and storage of industrial hazardous waste. The company "BalBok" Eng. has more then 17 years of experience in treatment, transportation and storage of hazardous waste and possess full licenses for collection, transportation and treatment of more than 60 different types of industrial hazardous waste. A copy of the signed Contract for collection, transportation and treatment of the hazardous waste, generated during the operation of the new Zinc Galvanizing Plant as well as all appropriate licenses of BalBok Eng. is presented in ***Appendix 5.5*****.**
- "TRE-P signed another Contract (i.e., a supplementary one), with another BG company, certified for transportation and treatment of nuclear & industrial hazardous waste. The Contract is for transportation services only, and can be used as a back-up to the previous option. Copies of all signed Contracts as well as ADR licenses can be found in ***Appendix 5.5*****.**

5.5.3. Definitive Storage of the Waste on a Certified Landfill.

The ***already containerized waste***, generated during the operation of the new Zinc Galvanizing Plant, shall be disposed (for a definitive storage) on a landfill, ***specially designed for storage of Industrial & Municipal Hazardous Waste.***

The landfill is located near the town of Sevlievo, i.e., at about 70 miles away from the project area (*see Exhibit. 3.1. Project Location, for details*). The landfill was

completed and opened for operation about an year ago (in October 2006). The landfill was designed by a German company and built by a BG-German consortium.

The total capacity of the landfill is for about 1,300,000 cubic yards of waste, of which 325,000 cubic yards are designated for industrial hazardous waste (distributed in 47 specially designed, concrete-lined cells).

- A copy of a signed Contract for definitive storage & disposal of the already containerized waste, on a certified landfill, located near the town of Sevlievo, (and specially designed & built for storage of a hazardous waste), is presented in ***Appendix 5.5.***

Chapter 6. Project Impacts and Mitigation Activities.

An extremely important stage in this new Project will be the development of a detailed study of all significant ***potential environmental and social impacts,*** that could be generated during the proposed project activities.

Such a study should comprise a definition of all ***major issues,*** related to each potential project impact, an evaluation of the ***existing conditions***, a prediction of the ***significance*** of all generated project impacts and a determination and a development of appropriate ***mitigation measures***, that should be applied to reduce the possible adverse impacts. An appropriate ***monitoring requirements***, should also be created and included in the proposed study.

6.1. Methodology for Assessment of the Project Impacts.

A specific kind of impact assessment ***Methodology,*** must be created and applied for the development of all impact assessment stages.

For this new Zinc Galvanizing Project, the specially created ***Methodology for Assessment of the Project Impacts (MAPI)***, consists of the following sections :

a) Potential Issues.

All potential issues, which are related to some specific technologic and/or logistics exigencies & activities of the Project, as well as to some proposed construction and installation activities, that could potentially affect the environment, must be identified and analyzed in this section of the MAPI.

b) Existing conditions.

All existing conditions, related to previous and/or current project activities, and having the power to influence the generation of some important project impacts, should be identified and evaluated in this section.

c) Criteria for Determining Significance.

All consequences of the generated project impacts (resulting from the proposed project activities), should be evaluated in this section of the MAPI. The evaluation of these consequences must be performed by comparing it against some recognized significance criteria, which could be of the following types :

- technical recognition, i.e., scientific and/or technologic knowledge;

- expert opinions and/or considerations of the project team and other recognized experts in particular domains ;

- institutional recognition, i.e., government laws, standards, and policies and/or programs;

- public recognition, i.e., social and/or cultural values of the public, (and most of all the public opinion of the community, that could be directly affected by the project impacts).

d) Prognosis of Impact's Magnitude.

In this section of the MAPI, a precise descriptions of the magnitude of all potential impacts have to be developed. A ***quantitative*** and/or a ***qualitative evaluation of the magnitude*** of the anticipated impacts should also be performed.

e) Impact Analysis.

The nature, and the particular "weight factor" of each *activity* and/or specific *measure*, specially developed to ***exclude*** any possibility for occurrence of hazardous potential and/or unmitigated discharge (of waste), as well as the potential *impacts* of all these proposed activities & measures on the environment, should be analyzed in this section of the MAPI.

f) Mitigation Activities. Minimization Measures.

An appropriate ***mitigation activities***, that should be applied ***to reduce*** the "*potential*" of each significant project impact on the environment (or even ***to avoid the impact entirely***), must be developed (in details) in this very important section of the MAPI.

In general, the developed mitigation activities could be classified into the following categories:

A. *Reducing* the potential (i.e., the "strength") of the impact by limiting the degree of its activity;
B. *Rectifying* the impact by repairing, rehabilitating or restoring the affected environment;
C. *Compensating* for some consequences of the impact (unmitigated) by replacing or providing an adequate substitute resources;
D. *Avoiding* the impact entirely, by applying an appropriate technologies and equipment, that will exclude any kind of generation and/or existence of the impact, or even by not developing a certain proposed activity at all.

Some possible ***Minimization Measures***, that could eventually minimize the particular "weight" of each potential project impact, (submitted to the analytical procedures), could also be developed in this section.

g) Monitoring Requirements.

The last stage of the MAPI should be a determination of an appropriate minimum of monitoring requirements.

The purpose of the monitoring procedures is to confirm, that the analyzed project impacts are within the predicted limits, and also to provide an appropriate (and timely) information, in case, if any unacceptable and/or hazardous impact is going to occur.

The scope and the frequency of the monitoring depends strongly on the nature of the developed mitigation and minimization measures.

6.2. Environmental Impacts and Mitigation Measures, Associated with Facility Operation.

6.2.1. Potential Impacts of the Generated Waste on the Environment. Mitigation Activities. Waste Minimization Measures.

- **Potential Issues.**

The liquid and solid industrial waste, generated during the operation of the new hot dip zinc galvanizing facility (and considered as a hazardous one), could potentially affect the environment.

- **Existing conditions.**

The Bulgarian partner in this project, i.e., the BG company "TRE – P" owns and operates also ***a metal-working facility,*** situated in the project area, and close to the facility site of the new Hot Dip Zinc Galvanizing Plant. The operating metal working facility represents a source, that generates a non-hazardous industrial waste. A considerable part of the steel works manufactured by the "TRE – P" metal-working facility will be galvanized in the new plant (*see also Chapter 3.3. for details*).

- **Criteria for Determining Significance.**

When determining the ***significance of the potential impacts*** on the environment, an extremely important "weight factor" should be considered – i.e., that in fact, ***the quantities of the liquid and solid waste, generated during the operation of the new hot dip zinc galvanizing facility shall be very small .***

During the first and the second year of the Project, the generated waste load, will not exceed 50 – 60 gallons of treated waste liquids & sludge ***per day***, which equates approximately to just **1 (one) barrel**, with capacity of 55 gallons, ***per day*** (*see Chapter 5.4., and Exhibit 5.1. for details*).

Respectively, the maximal waste load, generated ***per day*** during the 5-th year of the Project, will be about ***110 gallons of treated waste liquids (***which equates approximately to 2 **(two) barrels**, with capacity of 55 gallons per day), ***and about 0.1 cubic yard of solids and sludge*** (*see Chapter 5.4., and Exhibit 5.1. for details*).

These small quantities of waste shall be processed by an extremely effective technologies, applied for ***complete neutralization*** of the waste liquids.

- **Impact Analysis.**

As a result of all above-mentioned activities, a fully environmental protection measures, which ***exclude*** any possibility for occurrence of hazardous potential and/or unmitigated discharge on the environment have been developed and would be carried out (*see Chapter 5. for details*).

- **Mitigation Activities. Waste Minimization Measures.**

The first step of the proposed mitigation measures was implemented in the *tank's design*. The pickling process tanks and the waste treatment process tanks will be contained by ***five levels of security, so that leakage to the environment will be practically impossible.***

These ***five levels of security*** respectively are:

a) thermoplastic primary tank liner;
b) secondary tank containment;
c) thermoplastic tank pit liner;
d) the concrete tank pit itself;
5) the thermoplastic under-liner between the concrete of the pit & the soil.

In case of some highly improbable situation, when some accidental spillage of spent and/or fresh acids occurs, (for example, there could be some leakage from the tanks for fresh acid and/or the neutralization tanks), then, the area, that would be impacted by this leakage should have a total surface of about 22 m^2.

The applied mitigation measures provide, that, all tank's pits, (which are ***under the bottom of all tanks and*** situated ***below*** the ground level)**,** will be ***concrete-lined***, with 30 cm thickness of the concrete.

In fact, it will be practically impossible for some accidentally spilled acid (a treated and/or a fresh one) to pass through 30 cm (i.e. about 1 foot) of concrete, after that – go through the thermoplastic under-liner (placed under the concrete pit), and finally - penetrate into the soil.

Moreover, the company "BalBok Engineering" has developed technologies for waste collection (of an accidentally spilled hazardous waste), as well as for physico-

chemical treatment, solidification and stabilization of the hazardous waste. BalBok Engineering utilizes a small mobile installation, that provides options for appropriate collection and treatment of the waste at the factory site, in case if some emergency situation occurs. The final products from the waste treatment processes shall be containerized in hazmat containers and shall be directed to a certified landfill for definitive disposal. A subsequent cleaning of the impacted area with process water (under pressure) will be performed.

A significant minimization of the generated waste sludge can also be achieved. A state-of the art technology and equipment (developed by GTI Eng.), shall be used for the purpose – i.e., transfer pumps, specially designed tanks and Plate & Frame type Filter Press (*see Chapter 5.5.1. and Exhibit 5.1. for details*).

- **Monitoring Requirements.**

The pickle and the waste treatment area *will be monitored* by a ***system of test points in the area between the concrete pit and the thermoplastic under-liner***. These test points will be sampled daily to ensure that no liquid has escaped.

Records for all types of waste, generated during the facility operation will be maintained.

Quantities of all waste (liquids, sludge and solids), that are subject to on-site temporary storage and/or definitive disposal, will be logged on a specially created ***Waste Tracking Register***. A bachelor's degree chemists shall be in charge of the *record keeping,* so that no questions will ever arise about what is being discharged from the new plant. This person can also fill the duties of *quality control* and *waste treatment supervision.*

6.2.2. Waste Management and Mitigation Measures, associated with the On-site Handling, On-Site Storage and Disposal of the Waste.

- **Potential Issues.**

All kinds & quantities of hazardous waste, generated during the operation of the new hot dip zinc galvanizing plant *must be packed* in appropriate *HAZMAT containers,* specially designed for transportation and storage of hazardous materials.

The on-site handling of the already containerized waste must be performed by a specialized material handling equipment – fork-lift loaders and specially designed bridge cranes. For that purpose, the hazmat containers must be placed on a flat and/or metal (or metal cage) pallets (*see Chapter 5.5.2. for details*).

Specially designed *HAZMAT Buildings* must be used for a temporary storage of the hazardous waste "on-site".

The HAZMAT Buildings must be situated near the main production building of the new plant and included in the Plant's logistics chain (*see Chapter 5.5. and Appendices 5.1 thru 5.4.*).

- **Existing conditions.**

The non-hazardous industrial waste, generated during the operation of the metal-working facility (owned by "TRE-P", and situated also in the project area), is handled "on-site" and disposed to the landfill of Oryahovo Municipality (as it is a non-hazardous waste).

- **Impact Analysis.**

An appropriate environmental protection actions, which will provide ***full protection of the environment*** during the on-site handling and the on-site temporary storage of the generated waste, as well as during transportation of the already containerized waste, have been developed and would be carried out (*see Chapter 5. for details*).

- **Mitigation Activities.**

Separation & collection of all recyclable materials shall be performed during the on-site handling of the waste.

The main recyclable material in the new zinc galvanizing facility will be the so-called "***zinc dross***". Specific types of containers for storage of the zinc dross and a special material handling equipment (a dross clamshell and a monorail system), shall be used for the purpose (*see Chapter 3 and Appendix 3 for details*).

All other kinds of recyclable materials, i.e., *plastic*, *paper*, *glass*, and *metal scrap*, will be separated, collected and stored in ***separate bins***.

All recyclable waste shall be sold to waste contractors. The zinc dross shall be sold to a smelter company.

The *concrete-lined* floor of the entire *Waste Liquids Processing Area* shall have a supplementary cover, made by a specially-designed ***Spill Containment Modular Platforms & Ultra Spill Decks*** (*see Appendix 5.3. for details*). The selected platforms and spill decks will be in full compliance with the appropriate storage regulations (as shown in 40 CFR 264.175).

The Spill Containment Platforms will provide ***full protection*** of the Waste Processing area, in case if some kind of *accidental hazardous spillage* occurs during *the waste handling activities*. The modular containment platforms will also be providing options for collection of the waste (from the waste processing area), in case of some accidental spillage.

Specific types of ***HAZMAT Containers***, designated for storage & transportation of hazardous waste (solids, liquids and sludge) shall be used in the plant's logistic chains (*see Appendix 5.1 for details*). All types of the Hazmat Containers, will be in full compliance with the **ADR Convention** requirements, concerning the *International Carriage of Dangerous Goods by Road, Volume I, ADR -2007, Chapter 3.2, Volume II, ADR – 2007, Chapter 4.1.4.1.* (*see Appendix 5.4. for details*).

HAZMAT Storage Buildings, designed for temporary storage of *the already containerized waste* (consisting of *liquids, sludge & solids*), will be built, installed and included in the Plant's logistic chain. Hazmat Storage Buildings shall provide the safest and most complete solution for the storage of the hazardous waste. All hazmat buildings are equipped with a 6" deep secondary containment sump to exceed the EPA spill containment requirements as set forth in 40CFR 264.175. The hazmat buildings are designed in accordance with OSHA and NFPA Code 30 requirements and all Standard Sizes are Factory Mutual Approved.

All kinds of the ***already containerized waste***, will be disposed of (for a definitive storage) at a landfill, ***specially designed for storage of Industrial & Municipal Hazardous Waste*** *(see Chapter 5.5.3 and Appendix 5.5. for details)****.***

An appropriate *Emergency Response Plan* will be developed. The subject of such a Plan will be to develop all necessary activities, applied for treatment, handling, collection and on-site storage of the hazardous waste.

A special *training courses* will be conducted to all personnel, involved with treatment, identification, segregation, handling and management of the generated waste.

- **Monitoring Requirements.**

On-site *audits* for all kinds of waste management activities will be carried out on a regular basis.

Audits of the selected waste disposal contractors, as well as of the selected waste disposal facilities will be undertaken on a regular basis. The purpose of these audits will be to check that, all procedures and measures related to the waste transportation and the waste disposal activities, included in the already signed Agreements, are being respected (*see Appendix 5.5. for details*).

6.3. Potential Human Impacts. Mitigation Measures.

The new Hot Dip Zinc Galvanizing Facility Project is a relatively small one. Therefore, the number of persons, that shall be employed during construction and rehabilitation works, as well as the number of the plant's permanent personnel, will also be a relatively small one.

The estimated number of persons to be employed during the construction stage of this project (i.e., for construction, rehabilitation and installation works) will be about ***20 people***.

The estimated number of the plant's permanent personnel, to be employed during the first year of the Plant's operation (i.e., management, professional/technical and unskilled labor) will be about ***30 people***, and respectively by the fifth year of operation – about ***50 people***.

The ***Positive potential human impacts*** of the new project will be the creation of opportunities for *new employment* and *new services*, related to the plant's operation activities.

It is expected, that there should be ***no*** any kind of significant ***Negative potential human impacts*** from this project on the Oryahovo region, (for example some kind of resettlement and/or economic displacement). The new plant will be situated *inside the boundaries* of the already existing assets, and the number of the persons employed will be relatively small. Therefore, there should be no any real negative human impacts on the residential and occupational population in the project area.

During the construction stage of this project, the SPC (i.e., the Special Purpose Corporation) can provide jobs for the people from the villages, situated near the Project area. These people can be hired as unskilled laborers. Once the construction, rehabilitation and installation works are completed, some of the unskilled laborers will receive supplementary *training* and can be employed again (this time in the galvanizing operation) *on a permanent basis*. All these activities can be considered as ***Mitigation Measures***, developed during the implementation of this new Project.

6.4. Environmental Impacts Associated with Construction and Installation Activities. Mitigation Measures.

All important environmental impacts, associated with the proposed construction and installation activities of this Project have to be carefully analyzed in this section. An appropriate mitigation measures, that should be applied during the construction & rehabilitation stages of the project, must also be developed.

The main potential impacts, that could be generated during the construction, rehabilitation and installation works are the following:

- ***Noise,*** *generated during Construction, Rehabilitation and Installation activities;*

- ***Dust Emissions,*** *generated during Construction and Rehabilitation activities;*

- ***Equipment and Vehicle Exhaust Emissions***.

The new Hot Dip Zinc Galvanizing plant will be situated in the *industrial zone* of the town of Oryahovo and about 3 miles away from the residential quarters. Therefore, the proposed project activities *would not affect any archeological and/or cultural resource*s in the area.

The new plant will be installed on the premises of a former metallurgy facility, (which comprised a foundry and an electro-galvanizing facility), and shall use the major part of the already existing infra-structure of the former electro-galvanizing facility, i.e., the existing facility buildings, the industrial water sources, the inter-plant roads, offices and warehouses.

All proposed construction, rehabilitation and installation works shall be carried out within the existing plant's boundaries. There would be *no any land acquisition* and/or *change to land-use* for the new zinc galvanizing plant.

6.4.1. Construction and Installation Noise.

- **Potential Issues.**

All potential issues, related to the noise, generated during the construction & rehabilitation stage of this project, are mainly ***the possible disturbances***, that could be caused to ***the population***, residing near the project area, (but outside the boundaries of the new plant).

These possible disturbances could be provoked by the operation of all types of light and heavy construction equipment, that should be used in the construction, rehabilitation and installation works, performed on the project site.

- **Existing conditions.**

The ***existing sources of noise*** in the project area are mainly *the industrial units* of the metal-working facility, operated by the BG partner in this project – "TRE-P" and situated in the project area, the *inter-plant traffic*, and the existing *road traffic*, (outside of the facility boundaries).

- **Criteria for Determining Significance.**

Since the new plant and the existing metal-working facility are situated in the *industrial zone* of the town of Oryahovo, and not in proximity to residential quarters, these existing sources of noise are not expected to generate some significant impacts to any nearby industrial facility and/or to residential quarters.

The World Bank guidelines for recommended noise levels require, that the sound level in the industrial areas should not exceed 70 dB(A), during the day (*see Exhibit 6.1*.).

There exists also an alternate criteria, developed by the World Health Organization (WHO). The WHO guidelines specify the energy average sound level L_{eq}, and prescribe the maximum noise level L_{max} (*see Exhibit 6.2.*). This maximum noise level is important in cases, if some kinds of distinct events to the noise also exist.

Exhibit 6.1. World Bank Recommended Noise Levels.

Specific Environment	**Maximum Allowable Log Equivalent in (Hourly Measurements) dB (A)**	
	Day (7:00 h – 22:00 h)	Night (22:00 h – 7:00 h)
Residential, Institutional Educational	55	45
Industrial, Commercial	70	70

Exhibit 6.2. World Health Organization Values for Community Noise in Specific Environments.

Specific Environment	**L_{eq} (dB)**	**Averaging Time (hours)**	**L_{max} (dB)**
Outdoor living area	55	16	-
Dwelling (indoors)	35	16	-
School classrooms (indoors)	35	During class	-
Hospital, ward rooms, nighttime (indoors)	30	8	40
Industrial, Commercial, Shopping and Traffic Areas (indoors and outdoors)	70	24	110

The noise levels, recommended by the Bulgarian National Standards are presented in Exhibit 4.8. (*see Chapter 4.3.8.)*, and should not exceed 70 dB(A) for industrial areas, i.e., these values are in full compliance with the World Bank and WHO requirements.

- **Impact Analysis.**

The impact of the noise, generated during the construction & habilitation works depends mainly by *the type* of the selected construction equipment and by its *distance* to the groups of people (also referred as "receptors", or "target groups"), exposed to the noise.

All target groups, concerned with the noise impacts may be exposed to *intermittent* and/or to *variable* noise levels. During the day, such noise impacts result in a kind of a general annoyance for the people concerned, while during the night, the generated noise can disturb their sleep.

The ***potential sources of significant noise***, include mainly the *light and the heavy construction machinery*, the *camp generators* (applied for some specific construction purposes), and the *construction related traffic*, (i.e., the inter-plant traffic and the external traffic as well).

Precise *predictions* of the noise, generated during the construction & rehabilitation works, and especially at a specific location and for a precise time period, could also be developed.

For this purpose, it should be necessary to perform a profound analysis of all *important technical factors*, associated with the construction equipment, that would be operational at a given time and at a given location. These technical factors, should be analyzed and evaluated for each piece of construction equipment and can be classified as follows:

a). Maximal and minimal noise levels, measured at reference distance from each piece of the construction equipment (during its work cycles);

b). Period(s) of time, when each analyzed piece of equipment generates noise with maximal level;

c). Number of hours (during the day and/or the night), when the equipment is fully operational (i.e., the usage factor for each piece of equipment);

d). The average distance of the equipment from the target groups (i.e., the "receptors");

e). Existence of potential for noise barriers, that could attenuate the noise.

f). Atmospheric conditions in the Project Area, that could eventually affect the propagation of the noise, especially the wind speed and its direction, the humidity, the barometric pressure, etc.. However, for short distances, in the range of 100 – 300 meters, (as it is in the Project Area), the effect of the atmospheric conditions would be insignificant, compared to the other factors.

- **Mitigation Activities.**

As it was already described in Chapter 3, there are no any residential quarters, situated inside the project area. The management team of the Project will develop and apply an appropriate *mitigation activities*, that will result in *minimization* of the noise levels beyond the plant's boundaries.

These mitigation activities will be implemented through the following specific measures :

a). *Conducting a noise survey of all construction equipment.*

A Noise Survey of all construction equipment, will be conducted, (prior to its deployment at the project site, and at a regularly basis as well). For this purpose, each piece of construction equipment will be analyzed and all data, related to the noise survey will be collected, recorded and treated.

A specific database, containing the survey date, the ID of the surveyor, the equipment technical characteristics (i.e., type, ID, etc.,), the measured noise levels in all four directions (in idling and in full throttle conditions), etc., will be created and used during the development of appropriate measures for noise reducing.

b). *Reducing the equipment noise (at source).*

All types of light and heavy equipment, that emit excessive noise will not be allowed to operate on the construction site. Specific technical measures, providing the minimization of the noise levels for such kind of equipment, will be developed and applied, i.e., the equipment (under use) will be provided with mufflers, and will be regularly maintained and tuned.

c). *Reducing the traffic noise*.

The construction related traffic would enter into the project site only from the main entrance gate of the plant.

All supplementary traffic activities will be realized inside the project boundaries, i.e., the existing inter-plant roads shall be used for the purpose.

- **Residual Impacts**.

No irreversible noise impacts are expected from the proposed construction activities at the project site.

Since the size of the proposed construction & habilitation works is relatively small (*see Chapter 3.5 for details*), it is not expected that, the required noise levels (*presented in Exhibits 6.1. and 6.2.*), would be exceeded.

- **Monitoring Requirements.**

Based on the developed mitigation activities and noise minimization measures a special Noise Monitoring Plan will be developed and applied during the construction & rehabilitation stage of this project. The noise monitoring plan will provide the regular monitoring of the generated noise at source, and within the project area boundaries.

6.4.2. Dust Emissions During Construction and Rehabilitation.

- **Potential Issues.**

Potential dust emission, that could be emitted during the construction & rehabilitation activities, can eventually result in some deterioration of the ambient air quality and could be a nuisance to any person exposed to it.

Such dust emission, can be a concern particularly for the settlements, that are situated near the construction site. However, since the new zinc galvanizing plant will be situated in the *industrial zone* of the town of Oryahovo and about 3 miles away from the residential quarters, there should be no any impacts, (generated by potential dust emissions), that can eventually affect the residential population in the project area.

All inter-plant roads as well as the external roads, are ***concrete roads***, so it is not expected, that, the construction related traffic can cause significant amount of dust emissions, that could affect the persons, who shall be employed during the construction stage of this project.

- **Existing conditions.**

There are ***no any existing sources*** of dust emissions at the project site. The existing factory site has many green areas, fountains and a decorative pool, designated for recreation of the plant's personnel (i.e., for the employees of the currently operating metal-working facility, as well as for the new personnel, that should be employed).

- **Criteria for Determining Significance.**

A significant effect of some potential dust emission on the environment shall be interpreted only in case, if there is an increase in the visible dust, (due to the developed construction activities), inside and/or outside the boundaries of the project site.

- **Impact Analysis.**

Several potential sources of dust emission, that could be emitted during the development of construction & rehabilitation works at the project site, could be identified and analyzed. These potential sources include :

a). land excavation (for equipment's foundations) ;

b). exposed surfaces and/or storage piles;

c). concrete and masonry batching and mixing ;

d). truck dumping and vehicle movement ;

e). combustion of liquid fuel in construction and/or material handling equipment and transportation vehicles.

Since the project activities will not involve a significant amount of civil and ground-works, it is not expected that they will cause significant dust emissions.

The major part of an already developed infra-structure will be used in the new project.

There will be no any kind of complex excavation works, since no new factory buildings will be built (*see Exhibit 3.2. Plant Infra-structure*).

The construction activities will be mostly a rehabilitation of the existing plant buildings and warehouses (*detailed description of all construction, rehabilitation and installation works is provided in Chapter 3.5.).*

There will be no heavy cranes and heavy excavators at the construction site. The digging of all foundations, (needed for the process tanks and the furnace), will be performed only in the interior of the main plant's building, and under a strict control of all potential dust emissions.

The material handling equipment, that shall be used during the construction and rehabilitation activities will be fork-lift loaders and bucket loaders with gas engines (i.e., their combustion will be a natural gas), so there will be no significant dust emission generated. Some supplementary material handling activities will be performed by electrically-driven bridge cranes and hydraulic jibs, that are also not expected to generate significant dust emissions.

- **Mitigation Activities.**

An appropriate mitigation activities, resulting in considerable reducing of all potential dust emissions, will be developed and applied at the construction site.

These mitigation activities will be implemented through the following *particular mitigation measures :*

a). Reducing of ***all*** *potential dust emissions by* ***wet suppression***.

The wet suppression remains one of the most effective methods for suppressing and reducing of the dust emissions.

The total dust emissions could be reduced by approximately 60 to 70% *by watering of all exposed surfaces* and/or *soils*. The water can be sprinkled daily, or on specific regular basis (i.e., when there is an obvious dust problem). The frequency of the sprinkling must be kept such, that, the potential dust emissions remain under control.

b). *Reducing the potential dust emissions from the soil piles and/or aggregate stock piles.*

The particular mitigation measures, that should be applied for suppressing the dust emissions in this case can include :

- erection of windshield walls on the three sides of the piles ;

- specific covering (made of thick plastic sheets) for all piles ;

- keeping the material (in all piles) moist, by sprinkling water at appropriate frequency.

c). *Providing specific options for transportation of all materials, that are susceptible to dust formation.*

Such types of construction materials will be transported only in securely covered trucks, in order to prevent an eventual generation of dust emissions during their transportation.

d). Reducing the potential dust emissions during batching and mixing of the aggregate materials.

All aggregate materials will be delivered to the construction site only in damp condition.

A supplementary water sparkling can be applied (if necessary) during the batching and the mixing of all aggregate materials, applied in the masonry and concrete works.

- **Residual Impacts.**

The dust emissions, generated during the construction activities could eventually affect the ambient air quality at/or near the facility site. However, since the applied mitigation measures will provide a considerable reducing of the dust emissions, it is expected, that the air quality shall remain always within the acceptable limits. The potential effects of an eventual dust nuisance shall be only temporary, and with no residual impacts.

- **Monitoring Requirements.**

During all stages of the construction and rehabilitation works, performed at the project site, the potential dust emissions shall always be *visually monitored*, particularly when the construction activities should be developed close to the neighboring facilities. All appropriate control and mitigation measures shall be applied in these cases.

6.4.3. Construction Equipment and Vehicle Exhaust Emissions.

- **Potential Issues.**

All combustion exhaust emissions, generated from construction & material handling equipment, as well as from all transport vehicles, operating at the construction site, can potentially affect the ambient air quality of the project area.

- **Existing conditions.**

The construction site is located in the industrial zone of the town of Oryahovo and therefore a variety of air exhaust emission sources exists in the neighborhood.

The existing exhaust emissions are due mainly to the traffic, circulating within the industrial zone of the town. An air emissions monitoring of the Vratza district and the Oryahovo region is performed on a regular basis (*complete data, obtained during this monitoring are presented in Chapter 4.6.1.).*

- **Criteria for Determining Significance.**

A significant impact on the ambient air quality would be interpreted, if only the transport vehicles and the construction & material handling equipment, should emit some visible smoke emissions, (that could cause some nuisance to the employed personnel).

- **Impact Analysis.**

The combustion processes in all kinds of construction & material handling equipment, transport vehicles and camp generators (if any), in general result in exhaust gases, that could potentially affect the ambient air quality at the construction site.

However, since there will be no any complex construction and excavation works at the construction site, there will be no heavy cranes and heavy excavators, that could emit significant exhaust emissions.

- **Mitigation Activities.**

An appropriate mitigation activities, resulting in prevention of all adverse impacts of potential exhaust emissions on the ambient air quality will be developed and applied. These mitigation activities will be incorporated through the following *mitigation measures :*

- all types of construction & material handling equipment, transport vehicles and camp generators (if any), used during the construction and rehabilitation works, shall be properly tuned, and maintained in good operating condition, in order to minimize the emissions of pollutants ;

- the material handling equipment, applied during the construction and rehabilitation activities will be fork-lift loaders and bucket loaders, supplied with *gas engines* (i.e., the combustion will be a natural gas), so there will be practically no any harmful exhaust emissions, during their operation.

- **Residual Impacts.**

A proper implementation of all mitigation measures developed, should *not allow the generation* of any kind of long-term residual impacts on the ambient air quality.

- **Monitoring Requirements.**

On-site inspection (on a regular basis) of all types of equipment and transport vehicles will be performed, in order to ensure compliance.

6.5. Potential Impacts on the Biological Resources – Vegetation and Wildfire Loss.

The project area is characterized by the presence of weed, which has no agricultural value and can not be used for food supplies.

Since the proposed project activities do not require any kind of widening and/or new development of the existing access roads (i.e., the existing infra-structure will be fully utilized), there will be ***no loss*** of the existing vegetation, and there will be ***no any potential impact*** on the vegetation as well.

The project site is not located on the natural habitat of any faunal species and so the project activities would not result in any impacts on the wildlife resources of the area.

6.6. Potential Impacts on the Water Resources.

The amount of water, required for the operation of the new facility will be provided by the plumbing system of Oriahovo region.

An additional advantage of the new project will also be the application of a *water recycling system* (currently under operation in the metal-working facility), during some specific technologic processes (*see Chapter 3.4 and Appendix 3 for details*).

The supplied water quantities would not result in any kind of water shortage. Therefore, no mitigation measures are required, since no any potential impacts on the water resources will occur.

6.7. Potential for Safety and Health Hazards Beyond the Workplace, Mitigation Measures.

- **Potential Issues.**

Burns from touching galvanized work before it has cooled, and mashed fingers and toes are the most common injuries. Chemical burns are less common, but sometimes they also do occur. Burns from molten zinc splatter could also eventually occur.

- **Existing conditions**.

The new Hot Dip Zinc Galvanizing Plant is still not under operation, so there are no any kinds of existing conditions, related to the potentials for safety and health hazards beyond the workplace.

- **Impact Analysis.**

Galvanizing plants are similar to fabrication shops, and good managers must have a background in materials handling as well as the supervision of operating personnel. Of course, experience in the art of galvanizing is desirable, but not essential because an experienced galvanizer can be employed to train other employees in the art.

Maintenance personnel must have good experience in mechanical equipment repair. Some knowledge of electrical control circuit troubleshooting is also required.

Operating employees need not be skilled and have to be capable of learning how to operate bridge cranes, monorail hoists, and simple hand tools in the performance of their duties.

- **Mitigation Activities**

The primary concern in the operation of a hot dip galvanizing plant is the particulate emission (smoke), which escapes from the surface of the molten zinc bath as the article to be galvanized is dipped. The emission is caused by the volatilization of flux and is primarily ammonium chloride although zinc oxide is also present (See EPA AP-40). Analysis of the air around the kettle has shown that these fumes *do not present a health hazard to personnel* (American Galvanizers Association, i.e., AGA compiled data).

Emissions from the pickle tanks are not generally a problem since they are mostly *water vapour* from the heated tanks. Some acid is entrained with the vapour, and can be damaging to the plant building and equipment. The building of the facility will have an appropriate ventilation system, and the construction materials will be properly chosen, so that, some eventual damage to the building and equipment shall be minimized. *The emissions from the pickle tanks have not been found to be a health hazard in the quantities present* (AGA compiled data).

Special kinds of additives (METFIN AD01 and METFIN AD11) *for suppressing the evaporation of acid fumes by 50%*, will also be utilized in the galvanizing process (*see Chapter 5.3.4. for details*), and thus – a supplementary protection of the workers in the galvanizing area will be provided.

The *fume hood also makes a significant contribution to personnel safety* by containing the *splatter of hot zinc*, that sometimes results when work is dipped. The fume hood enclosure shall be the primary means of *preventing burns from molten zinc splatter* burns (that can eventually occur). The galvanizers must also wear eye protection and burn resistant long sleeve clothing.

Chemical burns, (that are less common), have to be prevented by wearing eye protection and protective clothing such as rubber gloves and slickers.

- **Monitoring Requirements**

A special *training courses, related with the existence of potentials for safety and health hazards beyond the workplace, as well as with the development and application of an appropriate measures for prevention of the personnel,* will be conducted to all employees, involved with galvanizing (i.e., technologic) activities, a pre-fabrication of the steel works and material handling activities.

A special kind of "***Handbook for Safety and Health Prevention Instructions*** " will be created. This Handbook will contain all appropriate measures for safety and health prevention for all personnel at the new facility.

All plant's personnel (with no exception) will be familiarized with the appropriate measures, developed in the Handbook.

6.8. Stakeholders Consultations.

It is an advantage of this project, that specific consultations, related to some potential environmental issues, have been developed at a very early stage in the project cycle. These specific consultations (referred as ***"stakeholders consultations"***), have been organized and have been carried out with a participation of ***the Project team*** and the potential ***stakeholders*** of this Project.

The stakeholders, represent people, groups, and/or institutions, that might be affected by, or can significantly influence, or are important to the achievement of a stated purpose of a proposed project action. For the purpose of this project two main categories of potential stakeholders could be identified : ***The Primary Stakeholders*** and ***The Secondary Stakeholders***.

- ***The primary stakeholders*** are people, groups and/or institutions affected positively (i.e., the so-called "beneficiaries"), or negatively by the proposed Project;
- ***The secondary stakeholders*** are people, groups and/or institutions, that have the important position of intermediaries and experts in the project delivery process.

The main objective of the stakeholders consultations, was to spread widely a relevant information on the new project and its expected environmental impacts, among the groups of people concerned (i.e., *the stakeholders*), as well as to provide an appropriate *feedback information*, collected from communities and other stakeholders, concerned with the project activities. Such feedback information could be used for eventual modification and improvement of the project's design, its planning and its implementation, (especially from an environmental and social perspective).

A second important objective of the stakeholders consultations, was to determine the range of all potential positive and negative impacts, that could be generated during the proposed project activities and to recommend an appropriate mitigation measures.

The new plant will be located at the far side of the industrial zone and not in proximity to the residential quarters (see Exhibit 1.1. and Exhibit 1.2.). However a specific survey for identification of the Primary Stakeholders was conducted in the surroundings of the new Project. Representatives from the Municipality administration (Dept. of Environment) were also included in the team, that conducted the survey.

The Secondary Stakeholders included: Government Agencies and Specific Departments of the State Administration (mainly from the BG "Ministry of Environmental and Waters"), Specific Departments of Public Universities and Science Institutions, The Municipality Authorities, the appropriate construction and waste processing companies, concerned with the project, Non-Governmental Organizations etc.

The stakeholders consultations consisted of meetings, held with the Primary Stakeholders and relevant organizations and government departments, which are concerned with the new project (and therefore considered as Secondary Stakeholders).

The purpose of these meetings was *to inform* the stakeholders about the project components, *to analyze* the generation of some eventual project impacts on the stakeholders activities, and *to record* their concerns (whether real or perceived).

Two (2) town meetings, that included Primary Stakeholders and representatives of the Oryahovo Municipality were organized by the Project team and the Project Sponsors.

The first town meeting was held in December 2006, i.e., immediately after the conclusion of the of the soil sampling analysis (conducted in the project area).

The second town meeting was held in March 2007, i.e., after the completion of the EIA Study.

During these two town meetings, a detailed explanations, regarding the project goals and project activities, were provided to the primary stakeholders. All important aspects and potential issues were discussed and analyzed. Full description of the galvanizing and the waste processing technologies, as well as the drawings of the Plant's infra-structure were made available to the local stakeholders and respectively submitted to the Municipality administration and to the representatives of the local stakeholders.

The BG translation of the EIA Executive Summary was also submitted to the local stakeholders.

A list of all individuals, organizations and institutions, consulted during the course of the study is presented in **Exhibit 6.3.**

The stakeholders concerns, expressed during the meetings held, as well the proposed mitigation measures, are presented in **Exhibit. 6.4.**

In general, there was no any specific concern, that was expressed by the stakeholders during the consultation process.

However, most of the stakeholders expressed a general concern about some possible impact on the Danube River, especially, regarding some potential discharge of any untreated waste liquids (effluents) into the river.

The new hot dip zinc galvanizing plant will be a *zero effluent facility*. The plant will be located at about 7 to 8 miles away from the Danube River, (*see Exhibit 1.1. & Exhibit 1.2.*), where a *direct effluent* in the Danube River is ***practically impossible***.

Moreover, all waste liquids of the plant will be first treated (by the facility waste processing system) and then - safely containerized and sealed in a specially designed containers, that shall be stored on a certified landfill, situated on 60 miles away from the river (*see Chapter 5. for details*).

All this considerations resulted in the fact, that this particular concern ***is not relevant to the Project***.

The future zinc galvanizing plant will be located outside of the town of Oryahovo – on the far side of the industrial zone. The aerial photos *(see Exhibit 1.1. & Exhibit 1.2),* show, that there is nothing but ***open lands*** to the South, to the East and to the North from the future Zinc Galvanizing Plant. There is a cemetery, situated to the North-West, at a distance of about 1.2 miles away from the facility site (after the cemetery there is also nothing but open lands). These is also an electrical power sub-station (designated for transformation & distribution of electrical energy), which is situated to the West, at a distance of about 0.5 miles from the future galvanizing facility. At the North-West corner of the project area

Exhibit 6.3. People, Organizations and Institutions, consulted during the Stakeholder Consultation Process

Organizations and Institutions consulted	Organization Type	People Consulted
Municipality of Oryahovo	Governmental Institution	eng. Hristo Ivanov – Mayor. architect Atanas Yordanov, Head of Civil & Architectural Department - Oryahovo Municipality); eng. Milor Milov, Head of Environmental Department - Oryahvo Municipality);
Ministry of Environment and Waters, Executive Agency of Environment.	Government	eng. Rumiana Mitkova, Director of Regional Laboratory for Environmental Control – Vratza & Oryahovo region.
Technical University – Sofia, BG.	Public University	Prof. D-r eng. Marin Georgiev, Department of Engineering Logistics and Eco-Technology.
State University "Kliment	Public	Prof. D-r Petar Slaveikov,

Ohridski"- Sofia, BG.	University	Head of Department of Geography, Biology and Geology.
Institute of Soil Science "N. Poushkarov" – Sofia.	Non-governmental organization	D-r Nikolai Dinev, Vice – Director, Department of Soil Genesis and Mineralogy
University of Chemical Engineering, Sofia, BG.	Public University	D-r eng. Dimitar Karaivanov, Department of Chemical Equipment.
The National Association for Environmental - friendly Agriculture (ECOZEM)	Non-governmental organization	eng. Ivanka Zdravkova, eng. Antonia Michailova
"The Green Future" - Independent Club of Experts	Non-governmental organization	D-r Alexander Zaimov, eng. Cveta Bratanova

Exhibit 6.4. Stakeholders Concerns and proposed Mitigation Measures.

Organizations and Institutions	**Discussions and Concerns.** **Mitigation Measures proposed.**
Municipality of Oryahovo	Potential impacts from possible effluents in the Danube River. Possible discharge of untreated waste and potential contamination of the soil in the project area. *Full prevention measures, that exclude any possibility for occurrence of such events are developed*
Ministry of Environment and Waters, Executive Agency of Environment.	The conducted field and analytical study proved, that there was no existing contamination of the soil(s) in the vicinity of the Project Area. The soil in the project area should be preserved from any potential pollution, due to the operation of the new plant. *All appropriate mitigation measures, providing full protection of the soil during the waste treatment procedures and the temporary storage of the waste on-site, and excluding any kind of potential soil contamination, are developed and will be carried out.*
Technical University – Sofia, BG.	Options for redundancy in the plant's logistics chains should be provided. *The Design For Reliability (DFR)*

	approach was applied in the project. The equipment configuration respects the parallel layouts and provides options for redundancy, i.e., if some kind of a non-predictable failure in a system's component eventually occurs, the other modules of the system remain functional and the plant continues to operate.
State University "Kliment Ohridski"- Sofia, BG.	There are no endangered species reported in the project area. There should be no loss of the existing vegetation since the project activities will be developed within the existing boundaries of the facility site.
Institute of Soil Science "N. Poushkarov" – Sofia.	Soil preservation measures at facility site during the waste treatment procedures must be provided. *Appropriate mitigation measures are developed and will be applied on-site*.
University of Chemical Engineering, Sofia, BG.	The technologies, that shall be used for neutralization of the spent liquids are properly selected. Options for supplementary treatment of the waste (by solidification and stabilization) could be used. *These supplementary options are already provided by BalBok Engineering.*
The National Association for Environmental -friendly Agriculture (ECOZEM)	Possible discharge of untreated waste and potential contamination of the soil in the project area. *Full prevention measures, that exclude any possibility for occurrence of such events are developed.*
"The Green Future" - Independent Club of Experts	Possible effluents in the Danube River. *This particular concern is not relevant to the project.*

6.9. Conclusions - Significance, Sensitivity and Nature of the Impacts

In order to assign the Project to the World Bank & OPIC defined categories, the nature, magnitude and sensitivity of the environmental issues have been considered. Outlined below are various aspects and considerations that address the Project's potential environmental impacts, direct and indirect, including reference to preventive, mitigatory and compensatory measures.

- **SIGNIFICANCE**

The future Plant ***will be generating from 6 to 12 cubic yards of waste PER MONTH (liquids and solids included), i.e., about 70 to 140 cubic yards of waste PER YEAR,*** depending on the capacity of the processed steel works.

The ***containers*** to be used for storing and transporting of the treated waste liquids, sludge & solids are compliant with applicable regulations, and will be properly sealed until their final destination is reached.

The ***transport vehicles***, that shall be utilized for transportation of the already containerized waste will be in full compliance with the ***ADR Convention*** (see Appendix 5.4.).

All this means that, **NONE** of the Project's potential impacts can be qualified as ***"significant"*** due to the lack of the following attributes:

a) direct pollutant discharges, that are large enough to cause degradation of air, water or soil;

b) large-scale physical disturbance of the site and/or surroundings;

c) extraction, consumption, or conversion of substantial amounts of forest and other natural resources;

d) measurable modification of hydrologic cycle;

e) hazardous materials in more than incidental quantities;

f) involuntary displacement of people and other significant social disturbances.

- **SENSITIVITY**

The Project has no irreversible impacts; it does not affect vulnerable ethnic minorities, involve involuntary resettlement, or affect cultural heritage sites.

- **NATURE OF IMPACTS**

The potential impacts of the Project **do not** include any of the following attributes:

A. Irreversible destruction or degradation of natural habitat and loss of biodiversity or environmental services provided by a natural system;

B. Risk to human health or safety (for example, from generation, storage or disposal of hazardous wastes, or violation of ambient air quality standards).

Chapter 7. Analysis of Alternatives.

Two main alternatives, related to the equipment configuration (layout) and the resulting implementation of the technologic and the logistics chains were considered. The two alternatives were referred as *"Variant 1"* and *"Variant 2"*.

The equipment layout of the galvanizing system was initially developed in both variants :

- Variant 1. Perpendicular configuration (layout) with serial connections in the logistics and technologic chains;
- Variant 2. Parallel configuration (layout) with parallel–serial connections in the logistics and technologic chains.

A ***"Design For Reliability (DFR)" approach***, (referred as ***"Variant 2"*** in *Exhibit 3.3. Equipment Layout*), was implemented in the project phase of the new plant. The equipment layout (developed as a reliability structural schema), respects the parallel configuration and provides options for redundancy in the technologic and the logistics chains, i.e., if some kind of a non-predictable failure in a system's component eventually occurs, the other modules of the system remain functional and the plant continues to operate.

A logistics, reliability and technologic analysis of both variants, was performed and "Variant 2" was selected as a main option for the equipment layout in this project.

Chapter 8. Conclusions.

This EIA Study was carried out to assess the environmental and socio-economical conditions, as well as the potential impacts of the proposed Hot Dip Zinc Galvanizing Project – Oryahovo, Bulgaria. A final ***EIA Report***, documenting the EIA processes and results was prepared. The EIA Report was developed in compliance with the relevant guidelines, set by the Overseas Private Investment Corporation (OPIC), the IFC, and the BG Ministry of Environment and Waters (BG MEW).

An important amount of baseline environmental and socio-economical information was collected from a variety of information sources, including reports on previous studies and published literature. A considerable and a very important preliminary information, (related to the existing soil conditions in the project area), was collected also from a field survey, which was specially developed for the purpose of this EIA study. The collected information was used for creation of specific profiles on the natural, socio-economic and cultural environments, that could eventually be affected by the project activities.

As new zinc galvanizing facility will be located in the industrial zone of Oryahovo, where the residential communities are at least 3 miles away, there should be no significant environmental and/or social impacts during the construction phase of this project. The only environmental concern, expressed by the stakeholders consulted, was related to some potential discharge of any untreated waste liquids (effluents) into the Danube river. Since the new hot dip zinc galvanizing plant will be a zero effluent facility and will be situated at about 7 to 8 miles away from the Danube River, a direct effluent in the river is practically impossible. All waste liquids will be first treated, after that - safely containerized (in HAZMAT containers), and finally - disposed at a certified landfill. All this considerations resulted in the fact, that this particular concern is not relevant to the Project.

It is therefore concluded, that, if all project activities, including the strict implementation of all mitigation measures, will be developed as described in this EIA Report, then, the anticipated project impacts on the natural and the socio-economical environment (in the project area), will be well within the acceptable limits. The proposed project will also comply with all statutory environmental requirements and norms, presented in Chapter 2 of this EIA report.

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