Stephenson

Environmental Management Australia

# AIR QUALITY ASSESSMENT

## INDEPENDENT PRINT MEDIA GROUP

## WARWICK FARM, NSW

PROJECT NO.: 3907/07

DATE: SEPTEMBER 2008

P W STEPHENSON

**Stephenson**

**Environmental Management Australia**

Peter W Stephenson & Associates Pty Ltd
ACN 002 600 526 (Incorporated in NSW)
ABN 75 002 600 526

Newington Business Park
Unit 7/2 Holker Street
Newington NSW 2127 Australia
Tel: (02) 9737 9991
Fax: (02) 9737 9993
E-Mail: info@stephensonenv.com.au

# AIR QUALITY ASSESSMENT

## INDEPENDENT PRINT MEDIA GROUP

## WARWICK FARM, NSW

**PROJECT NO.:** 3907/07

**DATE:** SEPTEMBER 2008

**P W STEPHENSON**

# TABLE OF CONTENTS

## LIST OF TABLES



## LIST OF FIGURES

# ABBREVIATIONS

| | |
|---|---|
| % | percentage |
| $m^2$ | square metres |
| $mg/m^3$ | milligrams per cubic metre |
| | |
| CO | Carbon Monoxide |
| $CO_2$ | Carbon Dioxide |
| DECC | Department of Environment and Climate Change |
| DGLC | Design Ground Level Concentration |
| EPA | Environment Protection Authority |
| IAC | Impact Assessment Criteria |
| IPMG | Independent Print Media Group |
| $NO_x$ | Oxides of Nitrogen |
| NSW | New South Wales |
| $O_2$ | Oxygen |
| POEO | Protection of the Environment and Operations Act |
| $SO_2$ | Sulphur Dioxide |
| VDS | Vacuum Distillation System |
| VOC | Volatile Organic Compounds |
| VRS | Vapour Recovery System |

# 1 INTRODUCTION

## 1.1 OVERVIEW

Stephenson Environmental Management Australia (SEMA) was commissioned by Independent Print Media Group (IPMG) to prepare an Air Quality Assessment report to submit to the Director-General for the proposed development of the printing facility and associated activities at Warwick Farm, New South Wales (NSW). Refer to Appendix A for a copy of the Director-General Requirements.

## 1.2 KEY ELEMENTS OF THE PROPOSED DEVELOPMENT

IPMG seeks approval from the Director-General for the development of the printing facility and associated activities at Warwick Farm.

This site is located at 23 Scrivener Street, Warwick Farm and occupies 7.94 hectares with a warehouse and buildings of 34,400 square metres ($m^2$). The real property description of the site is Lot 1 DP 774089. Refer to Figure 1-1 for location of the site.

A key element of the proposed development is to ensure minimal impact on the environment. This report covers the assessment of air quality and associated impacts that this proposed process and operation may have on the surrounding environment.

The existing warehouse and buildings on the site are currently owned by Kimberly – Clark Australia (KCA). KCA currently use the warehouse and site for distribution of their paper based health and hygiene products such as nappies and paper based absorbent products including tissues and paper towels.

## 1.3 THE PROPONENT

IPMG is a market leading print group in Australia with operations extending to pre-media and distribution. Its origins date back to 1887, however since then the company has grown into a multi-million dollar, integrated printing group with the capacity to handle the most demanding print products in Australia.

IPMG printing companies together make up the largest privately held print group in Australasia.

IPMG operations specialise primarily in heat set web offset products, a broad range of high quality sheet-fed machines and the necessary ancillary equipment. Plants are located in Sydney, Melbourne and Brisbane.

IPMG is proposing to install new rotogravure presses at the Warwick Farm site which will require refurbishment of the existing warehouse and an extension of $4,000m^2$ on the eastern side of the building. Refer Figure 2-1.

**FIGURE 1-1 LOCATION OF THE SITE**

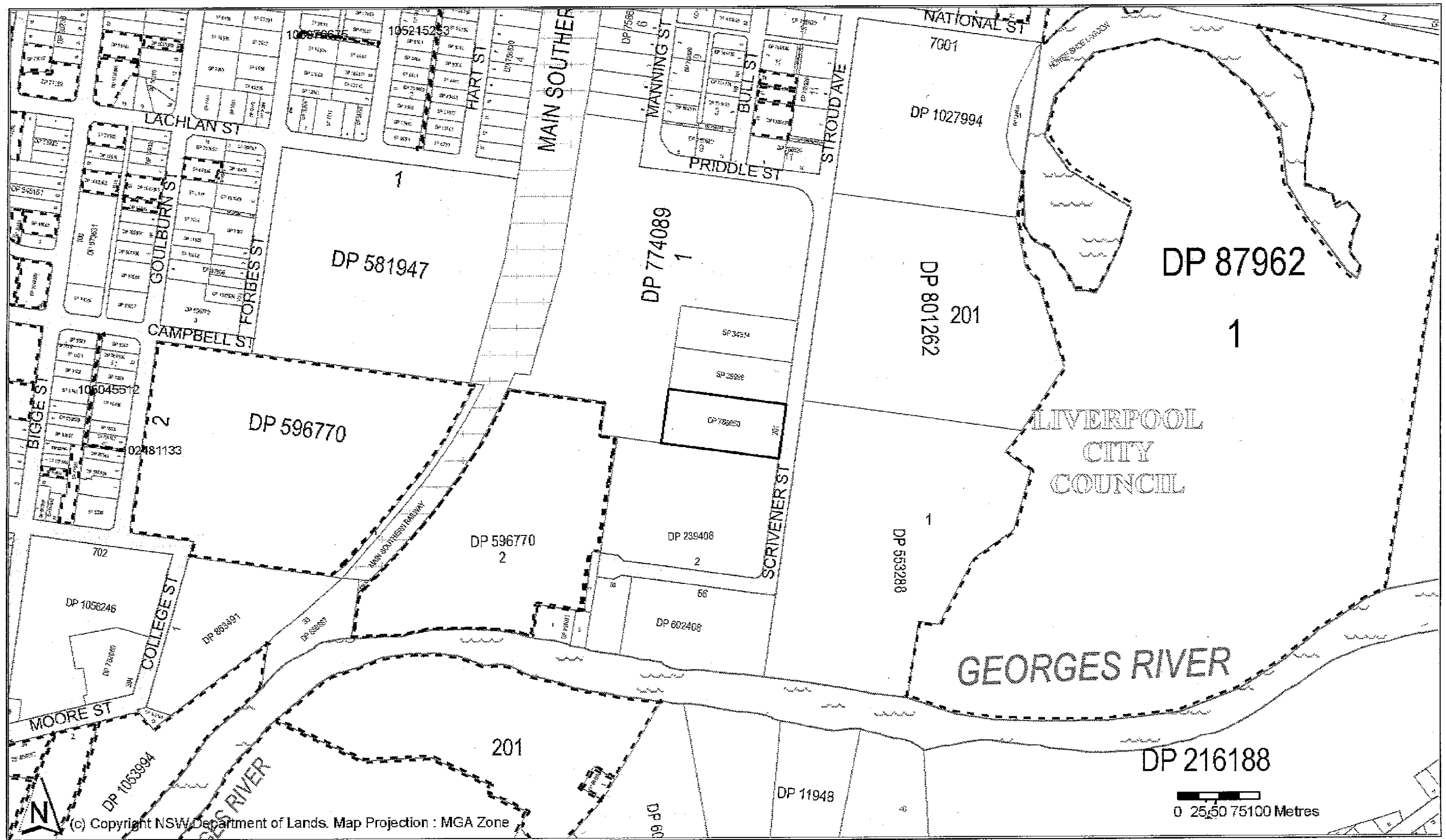
Department of Lands
*Reliable from the ground up*

**Cadastral Records Enquiry Report**

**Ref :** surv:epln-lamli

**Requested Parcel :** Lot 201 DP 786650 **Identified Parcel :** Lot 201 DP 786650

**Locality :** WARWICK FARM **LGA :** LIVERPOOL **Parish :** ST LUKE **County :** CUMBERLAND




Report Generated 10:40:59 AM, 28 May, 2008

**This information is provided as a searching aid only. While every endeavour is made to ensure the current cadastral pattern is accurately reflected, the Registrar General cannot guarantee the information provided. For all ACTIVITY PRIOR to SEPT 2002 you must refer to the RGs Charting and Reference Maps.**

Page 1 of 7

# 2 DESCRIPTION OF PROPOSED OPERATIONS

## 2.1 PROPOSED OPERATIONS

### 2.1.1 OVERVIEW OF MAIN AREAS OF THE PRINTING PROCESS

IPMG is a major entity in print production of newspapers, magazines and catalogues for national distribution. The following groups of activities would occur at the proposed Warwick Farm print facility:

- Receiving
- Warehouse
- Print production, including pre-press cylinder preparation and the roto-gravure printing presses
- Binding
- Despatch.

Refer to Figure 2-1 for an overview of the proposed development and Section 2.3 for outline of where in the above process activities emissions would be expected.

## 2.2 HOURS OF OPERATION

IPMG proposes to operate the printing facility 24 hours per day, seven days per week.

## 2.3 EMISSION SOURCES

### 2.3.1 DEMOLITION AND CONSTRUCTION

The initial emission sources on-site will be associated with demolition of part of the existing building structure and some earthworks.

Dust generated from demolition and earthworks will be suppressed using normal industry standard dust suppression techniques; typically mist sprays.

The construction phase will potentially generate airborne emissions of gases and/or dust particles. Any emission from this construction phase will be addressed by normal construction industry dust control techniques.

Once the building modifications have been completed the precision installation of the printing presses and associated equipment will commence. This installation work will be performed inside the enclosed building which will require clean environments for this work.

### 2.3.2 PRINTING PROCESS

In summary, the four main process areas that could generate air emissions are:

(1) Cylinder Preparation and Mechanical Engraving Area via wet scrubber gas cleaning device – acid gases (Sulphuric Acid Mist / Sulphur Trioxide) and Chromium emissions

(2) Press Room via Vapour Recovery System(VRS) – toluene

(3) Waste Paper Recycling Area – particles/dust emissions

(4) Boilers for Steam and hot water generation - Oxides of Nitrogen ($NO_x$), Sulphur Dioxide ($SO_2$), Carbon Monoxide (CO) and Carbon Dioxide ($CO_2$) emissions.

The ink storage tanks and transfer of ink from Stolt transport container tanks which carry the ink from the manufacturer are not considered sources of toluene vapour emission.

The reason for this conclusion is that the solvent vapours emitted during the transfer of ink from the tanker transport to the storage tank, where ink displaces air in the headspace of the storage tank, will be returned to the tanker transport via a sealed pumping system. The air displaced from the tank will be the equivalent volume to the liquid delivered to the storage tank from the transport tanker. This returned vapour is then recovered by the manufacturer or transport company back at their purpose designed terminal facility. Therefore this presents a closed loop with solvent emissions being contained in the transport vessel.

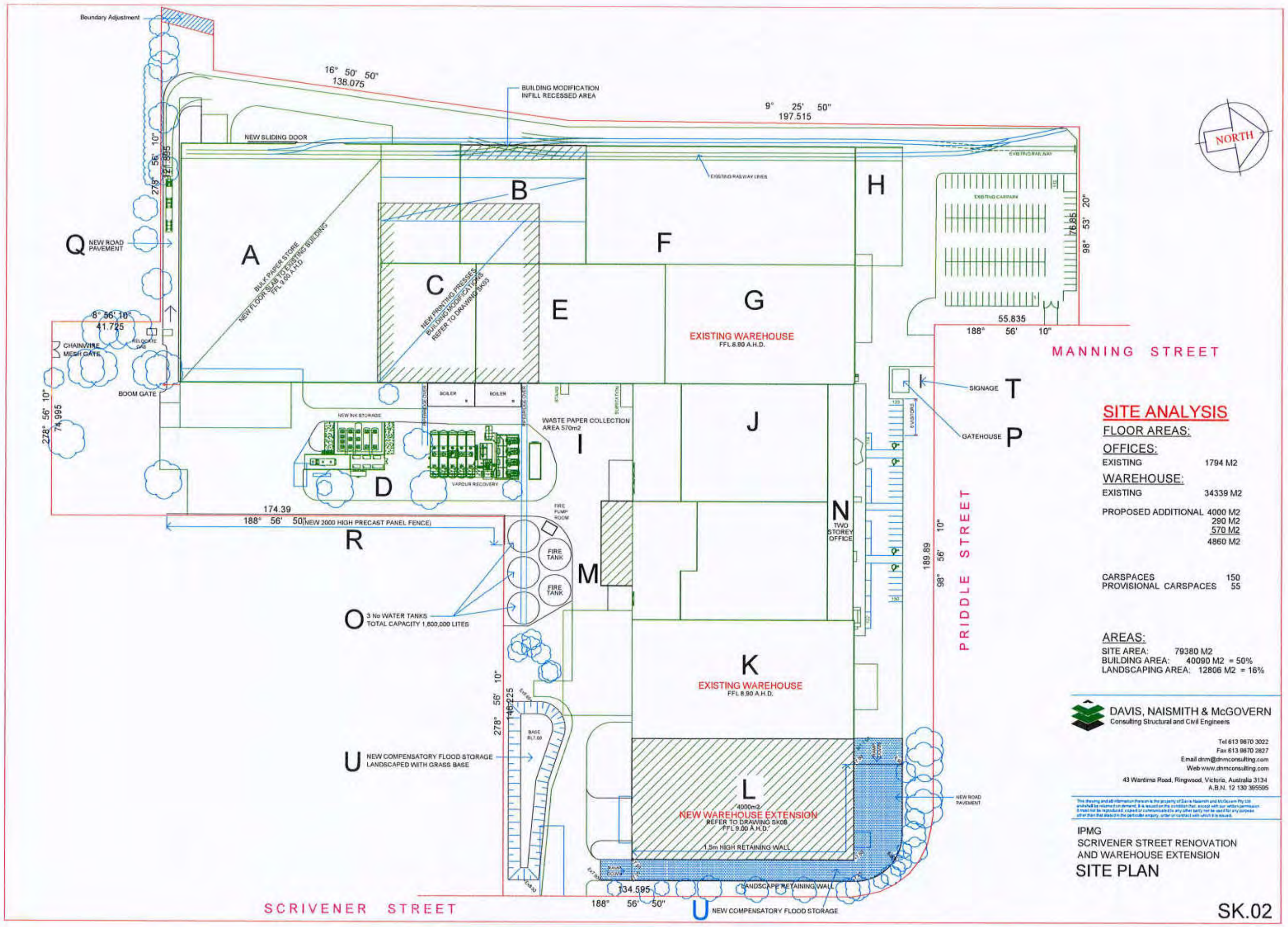
This vapour recovery activity is a standard process used in the petroleum industry throughout most metropolitan areas of Australia.

Section 3 provides an overview of the regulatory emission limits that are associated with the air emissions likely to be generated as outlined above.

Section 4 provides a description of the Cylinder Preparation and Mechanical Engraving process and associated emission control equipment. Section 5 presents a description of the Press Room, the printing process and its associated emission control plant. Refer to Area C of Figure 2-1 for location of this part of the process.

Section 6 relates to other sources including the Waste Paper Recycling area (Area I, Figure 2-1) and the Boilers (adjacent to Area I).

**FIGURE 2-1 SITE PLAN**



# 3 REGULATORY LIMITS – AIR QUALITY

## 3.1 SOURCE EMISSIONS

The NSW Protection of the Environment Operations (POEO) (Clean Air) Regulation 2002 sets out the maximum emission concentration limits relevant to the IPMG development.

Schedule 4 of POEO (Clean Air) Regulations refers to Standards of Concentration for Scheduled Premises: General Activities and Plant.

Table 3-1 summarises the emission limits for discharges from the various stacks associated with each activity. Group 6 refers to Premises which are currently being scheduled or new developments awaiting Approval after 1 September 2005.

However, it is understood that this plant will not be Scheduled and, hence, will be regulated by limits for Non-Scheduled premises; that is, Group C. However, there are limited Regulatory requirements for Group C emissions so the more stringent Group 6 Limits have been included to facilitate assessment.

The only emission parameters referenced in Group C are Total Suspended Particulate Matter (TSP), dark smoke (Ringelmann Number) and Opacity. The TSP is the only emission parameter relevant to the proposed IPMG operation.

The Group C emission limit for TSP is 100 milligrams per cubic metre ($mg/m^3$) whilst the Group 6 TSP emission limit is 50 $mg/m^3$.

The proposed emission control for TSP in the Waste Paper Collection Area is a fabric filter baghouse which will readily meet both the Non-Scheduled Group C (100 $mg/m^3$) emission limit and the Scheduled Group 6 (50 $mg/m^3$) emission limit.

**TABLE 3-1 POEO EMISSION LIMITS – GROUP 6**

| Activity | Air Impurity | Emission Control (Stack) | Group 6 Limits of Concentration ($mg/m^3$) |
|---|---|---|---|
| Metal Engraving | Sulphuric Acid Mist / Sulphur Trioxide | Wet Scrubber | 100 |
| Metal Engraving | Chromium | Wet Scrubber | 1 (Type I & II Substances in aggregate) |
| Press Room | VOC (toluene)(reported as n-propane) | VRS | 40 |
| Waste Paper Collection Area | Total Suspended Particulate Matter | Fabric Filter Baghouse | 50 |
| Steam generation by NAG Fired Boilers No. 1 & 2 | Oxides of Nitrogen | Stack | 350 |
| Steam generation by NAG Fired Boilers No. 1 & 2 | Sulphur Dioxide, Carbon Monoxide, Carbon Dioxide | Stack | NS |

Note:

$mg/m^3$ = milligrams per cubic metre @ 0C and 1 atmosphere pressure from n-propane

NAG = Natural Gas as a fuel for boilers

NS = Not specified

VRS = Vapour Recovery System

VOC = Volatile Organic Compounds

## 3.2 GROUND LEVEL CONCENTRATION IMPACT ASSESSMENT CRITERIA

The NSW DECC's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (August 2005)* sets out the design ground level concentration (DGLCs) to be met at the nearest sensitive receptor.

These DGLC's are presented in the *Approved Methods – Impact Assessment Criteria (IAC)* Table 7.4a for individual odorous air pollutants which states the IAC for toluene as 0.36 $mg/m^3$ with an averaging period of 1 hour. This IAC for toluene has been designed based on the odorous nature of this air pollutant.

The IAC ( 1-Hour Average) for each of the other emission parameters are:

- Sulphuric Acid/Sulphur Trioxide - 0.018 $mg/m^3$
- Chromium - 0.009 $mg/m^3$
- Oxides of Nitrogen - 0.246 $mg/m^3$
- Sulphur Dioxide - 0.570 $mg/m^3$
- Carbon Monoxide - 30 $mg/m^3$
- Total Suspended Particulates (TSP) – 0.09 $mg/m^3$ (Annual Average)

# 4 CYLINDER PREPARATION & MECHANICAL ENGRAVING

## 4.1 INTRODUCTION

This phase of the proposed process is where the surface of the cylinder is prepared to enable the printing processes to be able to be performed. The surface of the cylinder consists of a copper shell which is electro mechanically engraved with the image to be printed and then chrome plated.

In essence, the printing cylinder preparation is where the image to be printed is electromechanically etched onto an electroplated copper surface on the cylinder which is 3.2 metre long. The cylinder is then hard chrome plated prior to being installed on the printing press. Refer to Area B of Figure 2-1. Up to 5400 printing cylinders can be etched and prepared per year.

## 4.2 PROCESS DESCRIPTION & CHEMICAL USAGE

There are 8 main steps in this cylinder preparation and mechanical engraving process. The following briefly summarises each step of the process and the chemicals used in each step:-

- **Process Step 1**: Stripping Station – Manual removal of used copper shells from cylinder - no chemicals used
- **Process Step 2**: Degreasing Station – Cleaning of the cylinder prior to reprocessing – EL773 Degreasing Salt is only chemical used
- **Process Step 3**: Copper Bath – Application of copper metal to cylinder surface using electroplating techniques – Chemicals used: Sulphuric Acid and copper slugs
- **Process Step 4**: Polishing of copper surface– No chemicals used
- **Process Step 5**: Engraving – by electromechanical process - No chemicals used
- **Process Step 6**: Degreasing Station – Cleaning of the cylinder prior to further processing – EL773 Degreasing Salt is only chemical used
- **Process Step 7**: Chrome tank –Application of chrome metal to engraved surface using electroplating techniques – Chemical used: Chromic Acid
- **Process Step 8**: Chrome Polishing – No chemicals used

## 4.3 EMISSIONS OF ACIDS AND CHROME METAL FROM CYLINDER PREPARATION AND MECHANICAL ENGRAVING

Chromic acid and Sulphuric acid gaseous emissions are generated in the plating process. These gases will be collected in a fume extraction system and neutralised in a three stage packed tower wet scrubbing pollution control device. This horizontal packed tower wet scrubber is designed for 9,000 cubic metres per hour exhaust gas volume which is required for the various components of the cylinder preparation and metal engraving process. Refer to Table 4-1 for a tabulated summary of the extraction air requirements.

**TABLE 4-1 EXTRACTION AIR REQUIREMENTS FOR MECHANICAL ENGRAVING PROCESS**

K.WALTER

**Exhaust Requirements**

**Independent Print Media Group**

| | |
|---|---|
| created | Wolf |
| date | 22/08/07 |
| tested | |
| Revision: | |

| Pos. | Machine | # Machines | | Total cbm/hour | Flow rate cbm/hour | neg. pressure (Pascal) | temperature of exhausted air (° Celsius) | |
|---|---|---|---|---|---|---|---|---|
| | K.Walter | | | | | | | |
| 1 | Stripping station | 1 | | 1500 | 1500 | 300 | 22 | |
| 2 | Degreasing | 1 | | 2000 | 2000 | 300 | 25 | |
| 3 | Copper Tank | 1 | | 2000 | 2000 | 300 | 25 | |
| 4 | Chrome Tank | 1 | | 3500 | 3500 | 400 | 35 | |
| 5 | CFM Grand | 1 | | | | | | |
| 6 | Master Control | 1 | | | | | | |
| | | | | | | | | |
| | Bauer | | | | | | | |
| 7 | Crane | 1 | | | | | | |
| 8 | Shuttle | 2 | | | | | | |
| 9 | Cylinder Storage Rack | 1 | | | | | | |
| 10 | Crane Press room | | | | | | | |
| | | | | | | | | |
| | Hell | 0 | | | | | | |
| 11 | K6 Engraver | 2 | | | | | | |
| | | | | | | | | |
| | | | **TOTAL** | **9000** | | | | |

K 6 Engraver and CFM Grand
Recommended air temperature 20 - 25°C
Humidity 50 - 60%

Exhaust Requirements / Mastersheet Independent Print Media Group

The design collection efficiency of chromium by the wet scrubber has been specified to meet the stringent heavy metal (Type I and Type II Substances) emission requirement of the Clean Air Regulations in NSW which is 1 mg (in aggregate)/$m^3$.

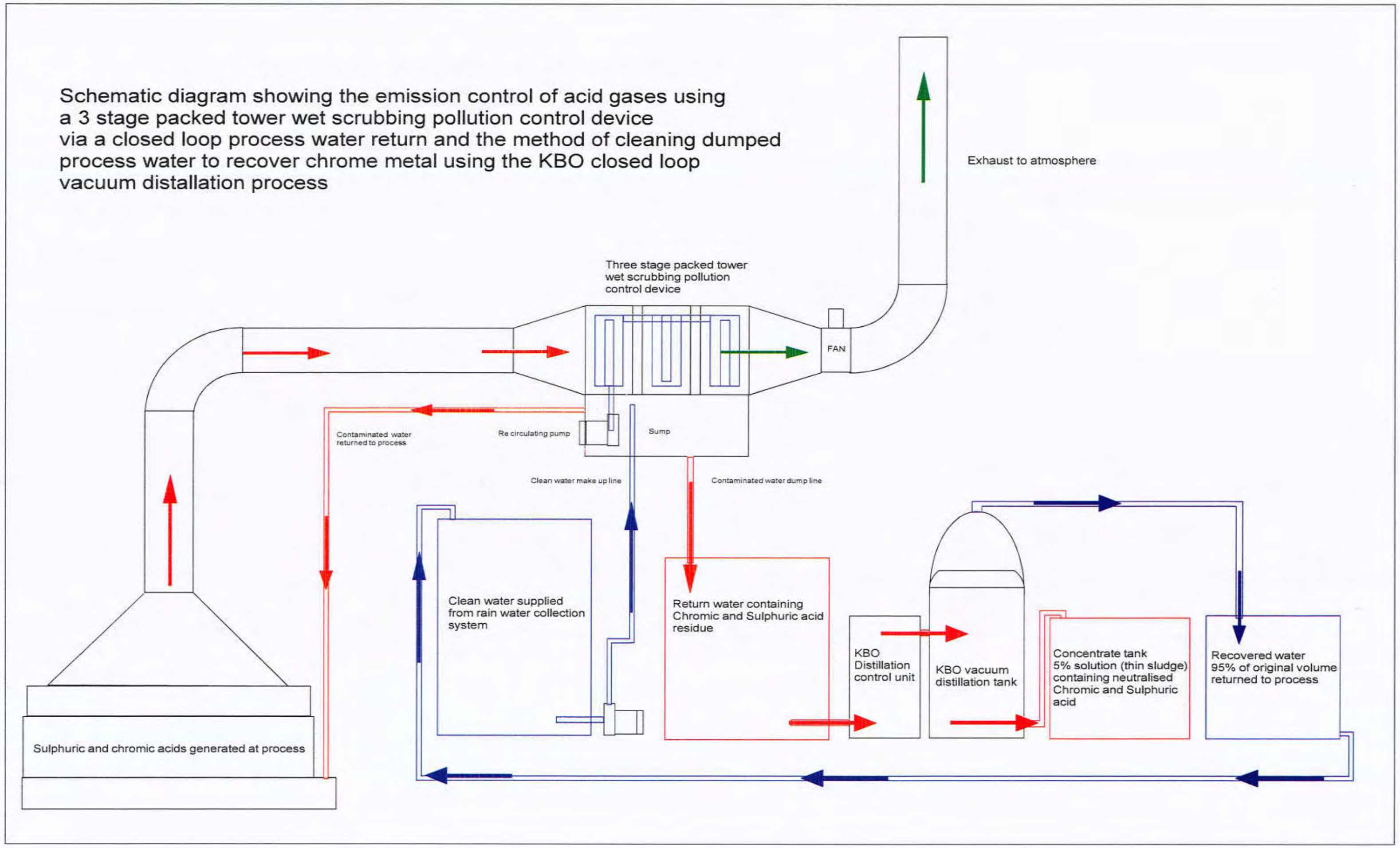
Figure 4-1 presents a schematic showing the sulphuric acid and chromic acids vapours being collected and ducted to the wet scrubber. The return water from the scrubber is collected and filtered through a closed loop Vacuum Distillation System (VDS) manufactured by KBO.

The wet scrubber and VDS have been designed to comply with the relevant emission Regulation limits. This proactive design has enabled all emissions to be controlled at source; thus limiting the emissions to atmosphere and maximising the reuse of solvents, acids and other chemical based raw materials on-site.

The collected scrubbing liquor is filtered through a closed loop filtration and distillation system in the VDS as per Figure 4-1. Once the scrubbing liquor and wastewater is processed through the VDS the re-useable component (95%) is stored for re-use, then de ionised and recycled back through the cylinder preparation process.

The remaining 5% of the concentrated, but neutralised chromic acid thin sludge will be stored in 1,000 litre transport vessels for disposal by an approved contractor.

**FIGURE 4-1 SCHEMATIC OF WET SCRUBBER AND VACUUM DISTILLATION SYSTEM**



# 5 PRESS ROOM AREA

## 5.1 DESCRIPTION

The Press Room will consist initially of 2 x 8 unit roto-gravure presses, which are located side by side, with provision for a third press. The Press Room is located in Area C of Figure 2-1.

The paper rolls are delivered automatically to the reel stands at the rear of each press adjacent to the paper store.

The paper roll up to 3.18 metres wide, is unwrapped and prepared prior to being lifted onto the reel-stands where the paper is unwound from the roll by the press. Each press consists of 8 printing units each printing unit prints and dries one of 4 primary colours first to one side of the web of paper then to the reverse side of the web of paper in a continual process.

Toluene vapour is emitted from each printing unit during the drying phase of the printing process; it is collected via sealed hoods and ducted back to the Vapour Recovery System (VRS). The VRS is located in Area D in Figure 2-1, externally to the main building where the toluene is recovered for re-use. Section 5.2 provides detail on the VRS.

## 5.2 EMISSION CONTROLS – TOLUENE SOLVENT VAPOUR RECOVERY

Toluene is the solvent that dilutes and carries the ink to the roto-gravure press and is integral to the printing process. Rather than being incinerated the solvent is removed from the print process via sealed hoods and ducting to the solvent VRS (Activated Carbon). The solvent is removed from the air using activated carbon adsorption and carbon is cleaned by a steam separation/regeneration process.

Section 5.2.1 describes in detail the Activated Carbon VRS to be used, while Section 5.2.2 outlines where the recovered solvent from the VRS is stored on site for re-use.

### 5.2.1 ACTIVATED CARBON VAPOUR RECOVERY SYSTEM

***Regenerable Type Adsorbers***

This regenerable activated carbon adsorption technology using steam as the regeneration medium is proposed for IPMG at Warwick Farm and has been incorporated into the design of the facility.

The adsorption process occurs under defined pressure and temperature conditions. By changing the pressure or temperature of the adsorber beds, the activated carbon can be made to release the adsorbed material. This released material (recovered solvent) can then be captured and either re-used in the process or sold back to the ink manufacturer for re-use in ink production. Common on site regeneration techniques are the injection of steam into the carbon beds or drawing a vacuum on the carbon beds. The proposed VRS utilises the former; that is, steam extraction/regeneration techniques.

The activated carbon beds in a regenerable activated carbon system generally need to be replaced every 5 years or so because toluene solvent molecules or droplets, which become trapped in the interstices of the carbon, can gradually build up in the activated carbon beds, reducing the adsorption capacity of the carbon which can lead to the need for increased desorption times and shorter time for each adsorption cycle.

Advantages of a VRS over a thermal oxidation/incineration unit are both the recovery of reusable solvent and a substantial reduction in Greenhouse Gas Emissions from both solvent emissions and products of combustion emissions from the thermal oxidation process including $CO_2$ and $NO_x$ emissions.

Figure 5-1 presents schematic drawing of the VRS.

Refer to Figure 5-2 for plan layout of the Recovered Solvent Storage Tanks and the VRS which incorporates five adsorption vessels which contain approximately 21 tonnes of carbon each. These adsorption vessels are programmed to cycle to desorption on demand or, alternatively, on a fixed time cycle during the solvent vapour recovery process.

Figure 5-3 presents building elevations in particular, Part South Elevation, which shows location of VRS and a stack height of 15 metres.

The type of VRS proposed is currently operated in Italy, Europe and USA with typical discharge concentrations of 15 mg/m$^3$ of toluene which is in compliance with POEO (Clean Air) Regulation limit of 40 mg/m$^3$ (as n-propane). Refer Table 5-1 for recent continuous emission measurements (CEMS) from a similar printing plant in Europe.

**FIGURE 5-1 SOLVENT VAPOUR RECOVERY SYSTEM SCHEMATIC**

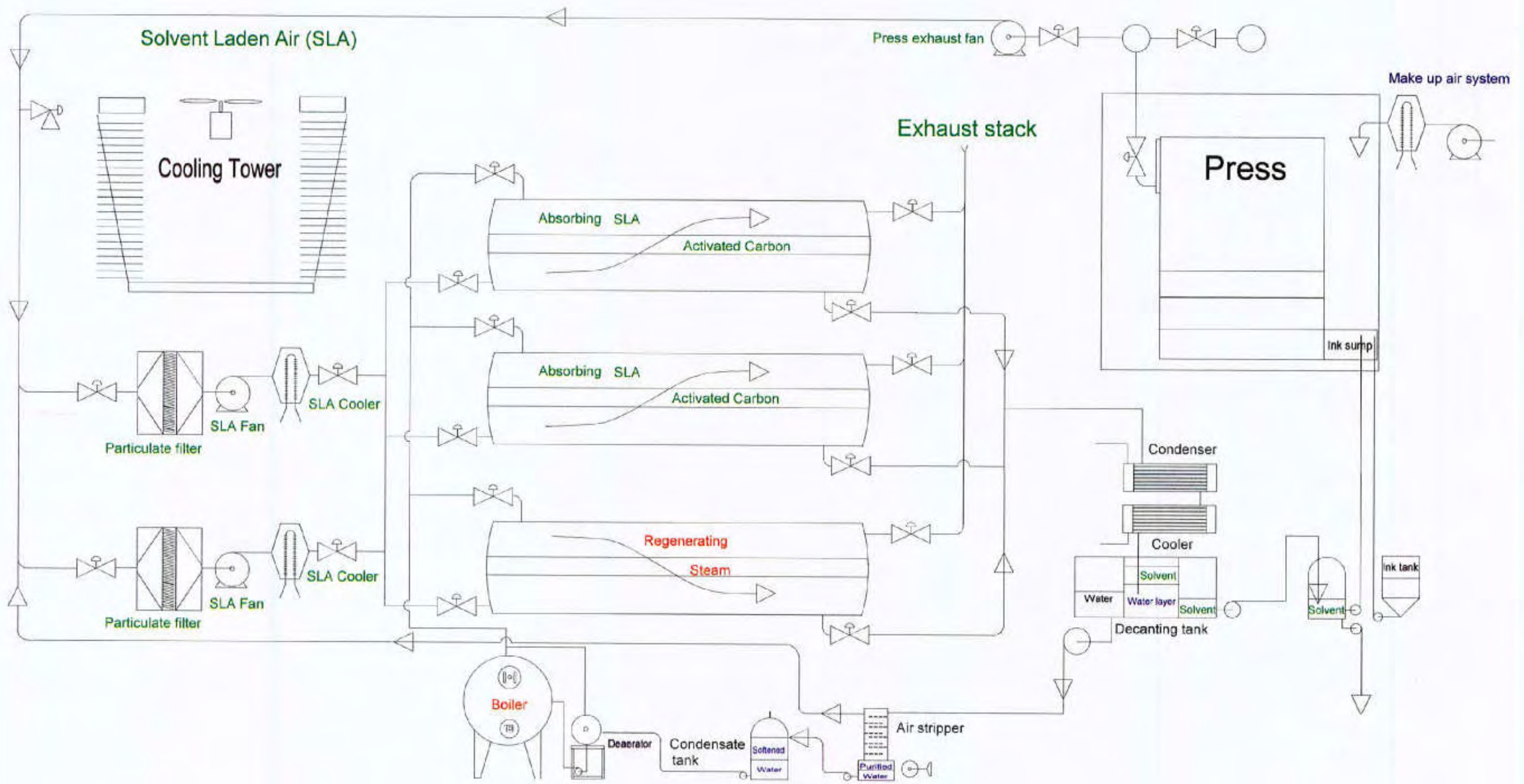


**FIGURE 5-2 VAPOUR RECOVERY SYSTEM AND STORAGE TANK LAYOUT PLANS**

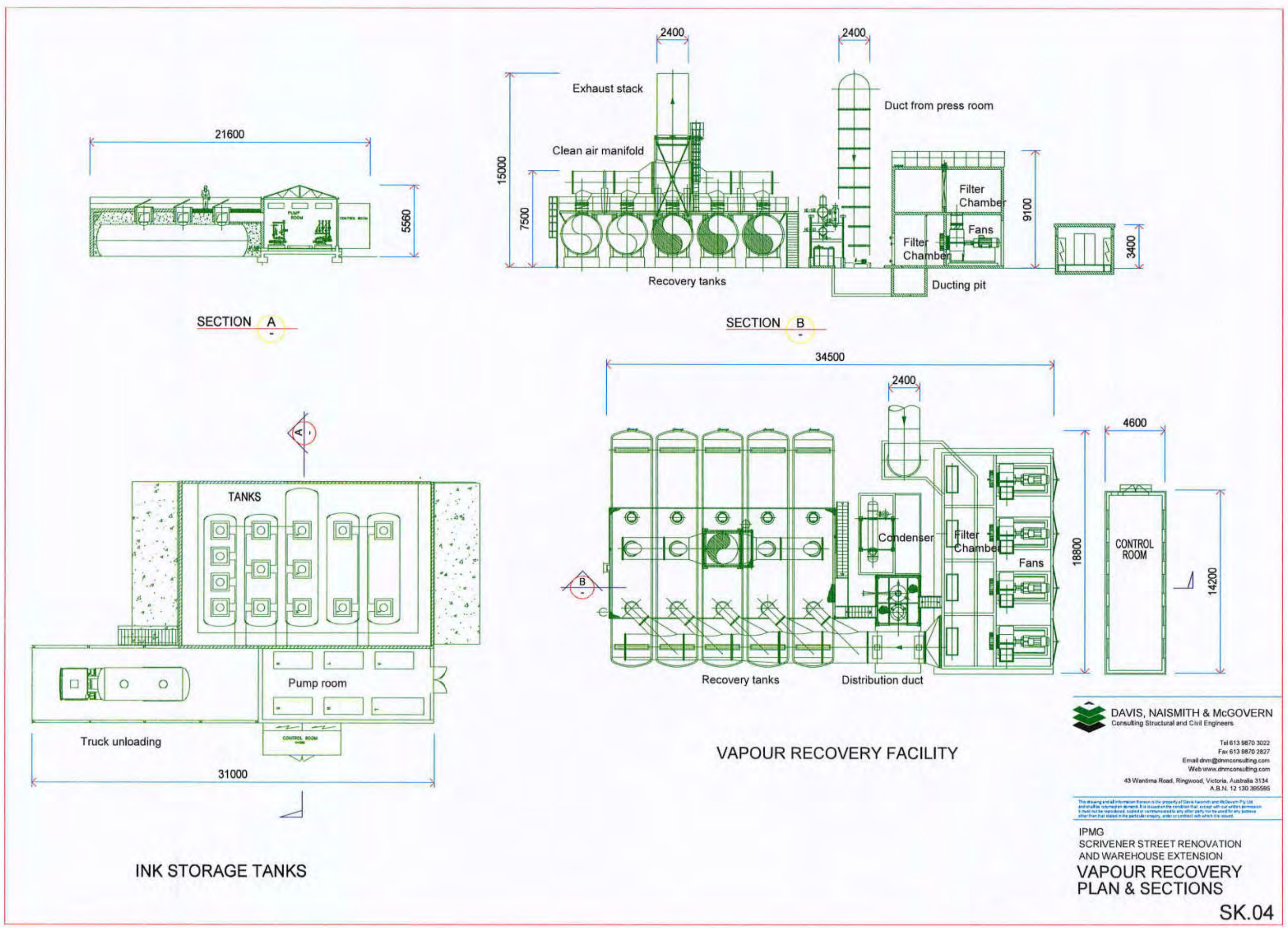


**FIGURE 5-3 BUILDING ELEVATIONS**

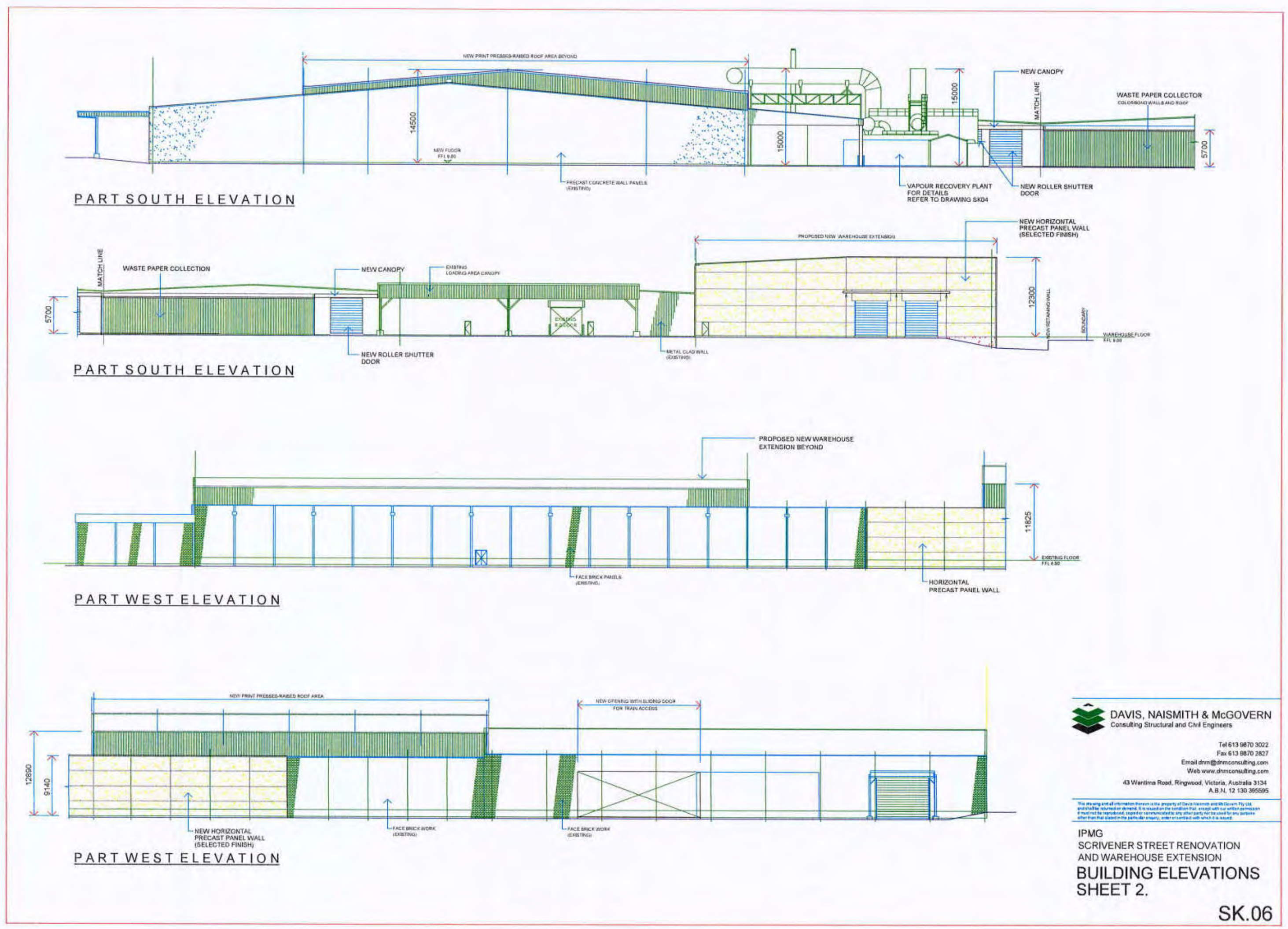


**TABLE 5-1 CONTINUOUS TOLUENE EMISSION MEASUREMENT SYSTEM (CEMS) RESULTS FROM ROTO-GRAVURE PRINTING PRESSES SERVED BY A VRS (LENGLETGRAVURE, FRANCE)**

| Date | Average VOC (as toluene) emission concentration (mg/m³) | Average VOC (as n-propane) emission concentration (mg/m³) |
|---|---|---|
| 28/7/2008 | 8.83 | 4.26 |
| 29/7/2008 | 5.88 | 2.83 |
| 30/7/2008 | 13.51 | 6.51 |
| 31/7/2008 | 58.20 | 28.1 |
| 1/8/2008 | 7.65 | 3.69 |
| 2/8/2008 | 5.73 | 2.76 |
| 3/8/2008 | 6.49 | 3.13 |
| 4/8/2008 | 5.26 | 2.54 |
| 5/8/2008 | 4.45 | 2.15 |
| 6/8/2008 | 4.66 | 2.25 |
| 7/8/2008 | 9.03 | 4.35 |
| 8/8/2008 | 4.59 | 2.21 |
| 9/8/2008 | 6.58 | 3.17 |
| 10/8/2008 | 5.81 | 2.80 |
| 11/8/2008 | 5.71 | 2.75 |
| 12/8/2008 | 2.93 | 1.41 |
| 13/8/2008 | 5.73 | 2.76 |
| 14/8/2008 | 4.84 | 2.33 |
| 15/8/2008 | 5.10 | 2.46 |
| 16/8/2008 | 3.30 | 1.59 |
| 17/8/2008 | 3.42 | 1.65 |
| 18/8/2008 | 7.91 | 3.81 |
| 19/8/2008 | 6.86 | 3.31 |
| 20/8/2008 | 2.91 | 1.40 |
| 21/8/2008 | 10.04 | 4.84 |
| 22/8/2008 | 5.44 | 2.62 |
| 23/8/2008 | 3.70 | 1.78 |
| 24/8/2008 | 4.54 | 2.19 |
| 25/8/2008 | 4.39 | 2.12 |
| 26/8/2008 | 5.91 | 2.85 |
| 27/8/2008 | 3.33 | 1.61 |

Key:
$mg/m^3$ = milligrams per cubic metre

# 6 OTHER EMISSION SOURCES

## 6.1 WASTE PAPER COLLECTION AREA

### 6.1.1 DESCRIPTION

Waste Paper Recycling area (Area I, Figure 2-1) is required to recover waste paper off-cuts and paper dust particles generated during the printing process.

Total solid particles or fine particles and paper off-cuts will be collected from the following areas:-

- Press Room – trimming and slitting
- Stacking and Palletising
- Binding Process.

### 6.1.2 EMISSIONS CONTROLS

The paper off-cuts and dust will be pneumatically conveyed at 14 metres per second (400 cubic metres per minute) to two separators and one fabric filter baghouse/dust collector the paper waste in the Waste Paper Collection Area.

Fine particles and the pneumatic conveying air stream will be filtered through conventional fabric filtration pollution control devices (Baghouses) prior to emission to atmosphere.

This fabric filter dust collector is designed to remove particles from the gas stream and typically only release particles in order of 2 to 20 $mg/m^3$ at a 99+% recovery rate.

## 6.2 BOILERS FOR STEAM AND HOT WATER GENERATION

### 6.2.1 DESCRIPTION

Natural gas boilers will be required onsite to produce steam for supplying heat to Dryers on each Press for curing printed ink; and, to supply actual live steam to the vessel in the VRS that is undergoing desorption. The desorption cycle on the VRS is either controlled at timed intervals or on-demand. This control is directed by a continuous toluene emission monitor (CEM) which continuously feeds back to a computer controlled Programmed Logic Controller (plc) which in turn manages all aspects of VRS operation and adsorption/desorption cycle timing.

Therefore, as VRS exit gaseous toluene concentrations approach design emission concentrations the particular adsorption vessel in the VRS will switch to desorption phase and another vessel will commence adsorption.

This desorption stage will demand steam to desorb the collected toluene from the surface of the activated carbon in the VRS and then recover the solvent for re-use.

There are two 8 MW natural gas fired boilers proposed for installation as part of this development. Each boiler will be operated in either Standby or Duty phase. The boilers are located adjacent to Area I in Figure 2-1.

### 6.2.2 EMISSION CONTROLS

Boilers have combustion efficiency feedback controls intrinsic to the boiler to optimise its combustion efficiency. There are no "tail-pipe" emission controls on the exhaust of these gas-fired package boilers.

Each boiler will emit products of combustion from 18 metre high stacks of the order outlined below:-

- Oxides of Nitrogen ($NO_x$) 5 to 100 mg/m$^3$
- Carbon Monoxide (CO) 0 to 90 mg/m$^3$
- Carbon Dioxide ($CO_2$) 8 to 10% by volume
- Sulphur Dioxide ($SO_2$) less than 5 mg/m$^3$

All of these emissions will comply with the Scheduled Premises Group 6 Emission Limits specified by NSW DECC in the POEO (Clean Air) Regulations 2002. Refer Table 3-1 and Table 7-1.

# 7 AIRBORNE EMISSIONS AND GROUND LEVEL IMPACTS

## 7.1 PROPOSED STACK EMISSIONS

The following pollution control plants have been designed to release minimal emissions to atmosphere:-

- VRS
- Wet scrubber
- Baghouse
- Boilers.

The predicted emissions from these gas cleaning systems are outlined in Table 7-1.

**TABLE 7-1 PROPOSED EMISSION LEVELS FROM EMISSION CONTROL GAS CLEANING SYSTEMS**

| **Activity** | **Air Impurity** | **Emission Control (Stack)** | **Proposed Emission Concentrations ($mg/m^3$)** | **Proposed Mass Emission Rate(g/s)** | **Group 6 Limits of Concentration ($mg/m^3$)** |
|---|---|---|---|---|---|
| Metal Engraving | Sulphuric Acid Mist / Sulphur Trioxide | Wet Scrubber | 20 - 60 | 0.05 - 0.15 | 100 |
| Metal Engraving | Chromium | Wet Scrubber | < 1 | < 0.0025 | 1 (Type I & II Substances in aggregate) |
| Press Room | VOC (toluene)(reportedas n-propane) | VRS | 35** | 1.4 | 40* |
| Waste Paper Collection Area | Total Suspended Particulate Matter | Fabric Filter Baghouse | 2 - 20 | 0.013 - 0.13 | 50 |
| Steam generation by NAG Boilers | Oxides of Nitrogen | Stack | 5 – 100 | 0.023 - 0.455 | 350 |
| Steam generation by NAG Boilers | Sulphur Dioxide | Stack | < 5 | < 0.023 | NS |
| Steam generation by NAG Boilers | Carbon Monoxide | Stack | 0 - 90 | 0 – 0.410 | NS |
| Steam generation by NAG Boilers | Carbon Dioxide | Stack | 8 – 10 % | 157 - 196 | NS |

**Notes re Table 7-1:**

Mass Emission Rates calculated based on the given exhaust gas flow rates for the nominated emission sources; that is,

- Metal Engraving wet scrubber = 9000 $m^3/hr$ =2.5 $m^3/s$ and for
- VRS =40 $m^3/s$ and for
- Waste Paper Collection baghouse = 400 $m^3/min$ = 6.67 $m^3/s$
- Boiler = 4.55 $m^3/s$

| | |
|---|---|
| * calculated | Regulation limit for VOC (as n-propane) reported as the equivalent molecular weight of toluene |
| ** VOC = | Proposed worst case toluene emission reported as if it were n-propane as required by Group 6 of Clean Air Regulations |

**Key:**

| | | |
|---|---|---|
| < | = | less than |
| g/s | = | grams per second |
| NAG | = | Natural Gas fired boilers |
| NS | = | Not Specified |
| $m^3/s$ | = | cubic metres per second |
| $m^3$ /min | = | cubic metres per minute |
| $m^3/hr$ | = | cubic metres per hour |
| $mg/m^3$ | = | milligrams per cubic metre @ 0C and 1 atmosphere pressure from n-propane |
| VOC | = | Volatile Organic Compounds |
| VRS | = | Vapour Recovery System |

### 7.1.1 CONCLUSION

Therefore, the collected data and application to Group C limits proves that the process plant shows conclusively that airborne emission parameters will comply with the Group C emission limits for Non-Scheduled Premises as set out in the POEO (Clean Air) Regulation 2002.

Furthermore, the proposed emissions will still readily comply with the more stringent Group 6 Regulation limits for Scheduled Premises. However, even with this ready compliance IPMG has gone the extra step to show that these emissions which comply with the Regulation stack limits will also comply with Ground Level Impact Assessment Criteria.

## 7.2 PREDICTED GROUND LEVEL CONCENTRATIONS – IMPACT ASSESSMENT CRITERIA

### 7.2.1 INTRODUCTION

Toluene was selected as the emission parameter of choice as an indicator of the likely impact of emissions from this proposed process because it had the highest mass emission rate compared with ground level concentration IAC. Also, toluene had the potential to be a source of odour emission and, thus, was potentially a more sensitive test of suitability of the proposed process and associated emission controls. Odour issues are the subject of a separate specialist report for this project.

Dust particles (Total Suspended Particulate Matter (TSP)); Chromium which is one of the Type I and Type II substances in Group 6 of the NSW Clean Air Regulations; Sulphuric Acid Mist/Sulphur Trioxide and $NO_x$ will all behave in the AUSPLUME model in a similar way to toluene. Therefore, if toluene emissions from the VRS with a discharge air volume significantly greater than other emission sources on-site (Refer Table 7-1 for Mass Emission Rates) complies with IAC then other smaller mass emission rate sources will readily comply with their respective IAC's.

As stated in Section 3.2 the DECC IAC for toluene is 0.36 mg/m$^3$.

### 7.2.2 ATMOSPHERIC DISPERSION MODELLING

#### BACKGROUND

Holmes Air Sciences was engaged by SEMA to conduct atmospheric dispersion modelling of toluene emissions from the proposed VRS to determine the impact at ground level of these emissions.

This modelling process requires various input data to define the local characteristics. These characteristics include a terrain file to show both natural and built topographic variations, meteorological file to reflect the variables of wind speed and wind direction, temperature and relative humidity and an emissions inventory file to define what mass of emissions would be discharged from the stacks on-site.

This data is then entered into the Regulatory AUSPLUME Dispersion Model which is used to predict what the ground level concentration of these emissions would be after discharge from the stack. Ausplume dispersion model was developed for the Victorian EPA and is still considered the Regulatory model of choice for Gaussian distribution of emissions in non-complex terrain. The output of the model will then be used to confirm an appropriate stack height and pollution control efficiency of the VRS.

#### TYPE OF IMPACT ASSESSMENT

Modelling was undertaken using the computer based dispersion model AUSPLUME, version 6.0. AUSPLUME is a Gaussian plume dispersion model whose mathematical basis derives from the Victorian Environment Protection Authority's "Plume Calculation Procedure" (EPAV 1985), which is an extension of the ISC model of Bowers et al. (1979). It is designed to predict ground-level concentrations or dry deposition of pollutants emitted from one or more sources, which may be stacks, area sources, volume sources, or any combination of these. Line source are not explicitly handled, but it is possible to improvise by modelling with multiple volume sources (Environment Protection Authority of Victoria).

AUSPLUME requires as input:

- A meteorological data set which contains information on wind speed, wind direction, wind direction variability (sigma theta), temperature, mixing height and stability class
- Information on each emission source to be considered
- Information on significant buildings in the area surrounding the emission points
- And optionally, if terrain features are to be taken into consideration, a terrain data set for both the topography and buildings.

#### METEOROLOGICAL DATA

Meteorological data used in the dispersion modelling was obtained for Liverpool by Holmes Air Sciences from nearby Sydney Water Sewerage Treatment Plant and Bureau of Meteorology.

The presence of topographic features, buildings or vegetation increases the ground's surface roughness. For all but the unstable categories (where convective turbulence dominates), the effect of surface roughness is to increase the vertical mixing of the plume because of the enhanced mechanical turbulence generated as the air moves over the ground.

Reported values of surface roughness in the literature vary greatly even for the same nominal land use. AUSPLUME allows the user to enter the surface roughness (Environment Protection Authority of Victoria).

#### TERRAIN DATA AND DISCREET RECEPTORS

The local terrain was relatively flat, therefore additional terrain data were not incorporated in the model. The model receptor grid was set at 100 metre spacing in the east-west and north-south directions over the full model domain.

As the purpose of the modelling was to determine the predicted impact of emissions on the residential area surrounding the site, no specific discreet receptors were set up in the model.

### BUILDING WAKE/DOWNWASH EFFECTS

As winds approach buildings and other structures, the wind tries to flow over or around the structure. This results in higher air pressures on the upwind side of the structures and lower air pressures on the downwind (lee) side of the structures. Depending on the discharge height of the stack relative to building or structure heights the lower pressures on the downwind side of buildings can cause plumes from stacks and other building openings to be trapped in the wake air flows, which increase ground level impacts and decrease the effects of dispersion on the downwind side of the buildings. This scenario is referred to as building wake or building down wash effects.

The AUSPLUME model contains options for including the effects of building wakes/downwash in the calculations, and the PRIME method of wake effect calculation was used for the modelling undertaken for this report.

The PRIME method requires the projected building heights and widths as input to calculate the effects of building downwash (the projected building heights and widths will vary depending on the building geometry and the wind direction). A utility within AUSPLUME, the US Building Profile Input Program (BPIP) was used to estimate the projected building heights and widths required. This version of BPIP also estimates additional parameters required by the PRIME building downwash algorithms.

Building downwash (wake) effects from major structures on the site were incorporated in the modelling. Figure 7-1 shows the plan view of building structures which have been incorporated in the model and their orientation in relation to the stack.

### INPUT DATA

To optimise the modelling process a number of potential combinations of stack height and emission rate were selected.

Initially, there were three (3) different stack heights modelled. Stacks heights of 12 metres, 15 metres and 24 metres were selected to determine if a short stack of similar height to surrounding buildings would suffice or whether a tall stack, which would require further planning approval, may be required to satisfactorily disperse the toluene emission. However, when the modelling predictions for the shorter stack heights complied with IAC's, the taller stack option was deleted.

Toluene emission rates of 1.2 and 1.6 grams per second were derived as emissions input data from an exhaust gas flow rate of 30 or 40 cubic metres per second and a discharge concentration of 40 mg/m$^3$.

This concentration is numerically equal to the POEO Clean Air Regulation limit for VOC's as n-propane but the toluene emission will be approximately 50% of this emission limit. These modelling scenarios are presented in Table 7-2.

**TABLE 7-2 ATMOSPHERIC DISPERSION MODELLING SCENARIOS**

| | Case 1 | Case 2 | Case 3 | Case 4 |
|---|---|---|---|---|
| Stack Height (m) | 12 | 12 | 15 | 15 |
| Exhaust Gas Flow Rate ($m^3/s$) | 30 | 40 | 30 | 40 |
| Stack Exit Velocity (m/s) | 11.3 | 15 | 11.3 | 15 |
| Toluene Emission Rate (g/s) | 1.2 | 1.6 | 1.2 | 1.6 |

Notes:
Constants used in Modelling Scenarios in Table 7-2 were:-

- Stack Tip Diameter = 1.84 m
- Exhaust Gas Temperature = 25 $^oC$
- VOC (as toluene) Emission Concentration = 40 $mg/m^3$

Key:
$^oC$ = Degrees Celsius
g/s = grams per second
m = metres
m/s = metres per second
$mg/m^3$ = milligrams per cubic metre@ 0 $^oC$ and 1 atmosphere pressure

**SENSITIVE RECEPTORS/ SURROUNDING LAND-USES**

The location of the proposed development at Warwick Farm is surrounded by industrial facilities to the East and South, Liverpool Hospital to the South West, residential property to the North and across the Rail Line to the West and High School across the main South West rail line to the West of the site.

Figure 7-1 is an aerial photograph of the site and areas in the immediate vicinity, while Figure 7-2 shows the location of the local schools and hospital.

The nearest industrial site, residence(s), hospital, high school were used in the dispersion modelling as receptors.

**FIGURE 7-1 AERIAL PHOTOGRAPH OF THE PROPOSED IPMG SITE**


**FIGURE 7-2 SITE SHOWING LOCAL SCHOOLS AND HOSPITAL**

### 7.2.3 ATMOSPHERIC DISPERSION MODELLING RESULTS

These scenarios were modelled using the computer-based AUSPLUME dispersion model. Table 7-3 summarises the results from the AUSPLUME dispersion modelling based on a 1-hour averaging period as required by the Approved Methods in NSW.

**TABLE 7-3 DISPERSION MODELLING PEAK GROUND LEVEL CONCENTRATION OF TOLUENE RESULTS – 1 HOUR AVERAGING PERIOD**

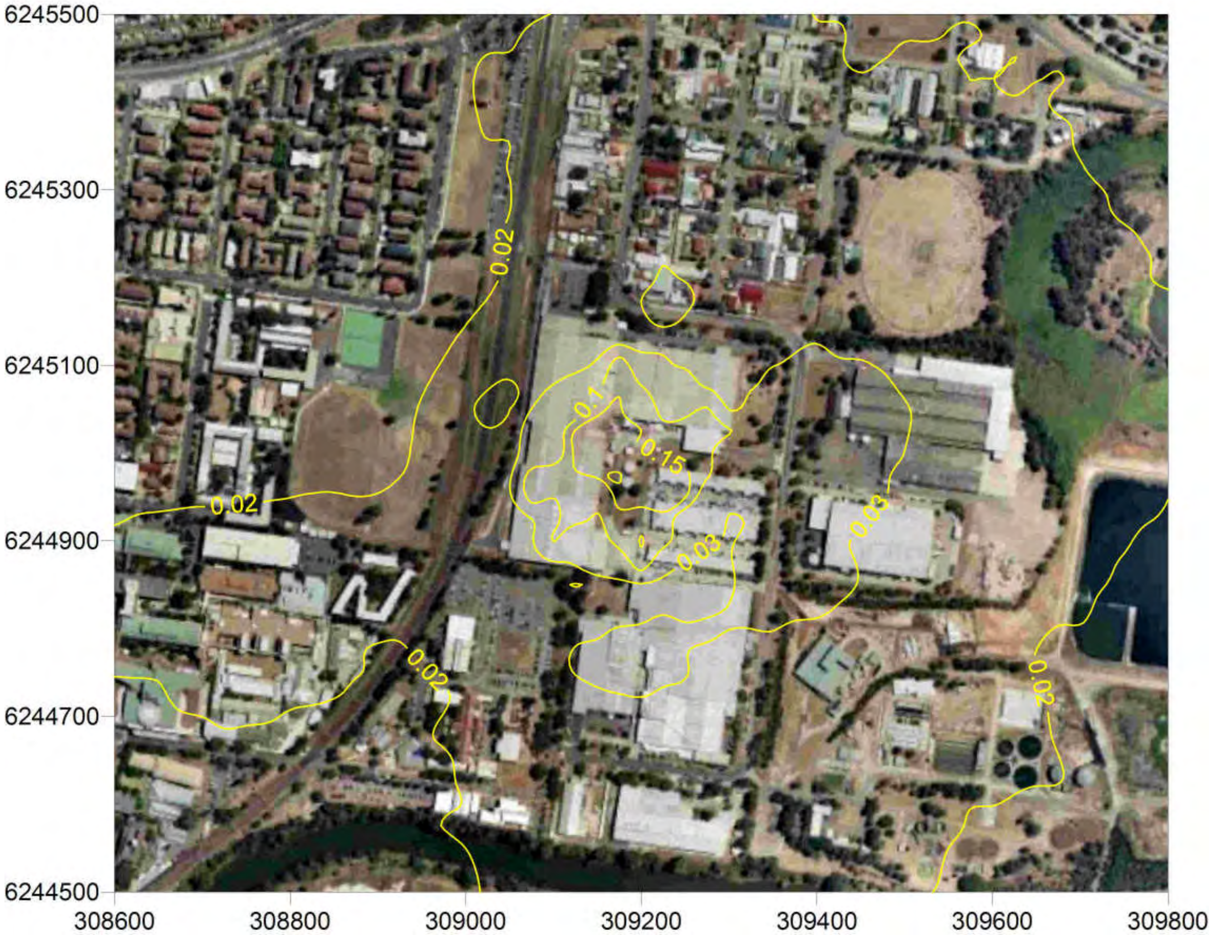
| | Ground Level Concentration of Toluene (mg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|
| | A: Boundary (Industrial) (33 m from stack) | B: Manning St Residence (250 m from stack) | C: Priddle & Manning St (218 m from stack) | D: Hospital (500 m to rear buildings) | E: High School (500 m) | DECC DGLC (Impact Assessment Criteria)for toluene (mg/m$^3$) |
| Case 1 | 0.10 | 0.03 | 0.05 | < 0.03 | < 0.03 | 0.36 |
| Case 2 | 0.15 | 0.05 | 0.05 | < 0.03 | < 0.03 | 0.36 |
| Case 3 | 0.15 | 0.03 | 0.03 | 0.02 | < 0.02 | 0.36 |
| Case 4 | 0.2 | 0.06 | 0.06 | 0.03 | < 0.02 | 0.36 |

Key:

| | | |
|---|---|---|
| < | = | less than |
| DECC | = | Department of Environment and Climate Change |
| DGLC | = | Design Ground Level Concentration |
| m | = | metres |

Refer to Figures 7-3 and 7-4 for plots of the results for Cases 3 and 4 of atmospheric dispersion modelling of toluene emissions from the proposed operations.

**FIGURE 7-3 DISPERSION MODELLING PLOT OF TOLUENE EMISSIONS (CASE 3)**



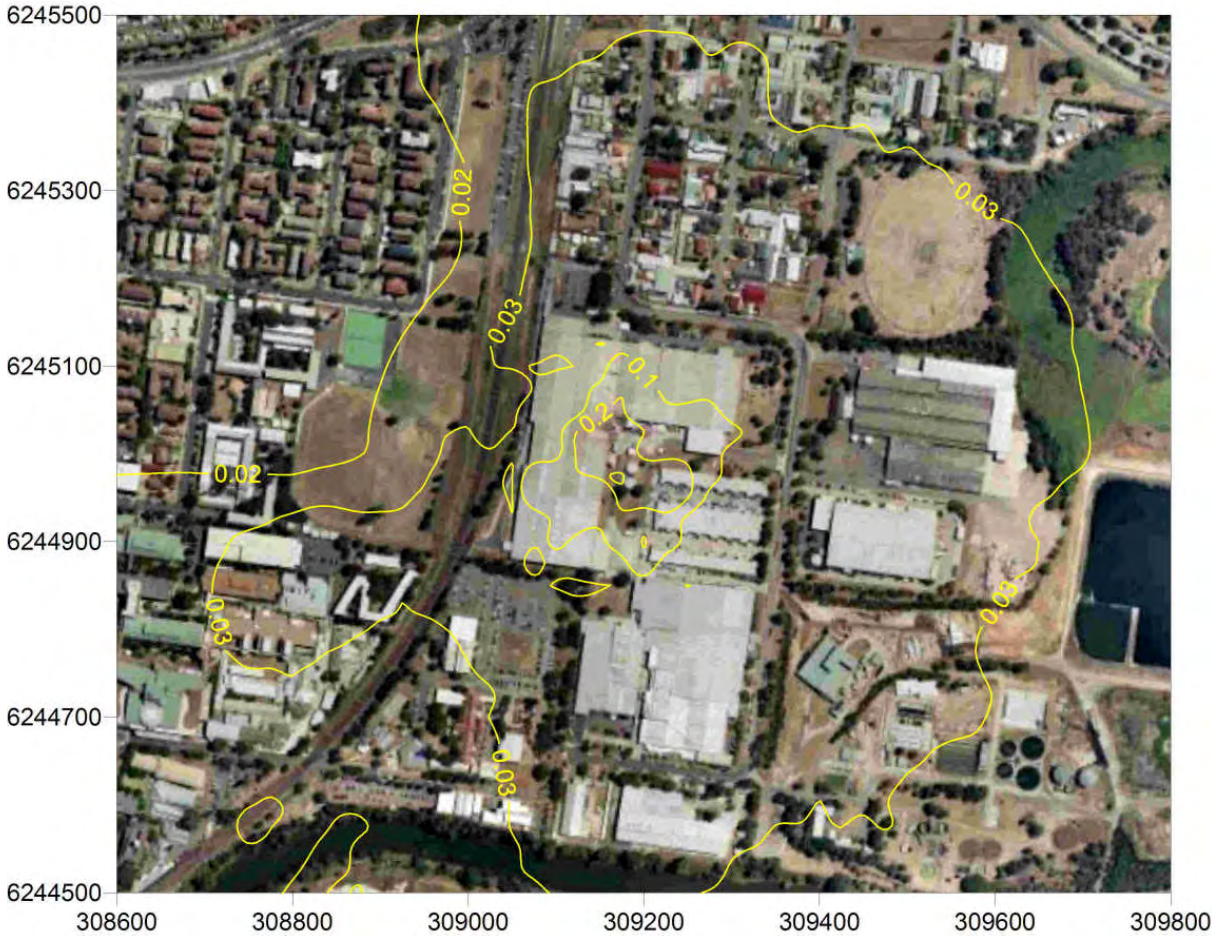

Predicted 99.9$^{th}$ percentile 1-hour toluene concentration (mg/m$^3$)

Emission rate of 1.2 g/s

Key:

Dimensions in metres: Grid is 1200 metres by 1000 metres

**FIGURE 7-4 DISPERSION MODELLING PLOT OF IMPACT ASSESSMENT (CASE 4)**




Predicted 99.9th percentile 1-hour toluene concentration (mg/m$^3$)
Emission rate of 1.6 g/s

Key:

Dimensions in metres: Grid is 1200 metres by 1000 metres

### 7.2.4 CONCLUSION

The predicted ground level concentrations of toluene presented in Table 7-3 indicate that all stack heights and emission rates will readily disperse the emissions prior to coming to ground and, hence, will comply with the Impact Assessment Criteria as specified in the Approved Methods for Modelling.

Table 7.4a of these Approved Methods for Modelling – Impact Assessment Criteria (IAC) for individual odorous air pollutants states the IAC for toluene as 0.36 $mg/m^3$ with an averaging period of 1 hour. This IAC for toluene has been designed based on the odorous nature of this air pollutant.

The prime reason for this ready compliance of the IAC is that the emission control for this plant has been designed at source; that is, the VRS is designed to collect toluene solvent vapours very efficiently rather than using the increased stack height as a method of facilitating the dilution or dispersion of air pollutants over time and distance.

Therefore, a stack height of 15 metres was selected for architectural and structural engineering reasons because the modelling has predicted ready compliance with IAC. Refer to Figure 5-3 for elevation drawing of the VRS and Stack.

# 8 CONCLUSIONS

The following conclusions are drawn from the data and assessment presented in this document:-

- **Overall** all emissions to atmosphere from this proposed rotogravure printing process and associated support processes including cylinder preparations and mechanical engraving will comply with the Group C requirements of the Regulations (Clean Air) under the POEO Act for Non-Scheduled Premises. Even though this plant will not be Scheduled, the more stringent Group 6 requirements for Scheduled Premises of the Regulations (Clean Air) under the POEO Act will still be complied with.

- **Sulphuric Acid Gases and Chromium Emissions - Cylinder Preparations**: Emissions of sulphuric acid gases and chromium will be controlled by a wet scrubbing exhaust gas cleaning system designed to comply with the more stringent Group 6 Clean Air Regulation emission limits.

- **Toluene Emissions-Press Room**: Emissions of solvents, in particular toluene, will be controlled and recovered by a Vapour Recovery System (VRS). The recovered solvent will be returned to process with excess solvent being returned to supplier for reprocessing or sale. Emissions of Toluene will comply with the more stringent Group 6 Clean Air Regulation emission limits.

- **Toluene ground level concentration**s will be determined by the design efficiency of the VRS rather than stack height. That is, the toluene emission will be collected for re-use by the VRS rather than being emitted to atmosphere and then relying on time and distance to disperse those emissions.

  However, despite this ready compliance of stack emissions with the Group 6 Clean Air Regulation emission limits by recovering the solvent emission, dispersion modelling has also been performed to determine compliance of the ground level impact of these emissions with the Impact Assessment Criteria.

- **The Impact Assessment Criteria (IAC)** for the ground level concentrations of toluene is readily complied with using either a 12 metre or a 15 metre high discharge stack. Based on the mass emission rates, stack heights and the AUSPLUME dispersion modelling the other emission parameters of Sulphuric Acid gases, Chromium, $NO_x$, $SO_2$, CO, $CO_2$ and TSP will also comply with relevant IAC's.

- **Oxides of Nitrogen ($NO_x$) / Sulphur Dioxide ($SO_2$) / Carbon Monoxide (CO)/ Carbon Dioxide ($CO_2$) Emissions - Boilers**: $NO_x$, $SO_2$, CO and $CO_2$ emissions from the package boilers on site will comply with the more stringent Group 6 requirements under the Clean Air Regulations.

- **Total Solid Particulate Matter (TSP) / Dust Particle Emissions -Waste Paper Collection Area**: Waste paper off-cuts will be pneumatically conveyed from the various sections of the printing, slitting and binding processes to a waste paper Baling facility for compaction and recycling. Pneumatic conveying air will be filtered using fabric filtration (baghouse) technology to remove particles from the exhaust gas stream prior to emission to atmosphere.

- Particulate matter (TSP) emissions from this baghouse will comply with the Group C requirements of the POEO (Clean Air) Regulations and, even though this plant will not be Scheduled, TSP emissions will also comply with the Group 6 requirements.

## APPENDIX A – DIRECTOR-GENERAL REQUIREMENTS

NSW GOVERNMENT
**Department of Planning**

**Manufacturing & Rural Industries**
**Major Development Assessment**
Phone: (02) 9228 6495
Fax: (02) 9228 6466
Email: megan.webb@planning.nsw.gov.au
Level 4 Western Gallery
23-33 Bridge Street
GPO Box 39
SYDNEY NSW 2001

Ms Vivienne Goldschmidt
JBA Urban Planning Consultants Pty Ltd
Level 7, 77 Berry St
NORTH SYDNEY NSW 2060

Dear Ms Goldschmidt

**Director-General's Requirements**
**Warwick Farm Printing Project**
**Project Application 08_0088**

The Department has received your application for the Warwick Farm Printing Project.

I have attached a copy of the Director-General's requirements for the project. These requirements have been prepared in consultation with the relevant agencies, and are based on the information you have provided to date. I have also attached a copy of the agencies comments for your information.

Please note that the Director-General may alter these requirements at any time.

If your proposal is likely to have a significant impact on matters of National Environmental Significance, it will require an approval under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act). This approval is in addition to any approvals required under NSW legislation. It is your responsibility to contact the Department of Environment, Water, Heritage and the Arts in Canberra (6274 1111 or http://www.environment.gov.au) to determine if the proposal requires an approval under the EPBC Act. The Commonwealth Government has accredited the NSW environmental assessment process, so if it is determined that an approval is required under the EPBC Act, please contact me immediately as supplementary Director-General's requirements may need to be issued.

I would appreciate it if you would contact the Department at least two weeks before you propose to submit your Environmental Assessment for the project. This will enable the Department to determine the:

- applicable fee (see Division 1A, Part 15 of the Environmental Planning and Assessment Regulation 2000);
- consultation and public exhibition arrangements; and
- number of copies (hard-copy or CD-ROM) of the Environmental Assessment that will be required for exhibition purposes.

Once it receives the Environmental Assessment, the Department will review it in consultation with the relevant agencies to determine if it adequately addresses the Director-General's requirements, and may require you to revise it prior to public exhibition.

NSW Department of Planning, GPO Box 39, SYDNEY NSW 2001
DX 10181 Sydney Stock Exchange Website: www.planning.nsw.gov.au

The Department is required to make all the relevant information associated with the project publicly available on its website. Consequently, I would appreciate it if you would ensure that all the documents you subsequently submit to the Department are in a suitable format for the web, and arrange for an electronic version of the Environmental Assessment to be hosted on a suitable website during the exhibition period.

If you have any enquiries about these requirements, please contact Megan Webb.

Yours sincerely

7. Mar 2008

Chris Wilson
**Executive Director**
**Major Project Assessment**
As delegate for the Director-General

2

# Director-General's Requirements

## Section 75F of the *Environmental Planning and Assessment Act 1979*

| | |
|---|---|
| **Application number** | 08_0088 |
| **Project** | Development of a printing, warehouse and distribution facility and associated infrastructure. |
| **Location** | 23 Scrivener St, Warwick Farm, Lot 1 DP 774089 |
| **Proponent** | Independent Print Media Group Pty Ltd |
| **Date of Issue** | 7 May 2008 |
| **Date of Expiration** | 7 May 2010 |
| **General Requirements** | The Environmental Assessment must include:<br>• an executive summary;<br>• a detailed description of the project, including the:<br>– need for the project;<br>– alternatives considered;<br>– engineering and/or architectural plans for the proposed building works; and<br>– various stages of the project;<br>• consideration of the project against any relevant statutory provisions, including whether it is consistent with the objects of the *Environmental Planning and Assessment Act 1979*;<br>• a general overview of all the environmental impacts of the project, identifying the key issues for further assessment;<br>• a detailed assessment of the key issues specified below, and any other significant issues identified in the general overview of environmental impacts of the project (see above), which includes:<br>– a description of the existing environment;<br>– an assessment of the potential impacts of the project, including any cumulative impacts;<br>– a description of the measures that would be implemented to avoid, minimise, mitigate, offset, manage, and/or monitor the impacts of the project;<br>• a Statement of Commitments, outlining the proposed environmental management, mitigation and monitoring measures for the project;<br>• a conclusion justifying the project, taking into consideration the costs and benefits of the project and the suitability of the site; and<br>• a signed statement from the author of the Environmental Assessment certifying that the information contained in the report is neither false nor misleading. |
| **Key Issues** | • **Development Controls** – demonstrate that the proposal is generally consistent with the Liverpool Council's relevant *Development Control Plans*, and justify any inconsistencies between the project and these DCPs;<br>• **Soil and Water** – including:<br>– flooding;<br>– a detailed water balance for the project, outlining the measures that would be implemented to minimise the use of water on site;<br>– wastewater predictions, and the measures that would be implemented to treat, reuse and/or dispose of this water;<br>– the proposed erosion and sediment controls during construction;<br>– the proposed stormwater management system; and<br>– consideration of the potential salinity, contamination and acid sulfate soil impacts of the project;<br>• **Noise** – including construction, operational and traffic noise; |

3

| | |
|---|---|
| | • **Traffic and Parking** – including:<br>– a detailed traffic impact study of the project on the safety and performance of the surrounding road network, and a description of the measures that would be implemented to upgrade and/or maintain this network over time; and<br>– an assessment of the potential parking demand of the project;<br>• **Hazards and Risk** - including a Preliminary Hazard Analysis (PHA) of the project;<br>• **Air Quality** – particularly the potential Volatile Organic Compounds (VOCs) and dust emissions;<br>• **Odour**;<br>• **Visual Impacts** – including landscaping, the design and articulation of the building, lighting, any signage; impacts on nearby sensitive receivers and any measures to mitigate impacts;<br>• **Greenhouse Gas and Energy** – calculate the scope 1 and 2 emissions of the project, and describe what measures would be implemented to ensure the operations on site are energy efficient; and<br>• **Waste** – identify, classify and quantify the likely waste streams that would be generated by the project during construction and operation, and describe what measures would be implemented to minimise, reuse and/or dispose of this waste. |
| **References** | The Environmental Assessment should take into account relevant State government technical and policy guidelines. While not exhaustive, guidelines which may be relevant to the project are included in the attached list. |
| **Consultation** | During the preparation of the Environmental Assessment, you should consult with the relevant local, State or Commonwealth government authorities, service providers, community groups or affected landowners.<br><br>In particular you must consult with the:<br>• Department of Water and Energy;<br>• Roads and Traffic Authority; and<br>• Liverpool City Council.<br><br>The consultation process and the issues raised must be described in the Environmental Assessment. |
| **Deemed refusal period** | 60 days |

4

## State Government Technical and Policy Guidelines - For Reference

| Aspect | Policy /Methodology |
|---|---|
| **Soil and Water** | |
| *Erosion & Sediment Control* | Managing Urban Stormwater: Soils & Construction (Landcom) |
| *Stormwater* | Managing Urban Stormwater: Council Handbook. Draft (EPA) |
| | Managing Urban Stormwater: Treatment Techniques (EPA) |
| | Managing Urban Stormwater: Source Control. Draft (EPA) |
| | Managing Urban Stormwater: Harvesting and Reuse (DEC) |
| *Flooding* | Floodplain Management Manual (DNR) |
| | Floodplain Risk Management Guideline |
| *Acid Sulfate Soils* | Acid Sulfate Soil Manual (ASSMAC) |
| *Salinity* | NSW Salinity Strategy (DLWC) |
| *Water Quality* | National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ) |
| | National Water Quality Management Strategy: Implementation guidelines (ANZECC/ARMCANZ) |
| | Using the ANZECC Guideline and Water Quality Objectives in NSW (DEC) |
| | Bunding and Spill Management (EPA) |
| | Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC) |
| *Wastewater Reuse* | National Water Quality Management Strategy: Guidelines for Sewerage Systems - Effluent Management (ARMCANZ/ANZECC) |
| | National Water Quality Management Strategy - Guidelines For Water Recycling: Managing Health And Environmental Risks (Phase1) (EPHC, NRMMC & AHMC) |
| *Groundwater* | National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC) |
| | NSW State Groundwater Policy Framework Document (DLWC) |
| | NSW State Groundwater Quality Protection Policy (DLWC) |
| | Draft NSW State Groundwater Quantity Management Policy (DLWC) |
| *Contamination* | Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC & NHMRC) |
| | National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC) |
| | Managing Land Contamination - Planning Guidelines SEPP 55 – Remediation of Land (DUAP and EPA) |
| **Noise** | |
| | NSW Industrial Noise Policy (DECC) |
| | Environmental Criteria for Road Traffic Noise (NSW EPA) |
| | Environmental Noise Control Manual (DECC) |
| **Traffic and Transport** | |
| | Guide to Traffic Generating Development (RTA) |
| | Road Design Guide (RTA) |
| | Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DECC) |

5

| | |
|---|---|
| **Hazards & Risks** | |
| | Applying Sepp 33: Hazardous And Offensive Development Application Guidelines (DUAP) |
| | Hazardous Industry Planning Advisory Paper No. 6 (HIPAP No 6): *Guidelines for Hazardous Analysis*, (DUAP) |
| | Multi-Level Risk Assessment (DUAP) |
| **Air Quality** | |
| | Protection of the Environment Operations (Clean Air) Regulation 2002 |
| | Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DECC) |
| | Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DECC) |
| **Odour** | |
| | Technical Framework: Assessment and Management of Odour from Stationary Sources in NSW (DEC) |
| | Technical Notes: Assessment and Management of Odour from Stationary Sources in NSW (DEC) |
| **Visual** | |
| | Control of Obtrusive Effects of Outdoor Lighting (Standards Australia, AS 4282) |
| **Greenhouse Gas and Energy** | |
| | National Greenhouse Accounts (NGA) Factors |
| | Guidelines for Energy Savings Action Plans (DEUS) |
| **Waste** | |
| | Waste Avoidance and Resource Recovery Strategy 2007 (DECC) |
| | Environmental Guidelines: Assessment Classification and Management of Non-Liquid and Liquid Waste (DECC) |