

ANNEX 18

WASTE MANAGEMENT PLAN FOR WORK FACES, SITES, AND CAMPS

1 INTRODUCTION

The present Waste Management Plan describes the necessary procedures and equipment to manage and dispose of waste generated during the construction phase of the Project. It also details the responsibilities the implementation of this plan requires as well as records and reports to be required for control and supervision purposes.

The plan has been developed following the relevant Chilean regulations as well as management best practices applicable to design and management of waste containment facilities.

In general the philosophy of the waste management system considers the following, in order of importance:

- Return to suppliers.
- Re-usage or recycling.
- Delivery to external operators.
- Disposal in landfill in the case of solid waste.
- Disposal to shallow streams in the case of liquid waste (meeting the existing regulation).

Specific areas will be defined to manage household and industrial waste generated by the project.

Additionally, all contractor companies shall keep the facilities and their working areas cleaned and tidy ensuring the right disposal of their waste as per the detailed management plan herein. Upon the end of the contract, the contractor company will conduct a general cleaning in the area where they have worked, removing the working sites and waste generated.

With regard to liquid waste generated during the construction stage these are to be treated and reused in PHAM in almost 100% for irrigation and watering of roads and site surfaces. During winter time the Project will discharge treated water to the nearest runoff water bodies in compliance with the maximum limits provided under S.D. N°90/2001.

Prior to the construction phase, the Owner commits to submit a “Plan of Facilities for Worksites and Camps” to the authorities that will include a layout and specifications for all and each facility as to supplement the above described.

2 WASTE IDENTIFICATION AND CLASSIFICATION

Wastes generated during the construction phase of the Project will be classified based on the following types: *hazardous waste and non-hazardous waste*. This classification is important to define the most appropriate way to manage such waste.

2.1 NON-HAZARDOUS WASTE (RNP)

2.1.1 Non-hazardous Solid Waste

This type of residue includes:

- Muck: Mainly refers to humid and crushed rock extracted from tunnels (considered as waste for internal environmental management purposes.)
- Construction Waste: Consist of wood, cropping of pipes, slag, wires, rest of packaging, metal, painting bins and cans, adhesives, and similar.
- Domestic waste or waste that can be considered as domestic: Mainly include remains of food from cafeteria, packing, paper, cardboards, among other.
- Vegetal Waste: Include pieces of bushes, weed, and in lesser proportion, trees removed from the work site.

Sorting of the waste will be done at the worksite as to classify the different types of non-hazardous recyclable waste using containers for glass, plastic, metal, etc. This will include that the staff will carefully manage the waste facilitating the sorting jobs in the areas dedicated for waste storage located in different camps.

2.1.2 Non-hazardous Liquid Waste

A. Waste Water

This type of residue include waste water from restrooms, showers, cafeterias, as well as from other activities conducted within the camps and worksite facilities and work faces. This waste water will be subject to primary and secondary treatment by installing modular activated sludge treatment plants at each camp.

B. Liquid Industrial Waste

With regard to industrial liquid waste these are only generated during the activities of concrete preparation, wash and preparation of gravels, washing of vehicle bodies and truck bins, machinery, tooling, and lastly, during the construction of tunnels that will produce water from within thereof.

Based on the above, the generation of this type of liquid waste will be restricted only to work faces. For camps, any waste water will be generated as the activities developed thereof will be there while the staff is present.

2.2 HAZARDOUS WASTE (RP)

2.2.1 Hazardous Solid Waste

Hazardous solid waste generated by the Project includes waste produced in workshops, store rooms, and work faces such as:

- Solvents
- Used oil
- Lubricant grease
- Batteries
- Oil filters

From the environmental point of view, waste classified as non-hazardous although some of those might not have any characteristic of reagent, flammable, radioactive, corrosive and/or toxic as per the definitions under SD 148/03 del MINSAL. Based on the above, GENER will adopt procedure for documentation and labeling as well as storage, handling, and disposal of these materials in a safe manner as provided under the current legislation.

3 QUANTIFICATION OF WASTE AND ORIGINATING ACTIVITY

Total volume of muck disposal to be generated during the construction phase of the project is of 1.7 Mm³. This material comes from tunnel excavation, road opening, and channel construction. Detail of stock sites for muck disposal and the amount produced by activity is listed under Annex 6.

With regard to waste generated from construction activities the production volume is estimated at 30 - 40 m³/month as detailed under Section 2.5.1 of the EIA. This low rate of generation is due to the re-usage or sale of part of materials that have a commercial value and to the usage of pre-assembled component at the site.

Waste managed as hazardous waste by maintenance and servicing activities to machinery and equipment is estimated at 200 L/month by site facility.

Domestic waste or waste considered as domestic is generated at the camps and site facilities. A conservative estimation of the global amount generated is about 2,500 Kg. /day during the construction phase as per a generation rate of 1 Kg./person/day, and considering a maximum manning of 2,500 workers (this figure considers all camps.)

Estimation of movement of waste by sector is included in the global flow analysis for the Project (see Annex 14).

Liquid waste classified as waste water come from camps and work faces with a volume estimated based on the number of workers present during the construction stage. The generation of this type of waste is an average of 60 m³/day by camp (a conservative estimate), for total manning of approximately 400 workers with an average usage of 150 L/day/worker.

Industrial liquid waste generated is basically water with suspended solids, mainly: sand, clay, and residues of concrete and cement.

Lastly, there is not any a priori estimation of waste from vegetable produced by clearing the area as to execute the works. However, a reduced volume of waste generated is estimated.

4 WASTE MANAGEMENT PROCEDURE

4.1 NON-HAZARDOUS WASTE MANAGEMENT

4.1.1 Handling

A. Solid Waste

Inert-type waste such as muck, construction, domestic or considered as domestic and vegetable waste will be collected regularly from the different points of generation.

Domestic or considered domestic waste will be placed in polyethylene bags and differentiated in containers as per the type of material having the potential to be recycled at each point of generation. The bags will be closed when removed from the containers and a new bag will immediately be replaced in the empty container; closed bags will be loaded into vehicles enabled for this purpose. This residual material will be delivered directly to an authorized landfill and operated by a third party (see Table 5.1.1).

Waste that is considered non-organic domestic waste and some other waste from the construction such as metal, cans, etc., that can be potentially recycled or reused will be transported to the waste management yard. There will be a waste management yard in all site facilities. In this area the waste corresponding to the different type of materials will be unloaded. There will initially be areas for wood, non-ferrous metal, and ferrous metal, plastic, paper, and cardboards. Based on the generation rate for this type of waste and returns by re-usage and recycling of material, other areas will be implemented and those originally proposed will be rearranged. Priority will be given to re-usage of these materials in the work faces and/or sale to third parties. Waste that cannot be reused, recycled or sold will be disposed of in a landfill as stated under Section 2.5.1 of the EIA.

Delivery of vegetal material to landfill should be avoided. This type of material could be used in reforestation programs (soil/land restoration) or will be placed in neighboring, non-intervened areas that will be used as safeguard areas for displaced species as a result from the works (restoration of habitat conditions) while used as material that mitigates the effect of the wind and hold atmospheric moisture. This waste shall not be burned under any circumstance.

Waste from excavation (muck) will be managed as detailed under the Muck Disposal Management Plan (see Annex 6 “Muck Disposal Management Plan”).

All waste from construction that is reusable will be stockpiled nearby the construction activities and will be reused for all activities when feasible. Rest of construction materials that cannot be reused will be ultimately disposed at the landfill.

B. Liquid Waste

— Waste Water

Waste water generated at the camps will be subject to primary and secondary treatment by installing modular activated sludge treatment plants at each camp. These systems include unit operations designed and equipped to purify waste water until reaching a degree of purity which allows its disposal or re-usage without any risk for human life and the environment.

In the construction phase during the rainfall period waste water will be discharged to runoff water bodies complying with the maximum limits provided under S.D. N° 90/2001 in its Table N° 1. This table set the "Maximum allowable limits for discharge of all liquid waste into river water." Waste water treatment plants will be located at the 5 camps described under the PHAM, in the areas of El Volcán, el Yeso, Aucayes Alto, Aucayes Bajo, and sub-station or tunnel Las lajas (see more detailed information about the location areas of treatment plants in Chapter 3, Section 3.3.2, and Annex 15). Additionally, treated water shall also meet NCh 1.333 “Water quality requirements for different usages” therefore in summertime this water could be used, with prior sanitary authorization to water surfaces for dust control purposes.

Water generated from the work faces resulting from usage of chemical baths will be transported by the contractor using pit cleaning trucks to the camps for further treatment.

Slurry produced from water treatment will be removed on a weekly basis by the contractor to be transported and disposed of in authorized places. The slurry will be removed using pit-cleaning trucks and, depending on the volume of slurry produced, it is estimated that 2 to 3 of these trucks (6 m³) will be needed by camp per week during the phase of construction.

The Contractor shall keep a control record of the volume removed. These documents will be available to the authorities when needed.

On the other hand, during the phase of operation the Project will use the facilities of the existing control building at Central Power plant; therefore it is not necessary to install a waste water treatment system and no slurry will be produced thereof.

— **Liquid Industrial Waste**

Given the characteristics of this waste water a sequential settling system to be enabled is considered. A settling pond will be enabled at each work face which will allow separation of liquid industrial waste into clear water and settling slurries. The settling systems will be located in the areas of El Volcán, el Yeso, Aucayes Alto, Aucayes Bajo, sub-station or tunnel Las Lajas, the area of Caballo Muerto and the discharge area of Maipo river (see more detailed information about the location points of the settling systems in Chapter 3, Section 3.3.2 and Annex 15).

The settled solid material extracted from the settling ponds will be placed in the muck disposal as material to be used as landfill. The removal frequency is 15 days.

The contractor shall keep a record of the volume of solid removed from the settling ponds; these documents will be available to the authorities upon necessary. Settled solid material will be de-hydrated using a press filter. This way transportation of this material will be done using a 60% humidity as to prevent it from flowing¹.

5 FINAL DISPOSAL

5.1 SOLID WASTE

Domestic waste or waste considered as organic domestic waste will be disposed of in a landfill. Construction waste, with the exception of debris and domestic waste or waste considered as non-organic waste will be delivered for sorting purposes to the waste management yard where material that can be valued will be returned for recycling and re-usage. The rest of the material will be sent to a landfill.

Below is a list of some of the sites authorized in the Metropolitan Region for final disposal of solid waste from construction and domestic waste or waste considered as domestic that can be used by Contractors.

¹ Design and management of muck disposal will prevent sliding, percolation, or detachment of settled solid material. Also, in order to prevent that this material is discharged to water bodies (in the case of disposal and piling located nearby those) slope containment barriers will be built to prevent muck material falling into the rivers.

Table 5.1.1
Recipients of Non-Hazardous Solid Waste

Name	Address	Line of Business
Domestic Waste or Waste considered as Domestic		
Relleno Sanitario Loma Los Colorados (KDM)	Panamericana Norte, km 62, Til- Til.	Landfill for domestic waste.
Relleno Sanitario Santa Marta.	Predio Rústico Santa Elena de Lonquén S/N Talagante	Landfill for domestic waste.
Relleno Sanitario Santiago Poniente	Fundo la Ovejería de Rinconada Lo Vial, Comuna de Maipú	Landfill for domestic waste.
Construction Waste		
Estin S.A.	Panamericana Norte Oriente km 17 ½ parcela 3. Fundo la Montaña, Colina.	Metal recovered from slag.
Gerdau Aza S.A.	Panamericana Norte, km 18, Renca.	Scrap smelter.
Proacer S.A.	Panamericana Norte Km 37. Til-Til.	Recipient of iron scrap.
Albromet	Camino interior Lampa-Renca. Parcela 6, Lote A-2. Pudahuel	Metal waste recycling plant of metal from smelting processes and metal chips; not including lead.
Comercial Romerelli S.A.	Arzobispo Subercaseaux N°4155, Estación Central	Piling, sorting, and treatment (cutting) of iron scrap, stainless steel, copper, bronze, aluminum, and zinc.
Comercial de Metales Cerrillos S.A.	Chañarcillo N°1141, Maipú	Non-hazardous industrial waste and non-ferrous waste recycling plant (copper, bronze, aluminum, stainless steel, lead and lead alloys in non-dispersed form), electronic waste, plastic, cardboard, and wood.
Baterías Cosmos Ltda.	Circunvalación Chacabuco Lote 2 y 3 B, comuna Lampa	Trading, recycling, storage, sorting of lead solid waste, lead by-products, and lead smelter, recipient of car and transportation vehicle batteries, that have lead content.
Recupac S.A	Calle Nueva N° 1821, Huechuraba.	Recovery of paper and cardboard.
	Av. Gabriela N° 02971, La Pintana.	
	Av. Cerrillos N° 960, Cerrillos.	
Sorepa S.A	Venecia N° 3.200, San Joaquín	Recovery of paper and cardboard.
	Camino Renca-Lampa s/n, parcela N° 3 Lo Boza, Pudahuel.	
Norma Angélica Catalán Torres	Jose Joaquín Pérez N°7433, Cerro Navia	Piling, sorting, and sale of solid waste consisting of cardboard and paper.
Tecnotambores S.A.	Lago Llanquihue N° 0491, San Bernardo.	Reconditioning, fabrication, and final disposal of containers. .
Yasna Bravo Bustamante	Camino n° 1, parcelación de Las Mercedes parcela n° 16, sector Batuco, Lampa	Recovery of metal containers.
Luis Segundo Mariman	Camino Santa Margarita N°	Recovery of containers and final disposal.

Name	Address	Line of Business
Lara	100, San Bernardo	
Engar Ltda	José Joaquín Pérez N° 4809, Quinta Normal.	Recovery of drums.
Tambores TMS.	Radal N° 564. Quinta Normal.	Reconditioning and storage of containers.
Coagro S.A.	San Martín 545. Buin.	Stock center for chipping and storage of empty containers: Plastic or metal containers of phyto-sanitary products
Martinez y Valdivieso S.A.	Panamericana Sur km34. Buin.	Stock center for chipping and storage of empty containers, plastic or metal containers of phyto-sanitary products.
Comercializadora de envases de la Fuente	Lo Amor N° 5976, Quinta Normal	Reconditioning of metal and plastic containers.
Plásticos del Norte Ltda.	Camino Lo Boza N°4105, Renca	Stock, sorting, and recycling of polyethylene plastics.
Agrimet Ltda.	Camino Lonquén Sur s/n paradero N°26, Calera de Tango	Stock center for chipping and storage of empty containers, plastic or metal containers of phyto-sanitary products.
Compagnon Bernabé y Cia. Ltda.	Camino Santa Margarita N° 0830, San Bernardo	Stock, sorting, and recycling of plastic boxes and lids.
Empresas Melón S.A.	Pedro de Valdivia N° 98, La Calera	Final disposal of tires not in use by co-incineration using a cement kiln. This recipient is located outside the jurisdiction area of the RM Seremi.
Semot	Elisa Correa N° 3936, Puente Alto	Stock of scrap and industrial waste considered as construction waste.
Regemac	Elisa Correa N° 1470, Puente Alto	Stock of scrap and industrial waste considered as construction waste.
Petreatos Quilin	Av. Departamental N°8250, Peñalolén	Stock of scrap and industrial waste considered as construction waste.
Idea Corp	Camino Catemito, Parcela N°6, San Bernardo	Stock of scrap and industrial waste considered as construction waste.
Villamor S.A.	Troncal San Francisco N° 1970, Puente Alto	Stock of scrap and industrial waste considered as construction waste.

Source: SEREMI Salud (www.seremisaludrm.cl)

Final disposal of muck will be done at the muck disposal sites enabled for such purposes as stated under Section 2.3.2.6 of the EIA and the Muck Disposal Management Plan (see Annex 6.)

A program to control rodents and insects in the waste management area will be developed.

5.2 LIQUID WASTE

5.2.1 Waste Water

With prior authorization of the sanitary authorities, waste water treated at the modular plants not intended for irrigation and watering of the areas in the Project will be discharged to runoff water bodies in strict compliance with the maximum limits provided under SD 90/2001.

The points of discharge will be located in the proximity of sites established for camp location and, therefore, nearby treatment plants (see Annex 15). Such points will be subject to monitoring by PHAM of water treated prior discharge considering compliance of the emission standard. Therefore, all and each parameter of the standard would be considered an operational indicator of the efficiency each treatment system has. Discharge water bodies are Estero El Morado, Río Yeso, Estero Aucayes² and Río Colorado (see more detail under Chapter 3, Section 3.3.2 and Annex 15)

It is essential to point out that the process used at the treatment plants will allow purification of waste water for further re-usage (most of it during periods without rainfall) without any risk for the environment reaching concentrations below the maximum limits of quality parameters provided under NCh 1.333. While strictly speaking this standard is not applicable to the expected use of the Project, the parameters of such standard will be considered as reference values for environmental follow-up purposes.

During the months of summer waste water treated will be used for watering roads and other surfaces within the work sites. Watering of roads and other surfaces within work sites will help reduce dust emissions or re-suspended particle matter. This measure will have the corresponding sanitary authorization.

During the construction phase management of slurry coming from waste water treatment plants includes temporary disposal of such using containers that are specially made for that purpose and which are available at the treatment plant. These containers are then removed weekly by the site contractor for transportation and final disposal in authorized locations. As the municipality does not currently have an authorized landfill, all slurries will be transported using pit cleaning trucks to one of the authorized sites listed in this Annex.

5.2.2 Liquid Industrial Waste

With regard to the final disposal of liquid waste the Project considers their disposal and treatment using settling ponds which will produce clear water 100% reusable.

² Water under water collection for human use

In the periods without rainfall a greater percentage of treated water will be reused for concrete processing or for construction related activities. Also, it will be used for watering of roads and work site and camp surfaces.

During rainfall periods treated water will be discharged to runoff water bodies nearby each of the 5 working camps as well as nearby the areas of Caballo muerto and discharge of Río Maipo, including Estero El Morado, Río Yeso, Estero Aucayes³, Río Colorado, and río Maipo (see Chapter 3, Section 3.3.2 and Annex 15), always meeting D.S. 90/2000 of MINSEGPRES. See more detailed information about points of discharge of treated water and river streams included in Chapter 3 Section 3.3.2.

5.3 HAZARDOUS WASTE MANAGEMENT

I. Handling

Management of hazardous waste includes management of used lubricants and oil as well as other waste from servicing and maintenance of equipment.

The first stage of hazardous waste management is the collection. This activity will be conducted using safety tools and the necessary equipment to collect, gather, and store in the appropriate containers for this type of waste. Under any circumstance hazardous waste will be combined with non-hazardous waste.

Containers will be moved and transported using mechanical support and vehicles that have been prepared for this type of material. Storage will be done in the hazardous waste management yard which will meet all provisions under SD N° 148/03 of MINSAL. There will be a waste management yard in all site facilities. This area for temporary disposal will be approved by the sanitary authorities. As possible agreements will be made with suppliers generating hazardous waste as to return containers as well as all those items that can be reused, thus minimizing the generation of this type of waste in the Project.

For safeguarding the workers of the Project information signs and boards will be placed in camps, work site facilities, and work faces addressing handling and management procedures for hazardous waste.

All workers will be trained in handling and managing of hazardous waste and their impact on the environment, general information about hazardous waste management plan using SD N°148/03 of MINSAL as a reference. Workers participating in operations that generate hazardous waste will be trained in other matters related with compatibility of waste and procedures for packaging, labeling, and temporary storage of hazardous waste using disposal containers.

Below are the specific procedures for handling and managing of some specific hazardous waste:

³ Water under water collection for human use

- *Used Lubricants and Oil.* Used lubricants and oils from servicing activities and processes of equipment will be stored in sealed drums on the hazardous waste management yard.

During the construction works of the Project PCB free oils will be used.

- *Oil and Fuel Filters.* Used filters for oil and fuel will be generated from equipment and machinery. Handling of this material will be the responsibility of the Head of Maintenance and will be done as follows:
 - Punching and draining the filters.
 - Collecting used oil or drained fuel in the appropriate container for storage and further final disposal at authorized locations.
 - Storing of drained filters in hazardous waste containers.
- *Cleaning Items.* Cleaning items will be used in most of the site facilities. Some of these items can be classified as hazardous waste themselves. If cleaning hazardous waste cannot be reused nor recycled, they will be stored in the storage area for hazardous waste.

In the event of a spillage of hydrocarbons, sand or sawdust placed at the storage sites for fuel intended for that type of events will be used for treatment and final disposal purposes to an external operator authorized.

II. Final Disposal

Final disposal of hazardous waste will be done using companies authorized (see Table 5.3.1) wherein such waste will be transported in 210 l or less drums.

Below are some of the possible final recipients for hazardous waste. All these recipients are duly authorized.

**Table 5.3.1
Main Recipients of Hazardous Solid Waste**

Name	Address	Line of Business
Hidronor Chile S.A.	Vizcaya N° 260, Pudahuel.	Treatment Plant for industrial solid, liquid waste.
Bravo Energy Chile S.A.	Av. Las Industrias N° 12.600, Maipú.	Treatment Plant for industrial waste. Oily aqueous waste, solvent waste, non-oily aqueous waste, oil filters, aerosol in small containers, and pharmaceutical waste. Storage, drainage, and disposal of exhausted electrolyte from acid led batteries.
Sercoin S.C.I. Ltda.	Las Acacias N° 02519, San Bernardo.	Recycling of pigment resins, solvents.
Sociedad Recycling Instruments Ltda.	La Estera N° 257, Parque Industrial Valle Grande, Lampa.	Recycling of solvents, used lubricant oils, and hydraulic oils.
Reciclaje Ecotrans Ltda.	Doctor Amador Neghme 03639, La Pintana.	Treatment and recycling plant for exposure liquids and solvents and reusable cleaning cloths.

Name	Address	Line of Business
Petroquímica Futuroil Ltda.	Camino Lo Castro, parcela N° 9, Lampa.	Refining of used lubricant oil.
Baterías Palmher	Av. Federico Errázuriz N° 1054, Pudahuel	Collection, storage, sorting, and trading of vehicle batteries not in use

Source: SEREMI Salud (www.seremisaludm.cl)

6 HAZARD RATING OF HAZARDOUS WASTE

Below is the hazard rating of the main waste to be generated during the construction stage of the Project as per the rating provided under SD N° 148/03 of MINSAL.

Table 6.1
Hazard Rating of Waste

Waste	Rating	DS 148		
		List*		
Muck / scrap	Non-hazardous	-	-	-
Wood	Non-hazardous	List B	B3	B3050
Pipe cropping	Non-hazardous	List B	B1	B1010
Wires	Non-hazardous	List B	B1	B1010
Packaging waste	Non-hazardous	List B	B3	B3020
Metal	Non-hazardous	List B	B1	B1010
Paint containers (latex or water based)	Non-hazardous	List B	B4	B4010
Adhesives	Non-hazardous	List B	B4	B4020
Food	Non-hazardous	-	-	-
Plastic containers	Non-hazardous	List B	B3	B3010
Paper	Non-hazardous	List B	B3	B3020
Cardboard	Non-hazardous	List B	B3	B3020
Vegetable waste	Non-hazardous	List B	B3	B3060
Used Tires	Non-hazardous	List B	B3	B3040
Solvents	Hazardous	List A	A3	-
Used oil	Hazardous	List A	A3	A3020
Lubricant grease	Hazardous	List A	A3	A3020
Batteries	Hazardous	List A	A1	-

Waste	Rating	DS 148		
		List*		
Oil filters	Hazardous	List A	A3	A3020
Containers for chemicals	Hazardous	List A	A4	A4130
Fuel containers	Hazardous	List A	A4	-

* The list provides the rating detail for every waste as provided under SD 148/03 of MINSAL.

7 WASTE MANAGEMENT FACILITIES

The infrastructure for an integral management of waste during the execution of the Project, for temporary storage, sorting, and preparation for transportation will include:

- Disposal sites for waste at the generating location (SAR)
- Yards for non-hazardous waste (PRNP)
- Yards for hazardous waste (PRP)
- Warehouses for hazardous waste (BRP)
- Waste water treatment plants
- Waste water settling plants

These facilities will have the authorization from the sanitation authorities.

7.1 DISPOSAL SITES FOR WASTE AT THE GENERATION LOCATION (SAR)

Each work face will have an area dedicated for storing non-hazardous solid waste, referred to as “Waste disposal sites,” waiting transportation to the waste management yards located at the different site facilities.

The temporary disposal site for construction waste will be fenced and will have waterproof flooring and its design will include a chute for spillages. Also, it will have a fire extinguisher and will have proper signage.

On the other hand, hazardous waste that can be generated at the working faces due to maintenance and servicing operations of equipment will be immediately transported to the nearest yard for hazardous waste thus preventing they remain at the working faces.

7.2 NON-HAZARDOUS WASTE YARD (PRNP)

The concept of waste management is based on taking a second look at waste sorted in an organized fashion after being rated in the SAR to then assess the potential for re-usage in the different activities in the Project, considering alternatives for recycling or re-usage, externally or internally. Special areas will be implemented in this yard for sorting and placing purposes of the different waste collected.

These yards (PRNP) will be located in a delimited area within site facilities.

7.3 HAZARDOUS WASTE YARD (PRP)

Hazardous waste will be managed separately from non-hazardous waste. A disposal yard will be implemented for hazardous waste at each of the site facilities as per the provisions stated for hazardous waste disposal under SD 148/03 of MINSAL. Hazardous waste generated at the work faces and site facilities will be immediately transported to the yards (PRP).

Below are the general characteristics of these yards:

- Waterproof, chemically and structurally resistant flooring to waste.
- Surrounding fence with 1.8 m high minimum as to prevent entering of animals and people.
- Roofing and protection against environmental conditions such as humidity, temperature, and UV rays.
- System to conduct and control spillage as to prevent contact with the soil. This system will have a capacity to hold spillages or runoffs exceeding the volume of the largest container and should not have a capacity less than 20% of the total volume of the containers stored.
- Control of access.
- One floor facilities without underground level.
- Evacuation routes in a sufficient number, location, and right identification allowing a fast exit of all people present to safety areas as provided under SD N° 594/99 of MINSAL.
- Exit gates and doors for evacuation will be opened in the direction of the evacuation without using neither keys nor any other mechanism which require a special knowledge in terms of exits operation.

The storage area will be designed to hold drum-type, transportable containers that will have the right size and thickness compatible with the waste stored therein.

Containers will be moved and transported using mechanical support and vehicles that have been prepared for this type of material. Only containers exceeding 30 Kg. will be moved manually.

Storage facilities will mostly hold used oils and lubricants. These areas should be duly signaled with signs informing of the class of substance stored in access ways and on the sides as provided under NCh 2190 as well as on the containers.

Hazardous waste will be stored separately as per its hazard rating as to prevent contamination. Under any circumstance the storage period will exceed six (6) months. Once a significant number of containers with hazardous waste is stored these will be transferred to the authorized facilities for their final disposal.

On the other hand, hazardous waste containers will not be reused and will be replaced every time they are transferred to the final disposal location.

Flammable substances or substances that combust easily will be stored separately in warehouses from the rest of the hazardous substances. These storage facilities will be built with a minimum fire resistance of type "A" and in locations that are distant from the main exit gates as provided under the General Ordinance for Urban Planning and Construction.

The storage site for flammable or reactive waste will be located at a minimum of 15 m from the limits of the tenure as provided under Article 35 of SD N° 148/03 of MINSAL.

7.4 HAZARDOUS WASTE WAREHOUSES

In the event that the Contractor enables warehouses for disposal of hazardous waste it is not possible to define specific construction aspects beforehand such as dimensions, loading of fuel, etc., as such aspects are part of the construction schedules of each Contractor. Notwithstanding the above, the Owner considers implementing (as required under the contract) at least the following measures as provided under Manual for Storing Hazardous Chemical Substances from the SEREMI of Health of the Metropolitan Region:

- Electric installations within the warehouse will be implemented in compliance with the existing regulation and will be stated by the SEC.
- The minimum clearance stored waste from the inner walls should be 0.5 m as per the existing regulation.
- 2.4 m wide at minimum with a clear delimitation in yellow lines.
- The minimum width of secondary hallways will be 1.2 m.
- A warehouse with low fuel loading and solid structure, fireproof, with light roofing and with fireproof walls will be used as provided under the General Ordinance for Urban Planning and Construction.
- The firefighting control system will include the implementation of elements that allow keeping internal and external communication in the warehouse as well as fire control and extinguishing equipment, spillage and leakage controls and personal protection and decontamination equipment
- While is not possible to currently determine the dimensions the warehouses for solid industrial waste will have, the general construction characteristics will include:
 - Signage indicating the class of substance stored in access ways and sidewalls (NCh 2190 Of. 93).
 - Solid, washable, non-porous flooring.
 - Natural or forced ventilation system depending on the chemical substances stored with air replenishment system adjusted as per SD N° 594/99 of MINSAL.
 - Evacuation routes in a sufficient number, location, and right identification allowing a fast exit of all people present to safety areas as provided under SD N° 594/99 of MINSAL.
 - Exit gates and doors for evacuation will be opened in the direction of the evacuation without the need of using keys or any other mechanism which requires a special knowledge to operate such exits.
 - All facilities for waste management will have only one floor without underground level.
 - A collection system for spilled liquids will be implemented depending on the product stored.

Prior to the construction phase, the Owner commits to submit a "Plan of Facilities for Worksites and Camps" to the authorities that will include a layout and specifications for all and each facility as to supplement the above described.

7.5 WASTE WATER TREATMENT PLANT

Waste water treatment consists of a primary and secondary treatment by modular plants using activated sludge.

Waste water treatment using activated sludge operation consists in injecting air (*aerobic treatment*) to a volume of waste water inside a very large tank.

Air injection is created by a pump or "blower" which injects air through the bottom part of the tank allowing that the bubbles created by diffusers passively move upward to the surface of the tank.

"Activated sludge" refers to the biological treatment system which uses aerobic bacteria that degrade the dissolved, fine particle, organic matter in the host fluid. The process consists of creating a convenient environment which fosters the ideal conditions for the proliferation of aerobic bacteria that will metabolize the organic matter present in waste water, thus promptly precipitating and settling such material.

The inclusion of air micro-bubbles in the aqueous medium amidst a turbulent jet allows precipitation of enough air and generates the kinetic energy necessary to break the chains of bacteria thus promoting their exponential growth.

The addition of air and, therefore oxygen, allows compensating the Bio-chemical Demand of oxygen (DBO) bacteria required promotion of degradation metabolism.

A clarification and settling process of water ensures the necessary conditions to produce the precipitation of the bacteria flocculate resulting from the metabolism of bacteria forming the activated sludge. Clear water can be pumped to chlorination tanks for sanitary disinfection and further re-usage in alternative purposes. Treated waste water will meet the quality parameters provided under SD 90 and will be discharged to a runoff water body. Treated water shall also meet la NCh 1.333 therefore in summertime this water could be used, with prior sanitary authorization to water surfaces for dust control purposes.

7.6 WASTE WATER SETTLING PLANT

The Owner considers enabling a sequential settling system. A settling pond will be enabled at each work face which will allow separation of liquid industrial waste into clear water and settling slurries. The ponds will be built using sound material parapet walls and stabilized with waterproof membrane.

Waste water collection from each of the sites identified as sources generating liquid water (washing of trucks, machinery, washing, concrete washing, etc.) will be done by enabling counter-slope platforms in those areas where such activities will be conducted. These areas will have a surrounding trough to collect the water that will be then direct to the settling pond.

Settled material will be dehydrated by using a press filter. The purpose is to obtain sludge with approx. 60% humidity, which makes it more appropriate for further transport to disposal locations.

8 TRANSPORTATION OF WASTE

8.1 INTERNAL TRANSPORTATION

Internal waste transportation will be conducted from the different generation sources (disposal sites) to the management yards by using equipment, routes, and previously defined signs as provided under Article 26 of SD 148/03 of MINSAL.

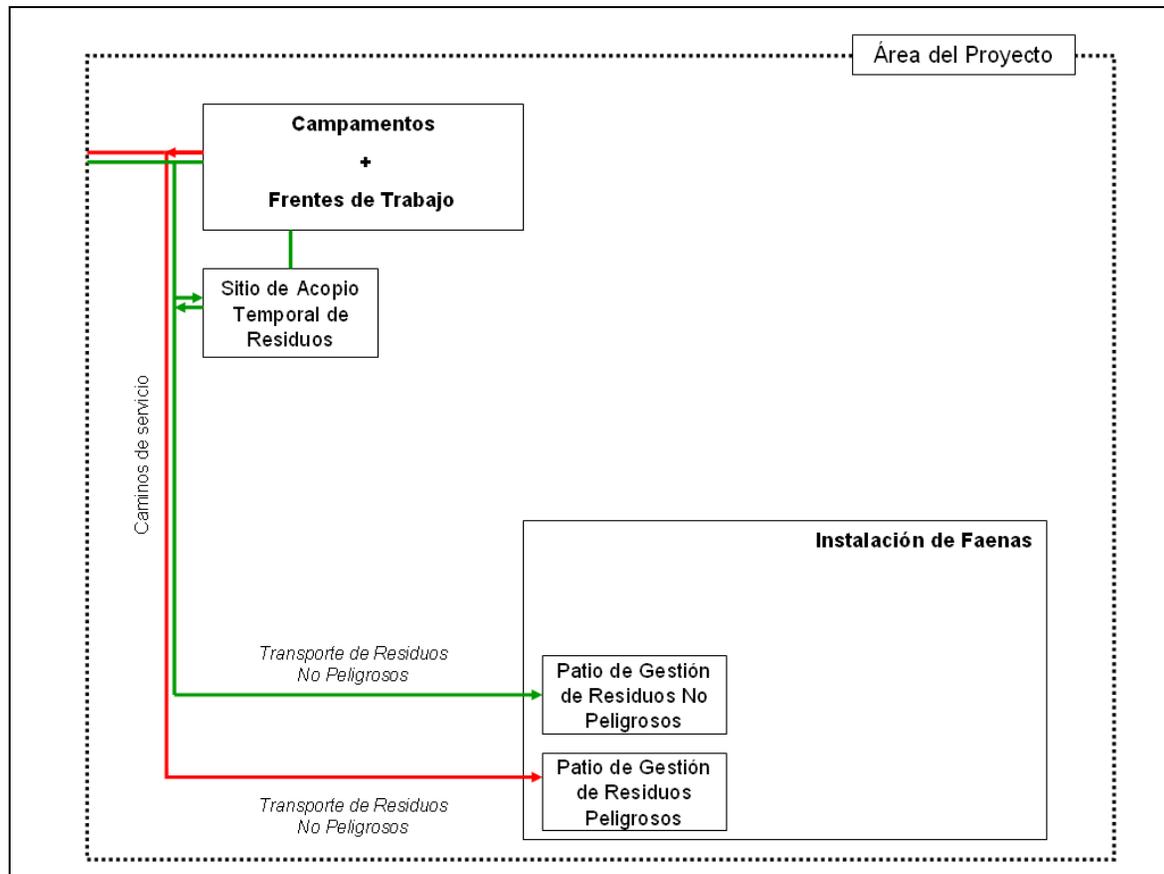
Non-hazardous waste collection and transport include the following:

- Establishing a routine schedule for non-hazardous waste collection and disposal considering removal from source points every day;
- Locations where waste are generated will be equipped with the appropriate containers for disposal purposes;
- Procedures intended to control that bad odors are produced will be implemented. These procedures include keeping the containers with lids closed, using plastic bags, and regular cleaning.
- Priority will be given to housekeeping as to prevent waste build-up at the facilities; and
- A record will be kept about transfer of both non-hazardous and hazardous waste to final disposal locations.

Mechanical equipment will be used for mechanical transportation of waste. These equipment will move and transfer the containers to the special vehicles which are appropriate for these purposes. Particularly in the case of muck these will be transported by trucks, wagons and/or conveyor belts.

With regard to the routes to be used for internal transportation of waste -both hazardous as non-hazardous, below is a scheme illustrating the internal transportation of waste (see Figure 8.1).

Figure 8.1
Schematics of Internal Transportation of Waste



Source: In-house preparation

Inner and access roads used for internal transportation of both hazardous and non-hazardous waste will have the appropriate signs for vehicle traffic such as signs, area delimiting tapes and other signal elements providing instructions, directions, maximum allowed speed, restricted areas, etc.

Safety Datasheets will be used as control measure for the transportation of hazardous waste for all the different types of hazardous waste produced. While transported all necessary cautions will be adopted as to prevent their reaction or combustion, and to avoid spillages.

All and every staff participating in the transportation of both hazardous and non-hazardous waste will be duly trained in the appropriate operation of the vehicle and its equipment as well as to face possible emergencies in compliance with the provisions under SD N° 148/03 of MINSAL and SD N° 298/94 of the Ministry of Transportation and Telecommunication which provides the Regulation for the Transportation of Hazardous Substances on Streets and Roads.

On the other hand, collection vehicles used for waste transportation shall not exceed their loading capacity while in use.

8.2 EXTERNAL TRANSPORTATION

Presently the municipality of San José de Maipo does not have a municipal landfill. Therefore domestic waste needs to be transferred to Santa Marta landfill located in the municipality of San Bernardo. This is done through a program for waste collection that covers from La Obra to San Gabriel and El Alfalfal. Consequently it is expected that waste transportation will be done outside from the municipality of San José de Maipo.

The following Table illustrates the routes located in the municipality:

Table 8.2.1
Approaching routes to PHAM Work faces and Camps

Route	Section	Construction Works
G-25	Parallel to Río Maipo	Works at río Maipo
G – 345	Parallel to Río Colorado	Works at Alfalfal II- Las Lajas
G – 455	Connects Route G-25 to El Yeso	Works at El Yeso
Laguna Negra	Connects Route G – 455 to Laguna Negra (private road).	Works at El Yeso
Volcán – Baños Morales	Connects Route G-25 to the towns of Volcán, Baños Morales, Lo Valdés.	Works at El Volcán

With regard to external routes, that is, those located outside of the municipality, it is not possible to define at present a specific route. Therefore this will depend on the contractor responsible for such activity. However, the Road Impact Study attached under Annex 14, has defined an area of influence with a great coverage which allows assessment of impacts beyond the internal routes of the municipality.

With regard to vehicle traffic generated by the Project, the item “other loads” in Table 8 in the study quoted an estimate of the vehicle contribution in traffic from the transpiration of waste and other minor input used during the construction stage of the Project, either for camp and site facilities operation as well for work operation. In particular the Project will generate a flow traffic of 7 truck /hour, distributed in the 7 operational facilities of the Project (5 camps and installation of working sites and 2 site facilities). The flow referred herein is the largest in magnitude. The above is based on the fact that estimations consider a traffic flow ranging from 0.1 to 0.7 trucks per hour, rounding up the figure to 1 as to include all scenarios.

In terms of impact, the contribution of flow from traffic added to other flows will not generate significant interventions on the Roads. The above information is consistent with the conclusions of the Road Impact Study (Annex 14).

9 CONTROL SYSTEMS

9.1 RECORD AND SAFETY DATASHEET

Hazardous and non-hazardous waste management yards will be operated by authorized and trained staff that will perform their duties in accordance with the valid legislation.

As control measure all waste produced by the Project will be logged in a book of records and specific procedures as to act accordingly in the event any contingency occurs. The record will include all safety datasheets of products store in compliance with NCh 2245 Of. 93. These records, which will be written in Spanish language, will be kept in a safe place and will be available to the staff in charge of the yards (PRNP and PRP).

Safety datasheets and records of both hazardous and non-hazardous waste generated by the Project will include the following information:

- Quantity in weight and/or volume as well as identification of the characteristics of rating of hazard of waste generated on a daily basis.
- Quantity in weight and/or volume as well as identification of the characteristics of rating of hazard of waste entering or exiting the storage site.
- Quantity in weight and/or volume as well as identification of the characteristics of rating of hazard of waste rejected an/or recycled in the corresponding activities or processes.
- Quantity in weight and/or volume as well as identification of the characteristics of rating of hazard of waste sent to third parties for disposal.

The record of waste generation will be differentiated between waste generated continuously (on a daily basis) and waste generated occasionally. The former type of waste will have a daily record while the latter will be recorded on the day the waste is created.

9.2 LABELING OF SUBSTANCES

As provided under Article 4 of SD N° 148/03 of MINSAL, hazardous waste will be identified and labeled as per the risk type and classification provided under la NCh 2.190 of.93. This labeling will be kept from storage to disposal of waste.

The label for substances will include, but will not be limited to, information such as name, address, telephone number of the source entity, date of placement in container, associated risks, and actions to follow in the event of an emergency.

Figure 9.2.1 shows the different types of labels that will be used for hazardous waste as per their individual characteristics.

Figure 9.2.1
Labeling and Hazard Rating Characteristics

ROTULACIÓN	CARACTERÍSTICA DE PELIGROSIDAD
	Residuos Tóxicos Agudos
	Residuos Reactivos
	Residuos Corrosivos
	Residuos Inflamables
	Residuos Tóxicos Extrínsecos y Residuos Tóxicos Crónicos

Source: Guide for preparation of Hazardous Waste Management Plans. CONAMA/GTZ, 2005

9.3 GOOD OPERATIONAL PRACTICES

Good operational practices will be implemented during the construction stage of the Project intended to minimize the generation of both hazardous waste and non-hazardous waste. The following will be applied:

- Periodically, inventory control will be conducted as to prevent the expiration date on raw material necessary during the construction stage is reached thus becoming hazardous waste as well as to ensure that the raw material entering first into the camps and work site facilities are the first ones to be used.
- Periodical inspections of equipment and operations to detect failures, breakdowns, need to replace and equipment maintenance.
- Failure and leakage control
- As much as possible an agreement shall be reach with suppliers as to have raw material distributed in reusable and returnable containers that do not need to be wash at the facilities.
- The staff in charge of waste handling and managing needs to be previously trained as to prevent the generation of hazardous waste due to poor practices.

9.4 HAZARDOUS WASTE STATEMENT AND TRACKING SYSTEM

The staff in charge of the transportation of hazardous waste outside the facilities of the Project will have available a document of Statement and Tracking of waste as provided under SD N° 148/03 and Resolution N° 5.081/93, both from MINSAL at all times. One copy of each of these documents will be submitted to the corresponding Health Authorities upon beginning of the transportation.

10 SAFETY MEASURES

10.1 EMERGENCY RESPONSE AND CONTROL PLAN (CONTINGENCY PLAN)

An Emergency response and control plan will be available at the facilities of the Project in the event of emergencies due to spillages, transportation or management/handling of waste (Contingency Plan.) This Plan should, at least, include the following measures:

A. Once the emergency finishes

- Measures will be adopted as to protect those employees that are directly exposed
- Waste compromised during the emergency will be identified using safety datasheets and records. These records will be regularly updated in terms of their quantity, characteristics, and location of existing waste and hazardous waste at the facility.
- The character, source, amount, and extent of the event will be identified (fire, explosion or leakage)
- Risks to human health and environment from the event will be identified considering the type and quantity of the substance spilled and the receiving medium (soil, water.) This task will be conducted by risk prevention experts along with the environmental affair person.

- Immediate notification will be given to the relevant agencies (Fire department, Police, Health Authorities.) An updated list with all individuals and public agencies that need to be notified in the event of an emergency will be available.

B. During the Control phase

- Measures to prevent the dissemination and recurrence of the event (fire, explosion or leak) will be adopted.
- All facility or work face operations will be stopped should the magnitude of the event so requires.
- Leaks, pressure, gases generated or breakdown of valves, pipes or any other equipment will be continuously monitored as deemed appropriate.
- Emergency staff will be equipped with emergency aids and equipment and personal protection equipment will be available at the facilities.

C. After the Emergency

- Treatment, storage, and final disposal of waste, contaminated soil and water resulting from the emergency which will be treated as hazardous or non-hazardous waste as per their hazard rating.
- At the areas impacted by the incident substances or waste not compatible with the material released or leaked during the incident will not be managed.
- Equipment used to control the emergency will be decontaminated and replaced.

D. Evacuation Plan

Evacuation Plans will be established as to face events such as:

- Explosion with ejection of particles and hazardous waste
- Leakage, spillages or chemical reactions emanating toxic fumes
- Fire that can be controlled and that do not grow to other areas in the facilities or that might produce toxic fumes or vapor.
- Every event requiring personal protection equipment for control purposes which is not available at the facilities.

10.2 FIRE CONTROL SYSTEM

All facilities for waste disposal and management will be equipped with fire prevention and control elements such as:

A. Internal and external communication systems as well as alarms that can be used to render emergency instructions or request help.

Implementation of speakers, bells or any other element allowing communication within the facilities is considered as provided under the existing legislation.

B. Fire control and fighting equipment

Fire-fighting and control equipment in place at all times, wherein such equipment will consist of dry chemical and CO₂ fire-extinguishers for the different types of fires that might occur due to different flammable materials or fuels existing in the location or that are handled. The total number of fire extinguishers and their location will depend on the surface area to be protected as provided under Article 46 of SD N° 594/99 of MINSAL "Regulation for Basic Sanitary and Environmental Conditions at the Workplace".

Extinguishers shall meet the requirements and characteristics provided under SD N° 369/96 of the Ministry of Economy, Promotion, and Re-construction. Also, they will be certified by an accredited laboratory as provided in the regulations thereof.

The extinguishers will be periodically subject to check, control, and preventative maintenance by qualified staff at least once during the year. The Contractor shall be responsible for adopting the necessary measures to prevent that the different workplaces lack extinguishers when maintenance is provided.

PRPs will have in place an independent system for fire control using dry powder, water or foam depending on the product and the amount of waste in storage.

Quantity and capacity of extinguishers and fire control will be established in accordance with the existing regulation.

C. Personal Protection Equipment and Decontamination Equipment

These equipment include usage of complete uniform, safety gloves, breathing masks, rubber boots, safety shoes and goggles, breathers, disposable clothing, among other.

10.3 OTHER SAFETY CONSIDERATIONS

Waste disposal sites and management yards will have restricted access, therefore only staff duly authorized by the person responsible for the facility will be authorized to enter the site. With regard to the safety of workers, disposal sites and waste management yards will be equipped with personal protection equipment such as complete uniform, gloves, masks,

safety shoes and goggles, as per type of hazardous waste and as provided under SD N° 594/99 of MINSAL, when appropriate.

As provided under SD N° 594/99 of MINSAL, evacuation routes will be identified in their number, capacity, and location as to allow a prompt evacuation of all staff to the safety areas defined. Exit gates and doors for evacuation will be opened in the direction of the evacuation without the need of using keys or any other mechanism which requires a special knowledge to operate such exits.