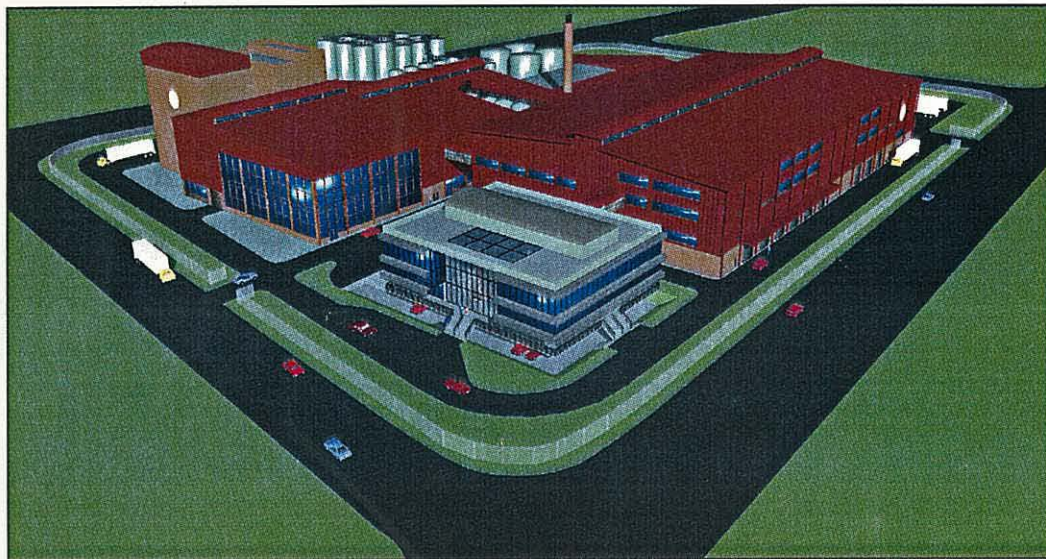


San Miguel Brewery Hong Kong Limited



Environmental Impact Assessment
of Proposed Brewery at
Yuen Long: *Executive Summary*

November 1995

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CONSULTING SERVICES BY ENVIRONMENTAL RESOURCES MANAGEMENT

214-0813/BC

EIA/020.3/95

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Reference C1214\Issue 3

For and on behalf of ERM Hong Kong

Approved by: *P. Chung*

Position: *Technical Director*

Date: *22 November 1995*

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1 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

San Miguel Brewery Hong Kong Limited (SMHK) propose to relocate and expand its existing facilities at Sham Tseng to a new site at the Yuen Long Industrial Estate. ERM Hong Kong were commissioned by SMHK in August 1994 to undertake an Environmental Impact Assessment (EIA) of the implementation of the proposed relocation. This Executive Summary presents the main findings and recommendations of the EIA (appended as a separate volume) together with a brief description of the brewery project.

1.2 PURPOSE OF THE STUDY

The purpose of the EIA is to assist in minimising environmental impacts from the construction and operation of the new brewery by providing information on the nature and extent of the potential environmental impacts recommending mitigation measures where appropriate.

The objectives of the EIA are as follows:

- to minimise pollution, and nuisance arising from the development and its operation and environmental disturbance during construction, operation and decommissioning of the project.
- to identify and evaluate the net impacts expected to arise during construction and operational phases for the issues outlined in the EPD Study Brief.

This assessment will focus on the proposed site design with a view to determining if there are any insurmountable residual environmental impacts associated with the development in construction or operational phases.

The development is proceeding on an exceptionally fast track with the new Brewery expected to be operational in 1996. As such this EIA has been conducted in parallel with the detailed design process enabling environmental considerations to be incorporated into the design at an early stage.

PROPOSED DEVELOPMENT

2.1

SURROUNDING ENVIRONMENT

The new San Miguel Brewery (SMB) is to be sited in Section L of Yuen Long Town Lot No 313, inside the Yuen Long Industrial Estate. The site location and its surrounding environment are shown in *Figure 2.1a*. As is expected in an industrial estate, the vicinity of the SMB site is occupied by other industrial users.

2.2

DESCRIPTION OF THE DEVELOPMENT

The site is just under four hectares in area, and will house the entire SMHK brewing operation. San Miguel has a multi brand strategy and their product lines include:

- San Miguel Pilsen;
- San Miguel Super Dry;
- Lowenbrau;
- Kirin; and
- Sun Lik.

The new brewery will be designed for an annual target production capacity of 1 million hectolitres (M hl) (Phase 1), and is capable of being expanded to 1.5 M hl in the future if so required (Phase 2). The expansion would involve the installation of additional equipment, mainly for storage, blending and filtration purposes. Note that no extra boilers are necessary for the possible Phase 2 expansion. The extra production capacity for Phase 2 would be achieved by extending the actual brewing time per week. Note this EIA is completed on a conservative basis for the ultimate capacity in Phase 2.

Main raw materials used for the brewing operations are water, malt, rice and hops.

Figure 2.2a shows the layout of the new brewery. The site is divided into four main areas:

- *The Process Building*

The process building houses all the equipment for beer production. The brewing process includes the malt storage facilities and processing plant, the main brew house, wort cooling, and spent grain handling. After brewing, products pass to the fermenting and storage facilities which include the filtration system, yeast propagation system and beer recovery system. The equipment includes a large number of stainless steel tanks with associated pipework and fittings.

The process building also houses various utilities including systems for steam generation, compressed air, carbon dioxide (CO₂) recovery, glycol cooling, and refrigeration.

Four boilers will be installed to raise steam for use in the various brewing operations. Three of these boilers run on light diesel oil (LDO). The other is a dual fuel boiler running on both LDO and biogas, utilizing beneficially a by-product from the on-site biological wastewater treatment plant.

Stack emissions from these boilers have the most potential to impact local air quality of the various emissions from the Brewery.

• *The Packaging Building*

The packaging building includes facilities for bottling, canning and kegging, together with the equipment for palletising, washing, pasteurizing and packing. These operations are expected to be the main sources of potential noise impacts from the Brewery.

• *The Administration Building*

The offices and reception area will be based in the administration building where there is also a half basement for carparking.

• *The Ancillary Buildings*

These include substations, the waste water treatment plant, dangerous goods stores, the guard house and fire control room, together with hardstandings and roadways.

The wastewater treatment plant has been specifically designed and built to treat all kinds of wastewater generated at the Brewery. Influent collected in the equalization tank and sludge generated from the treatment process could have generated bad smells if left exposed and posed as potential sources of odour impacts from the Brewery. However, the potential odour impacts have been designed out by covering the equalisation tank and enclosing the desludging process.

2.3 **PROCESS DESCRIPTION**

Brewing and Packaging are the two main stages involved in the production of beer.

2.3.1 **Brewing**

Wort Production and Treatment

This process involves the extraction of the desirable components from malt, cereal adjuncts and hops using conditioned water, producing an extract

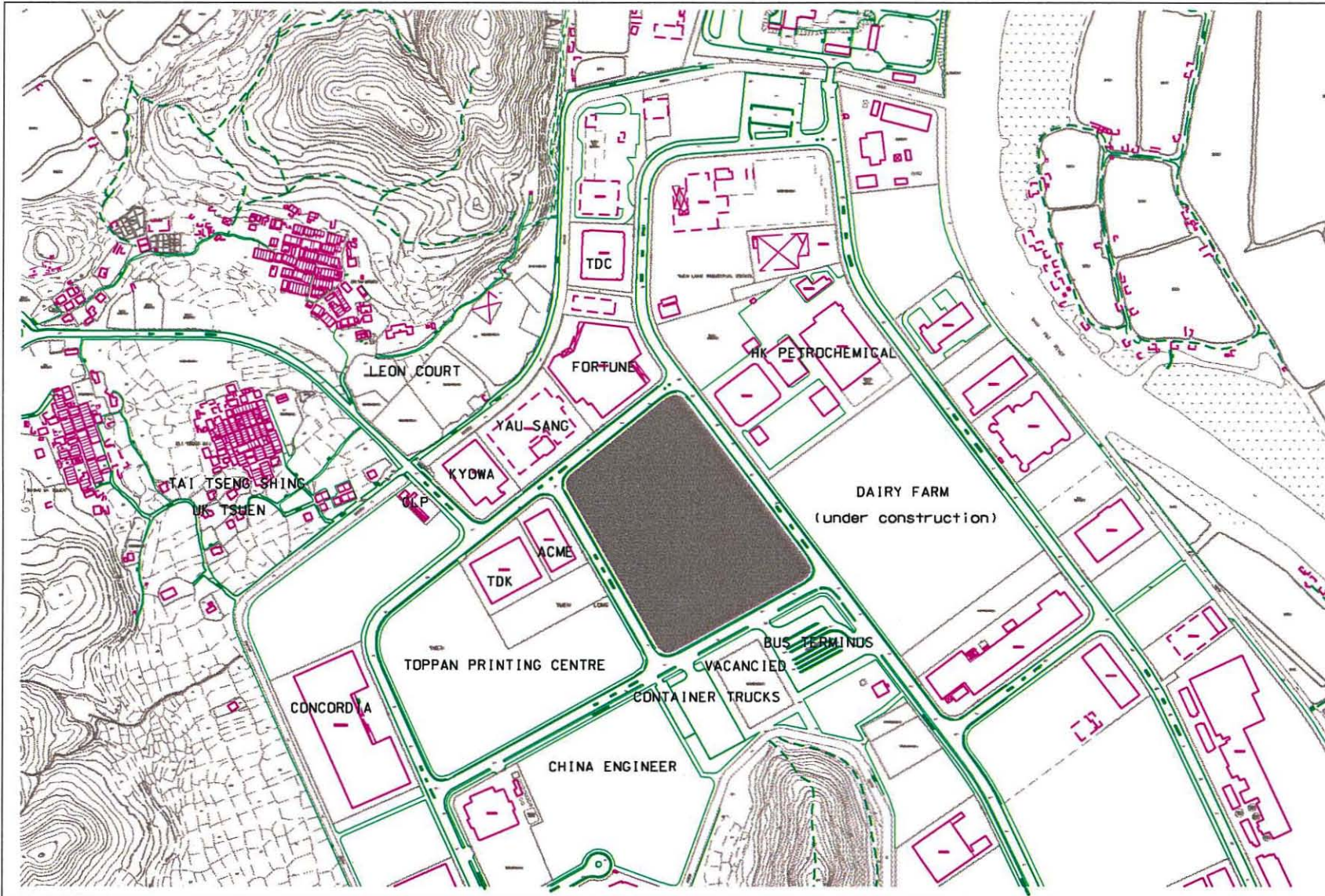


Figure 2.1a Site Location and Surrounding Environment

Date : 4 November 1994

Drawing no.: ERMHK/GIS/C1214/001

Prepared by : GIS & Mapping, ERM

Base map : 1:1000 topo. LANDS DEPT.

KEY

 SMB WORK SITE

ERM Hong Kong
 5, 10-11 th Floor
 Hecny Tower
 9 Chatham Road
 Tsimshatsui, Kowloon
 Hong Kong



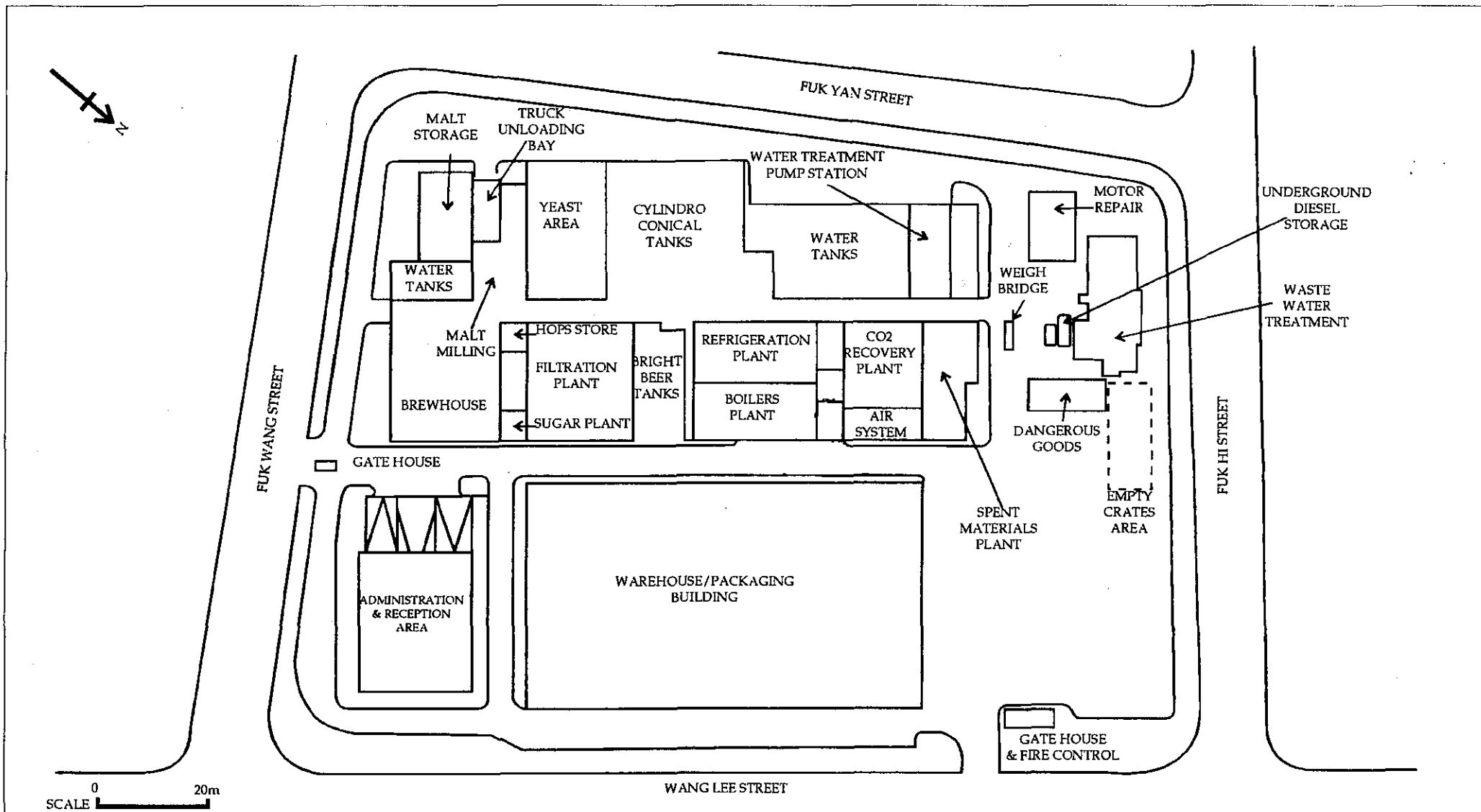



FIGURE 2.2a - LAYOUT OF BREWERY

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solution called *wort* which is the starting material for fermentation by yeast. The major operations involved are listed in *Table 2.3a* and are presented in a flow diagram in *Figure 2.3a*.

Spent grains are produced as a major by-product from the wort separation and sparging operations. These will be transported off-site for sale as animal feed but are also a potential source of odour nuisance.

Table 2.3a *Major wort production and treatment operations*

Operations	Location
Malt milling	Malt mill
Cooking of Unmalted Cereal Adjunct	Cereal Cooker
Mashing	Mash vessel
Wort separation and sparging	Mash filter
Wort boiling	Brew kettle
Hot sludge separation	Hot wort tank/ Whirlpool tank
Wort cooling	Wort cooler
Cold wort aeration	Wort aerator

Fermentation

Fermentation is the process by which treated *wort* is converted into *beer* by yeast, producing the desired alcohol content and flavour in the final product. The major operations involved are listed in *Table 2.3b* and shown in *Figure 2.3b*.

Table 2.3b *Major operations in Fermentation*

Operations	Location
Pitching of wort with yeast	Yeast room
Fermentation of wort by yeast	Fermenting tank area
Yeast recovery and storage	Yeast room

CO₂ gas and spent yeast are generated as by-products during the fermentation process. The gaseous CO₂ produced is purified, condensed and liquefied. It is reused throughout the production process and injected into the beer during the beer storage and conditioning processes. Any surplus is to be sold in tankers or cylinders.

Beer Storage and Conditioning

The properties of the fermented beer are adjusted to the required level by:

- removal of excess flavour compounds produced during fermentation; and
- optimal removal of residual substances that result in haze formation.

This is then followed by *Clarification* and *Carbonation* of beer to give the product a brilliant appearance and palatability. The major operations involved are listed in *Table 2.3c* and are presented in a flow diagram in *Figure 2.3b*.

Table 2.3c *Major beer storage and conditioning operations*

Operations	Location
Beer cooling and storage	Beer storage tank area
Beer cooling and final filtration	Beer filtration room
Beer carbonation and Cooling	Bright beer cellar

As shown in *Figure 2.3b*, spent yeast is produced as a by-product during the fermentation and beer storage operations. The spent yeast will be dried and packed in paper sacks for sale to food industry. It is also a potential source of odour nuisance.

In addition, during the beer final filtration process, waste filter cake will be produced which will need to be disposed of off-site.

2.3.2 *Packaging*

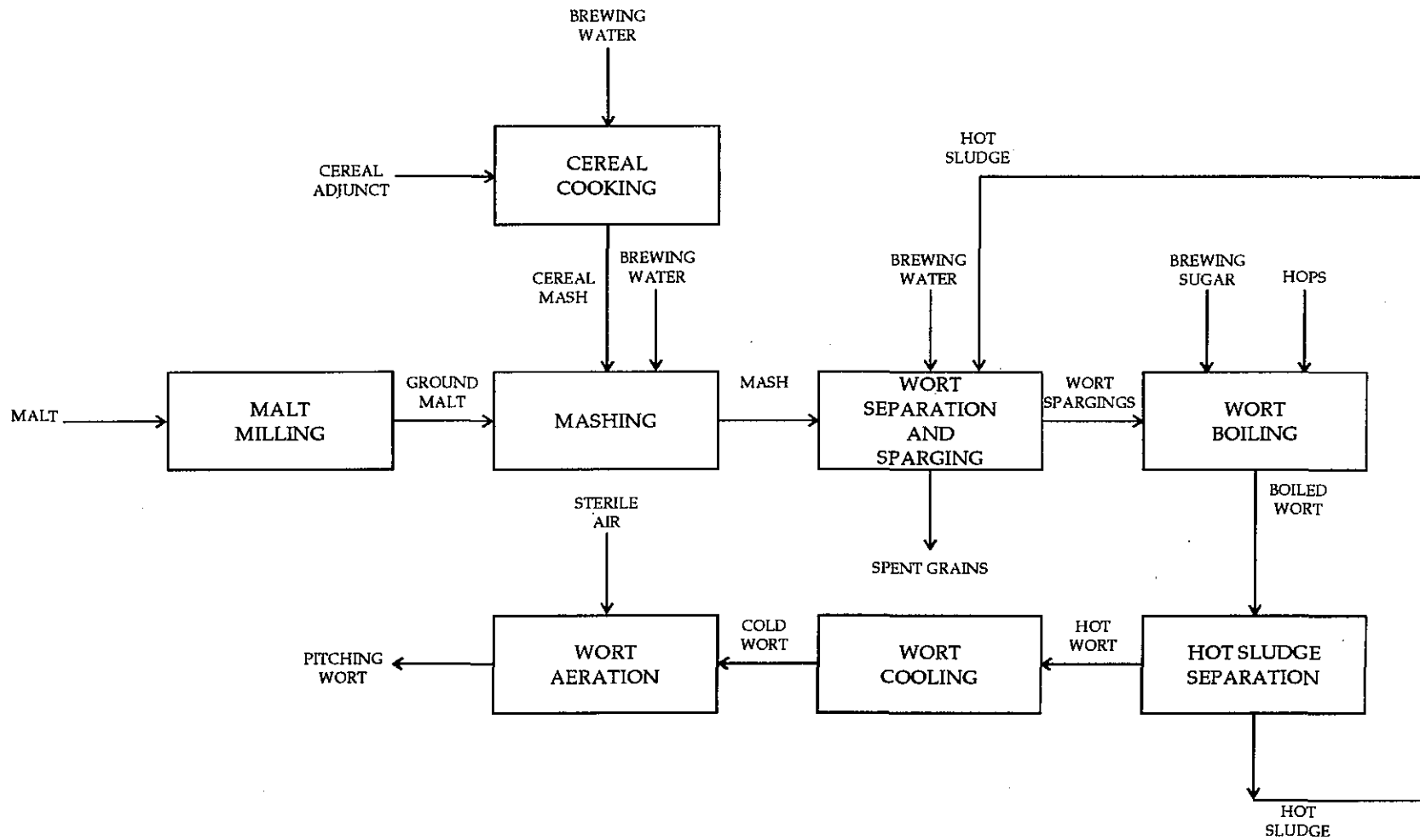
Bright beer produced is either bottled, canned or kegged. These are further divided into the following categories:

- Returnable bottles 640 ml and 330 ml
- Non-returnable bottles 330 ml
- Cans 500 ml and 330 ml
- Kegs 30 litre and 50 litre

The major beer bottling and canning operations are listed in *Table 2.3d*.

Table 2.3d *Major Bottling and Canning Operations*


Beer Bottling	Beer Canning
Depalletizing of bottles in cases	Can depalletizing
Uncasing of bottles	Can rinsing
Bottle pre-inspection	Can filling
Bottle washing and inspection	Removal of headspace air
Bottle filling	Can seaming
Removal of headspace air	Pasteurization
Bottle crowning	Final product inspection
Pasteurization	Packing
Final product inspection	Palletizing
Bottle Labelling	Other operations such as carton forming and sealing
Packing of bottled beer in cases or crates	
Bottled beer palletizing	
Other operations such as case washing, carton forming and sealing	

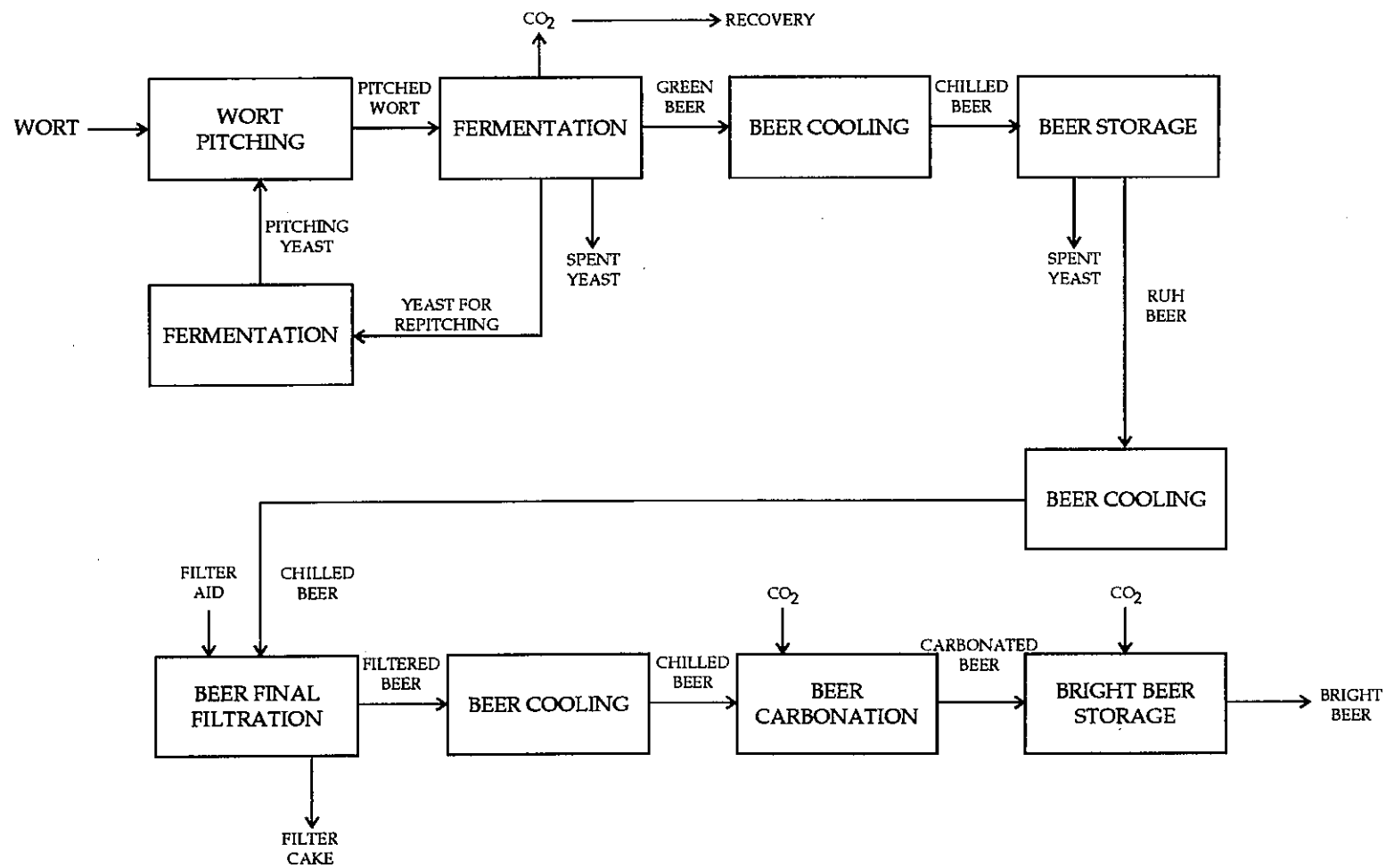


BREWERY BY-PRODUCT: SPENT GRAINS

FIGURE 2.3a - WORT PRODUCTION AND TREATMENT

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BREWERY BY-PRODUCT: CO₂ AND SPENT YEAST FILTER CAKE

FIGURE 2.3b - BEER STORAGE AND CONDITIONING

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 Hong Kong



3.1 INTRODUCTION

In general the EIA has shown that environmental impacts of the proposed Brewery, as currently planned or at ultimate capacity, will be acceptable. The new technology and design philosophy employed represents a considerable improvement on environmental grounds over SMHK's current operations at the old Brewery in Sham Tseng. This section summarises the scale of the predicted impacts and recommended mitigation measures.

3.2 WATER QUALITY

3.2.1 Construction Phase

The construction of the new brewery is not envisaged to have any water quality impacts provided that proper site management and good housekeeping practices are implemented.

3.2.2 Operational Phase

The operation of the Brewery will generate large volumes of effluent, in the region of 1120 to 1360 m³ per day (1680 to 2000 m³ per day for Phase 2). Consultation with the Drainage Services Department (DSD) and the Hong Kong Industrial Estate Corporation confirmed that there is adequate sewerage infrastructure to accept the effluent load from both Phase 1 and 2 of the new Brewery. However, DSD recommended that buffer tanks should be used to regulate peak flow conditions so as to prevent overloading of the sewerage system. SMHK's on-site biological wastewater treatment plant will be equipped with a buffer tank that will be used for this purpose.

The proposed brewery has been designed to function at a very low water consumption to beer ratio. A water conservation and recycling programme will further reduce overall water consumption.

The principal sources of wastewater arising from the operation of the brewery are :

- process wastewater from the brewing operation and associated cleaning requirement;
- rinsing/washing water from bottling, canning and kegging lines;
- waste detergents from cleaning of process units;
- backwash from water treatment plant;
- boiler blowdown;

- sanitary sewage; and
- site runoff.

These effluents from the brewery are to be treated to well below the required discharge limit, as stipulated in the *Technical Memorandum on Effluents Standards* (TM) at an on-site biological wastewater treatment plant where high levels of suspended solids, Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) are to be reduced. Special operational considerations during the operational phase have been recommended including the implementation of a water conservation programme to reduce water consumption and wastewater generation.

A water quality monitoring programme will be required as a check on the performance of the plant, particularly in the early months of operation, and to ensure compliance with the discharge standards.

3.3 AIR QUALITY

3.3.1 Construction Phase

The impacts arising from the construction activities are not expected to be extensive. The level of activities and size of works area are small in scale. In addition the air sensitive receivers (ASRs) are screened by topographic features (eg Chu Wong Ling) and structures. The predicted dust levels at these ASRs are much reduced by dilution and screening by structures and terrain. Dust impacts during construction in the surrounding area have been shown to be within established standards. Nevertheless, dust control measures are recommended to be implemented during the construction phase to minimise construction dust emission.

3.3.2 Operational Phase

The impact from various operation activities differ in extent. The major source of aerial emissions is from the chimney of the boilers used for steam raising. The pollutants comprise those associated with the burning of fossil fuels, namely Sulphur Dioxide (SO₂) and Nitrogen Oxides (NO_x), which can adversely affect human health or lead to deposition of acid rain. The predicted cumulative NO_x and SO₂ concentrations at ASRs are however, well within the respective *Air Quality Objectives* when the San Miguel Brewery development is included. San Miguel have received approval to build a stack to a regulation height of 48.5m, since it has been shown that there are minimal impacts to ASRs using a 30m stack, the higher stack built will have even less of an impact to the surrounding ASRs.

Biogas produced as a by-product from the on-site biological wastewater treatment plant will be utilised beneficially as a supplementary fuel for the boiler. This will reduce the light diesel oil consumption and the pollutant emissions from the boilers. Minor emissions from the flaring of biogas at the wastewater treatment plant may occur occasionally.

Odour nuisance has been an environmental concern at the Sham Tseng Brewery and has been extensively investigated at the new plant. Odour impacts from wastewater treatment are minimized by the selection of an anaerobic treatment method (an aerobic system is used at Sham Tseng). The impact is further reduced by enclosing the main potential odour sources, such as the equalization tank, which will be covered. The removal of sludge from the wastewater treatment plant will be carried out in enclosed pipes and will only be required once in every five to six months.

Residual odour sources will mainly arise from the spent materials. The predicted odour levels for spent yeast and spent grain disposal are within the EPD criteria of 5 odour units at ASRs. Odour impacts are not expected to be significant based on this assessment. Residual impacts will be monitored by regular odour patrols and minimised by the proposed good housekeeping practices.

3.4 NOISE

3.4.1 Construction Phase

The noise assessment has indicated that it is unlikely that daytime construction (0700–1900) activities will be capable of generating significant impacts at nearby noise sensitive receivers (NSRs). As a result, no mitigation measures have been recommended for daytime construction activities. If it becomes necessary for SMHK to apply for construction activities to continue into restricted hours, however, exceedances have been predicted and mitigation measures would be necessary for the Contractor to be eligible for a *Construction Noise Permit*.

Recommended mitigation measures, including reduction in plant teams, use of noise barriers and use of on-site noise management have been shown to reduce these impacts during restricted hours at nearby NSRs. In addition, if construction activities are proposed for restricted hours, noise monitoring should be carried out at nearby NSRs .

3.4.2 Operational Phase

The noise assessment has indicated that unmitigated equipment operating within the brewing facility is unlikely to be capable of generating significant impacts at nearby NSRs. An assessment and noise levels from external plant on the roof and noise breaking out from louvred plant rooms was carried out based on preliminary design information and predicts no significant noise impacts at NSRs.

Road traffic will be capable of generating significant impacts at nearby NSRs if allowed to travel exclusively on Fuk Hai Street. As a result, it has been recommended that road traffic associated with the Brewery generally use Wang Lee Street rather than Fuk Hai Street.

Based on manufacturers noise data and a noise surveys at a similar facility at Mandaue Cebu, noise levels within the packaging building will be close to the Noise at Work Regulation limits. It is recommended that allowance be made for an acoustic ceiling or hanging acoustic baffles so as to reduce the reverberant noise levels. The need for such treatment, and it's design should be addressed at the commissioning stage. Internal partitioning should be provided where possible to separate workers from using plant. Hearing protection should also be provided for unavoidably noisy working locations.

Noise levels in the refrigeration room, boiler room and the CO₂ recovery room are expected to be above the Noise at Work Regulation limits, but these areas are not expected be occupied on a day to day basis. Therefore provision of hearing protection for workers who occasionally visit the rooms will be adequate.

Monitoring

It is recommended that all rooms within the facility that are occupied on a day to day basis be monitored at commissioning and every 6 months thereafter to determine if machinery is in need of maintenance or additional silencing.

Provided Wang Lee Street rather than Fuk Hai Street is used for peak hour truck transport, no operational noise monitoring is recommended. However, if Fuk Hai Street is to be employed rather than Wang Lee Street, even for a restricted number of truck movements, then monitoring at the nearby NSRs is recommended.

3.5

WASTE MANAGEMENT

Solid wastes will be generated during the construction and operation phases of the facility. Biodegradable and inert fractions of the construction waste should be collected and disposed separately. The main types of waste generated during daily operation of the facility are waste oil, yeast, spent grain, glass/cans, filter aid and wet sludge from wastewater treatment process etc. Initially these wastes are to be reused and recycled as much as possible, and potential for further improvement will be reviewed on a regular basis. When disposal is unavoidable, transportation, handling and storage procedures should meet strict performance requirements to ensure that all waste is eventually disposed of in an environmentally acceptable manner.

No significant environmental impact is envisaged during both the construction and operation phases providing that proper waste management and good housekeeping practices, as recommended in the report, are implemented.

3.6

HEALTH AND SAFETY

The assessment has examined all the dangerous chemicals proposed to be stored and used on-site, and have recommended health and safety precautionary measures to be observed when working with the chemicals.

Liquefied Petroleum Gas (LPG) is proposed to be stored in quantities that would constitute a Notifiable Gas Installation (NGI). An application for approval from the *Gas Authority* will need to be submitted. The *Gas Authority* will need to approve that the LPG is appropriately stored in a safe manner before issuing a permit.

Due to the relatively small quantities of the other chemicals proposed to be stored on-site, no significant risks to life are expected.

3.7 *TRANSPORT AND TRAFFIC*

A transport and traffic assessment has indicated that the expected traffic flows from the construction and operation of the proposed San Miguel Brewery should not lead to significant impacts to the flow of traffic on the roads within the Yuen Long Industrial Estate. The sole exception to this conclusion is for the transport of over-sized loads during the construction stage for which road closures will be necessary; however, if special consideration is given to this operation (the police being notified and operation carried out during evening or night-time hours), the projected impact to the road system should be insignificant.

3.8 *VISUAL, FUNG SHUI AND ECOLOGY*

The new brewery development on the formerly vacant site overgrown with common grass species is expected to have minimal ecological impact. There will be no visual/Fung Shui intrusion to the nearby low-rise villages as the existing buildings/structures in the industrial estate and the hill mounts surrounding the site provide effective visual screening. The view of the brewery from distant high-rise residential blocks will blend in with the existing industrial character surrounding the site and additional visual intrusion is not expected.

3.9 *ENVIRONMENTAL MONITORING AND AUDIT*

An environmental monitoring and audit manual has been produced covering all the necessary monitoring and audit requirements and mitigation measures associated with the construction and operational phases of the project.

3.10 *OVERALL CONCLUSIONS*

It is concluded that with implementation of the proposed mitigation measures, environmental impacts from the construction and operation of the proposed new San Miguel Brewery in Yuen Long will be acceptable.

Considerable effort has been made by the environmental and design teams to further minimize residual environmental impacts and reduce overall water and energy requirements during the detailed design process. In environmental terms the new Brewery will provide significant benefits over the current brewing operations at Sham Tseng.