Intermodal Logistics Centre at Enfield Environmental Assessment

CHAPTER 10

HYDROLOGY, HYDRAULICS AND WATER QUALITY

- October 2005

Contents

10. Hydrology, Hydraulics and Water Quality

This chapter describes the existing hydrology and hydraulic regime and water quality characteristics of the waterways within the proposed Intermodal Logistics Centre (ILC) at Enfield. It addresses the Director-General's requirements to assess the potential impacts of the proposed development during the construction and operational phases on water quality, and to assess the implications of flooding and drainage. Specifically, the chapter considers surface water discharges from the development including impacts from stormwater runoff to any receiving waters, the effect of this on the flooding regime, the erosion and sediment control measures to be undertaken and possible opportunities for the recycling of water. Mitigation measures and environmental safeguards to minimise any adverse impacts are identified. The Hydrology and Hydraulics Working Paper and the Stormwater Quality and Soil and Water Management Working Paper are provided in Appendix D.

10.1 Waterways in the Study Area

10.1.1 Regional Catchment

The proposal is located within the Upper Cooks River Catchment (UCRC), which covers an area of approximately 2,200ha. The extremities of the catchment extend to the Rookwood Cemetery and the Chullora Railway Yards in the north, Potts Hill Reservoir in the west and as far as Roselands commercial district in the south. The Cooks River flows around to the north and east of the proposed ILC site at Enfield and there is a confluence with Coxs Creek (the eastern extreme of the UCRC) immediately west of Water Street in Strathfield South. The Cooks River then flows southeast to its receiving waters of Botany Bay adjacent to the Sydney (Kingsford – Smith) Airport.

10.1.2 Local Catchment

Four drainage lines flow beneath the ILC site, including Coxs Creek in the southern part of the site, and three unnamed drainage lines to the north of Coxs Creek. The two most northerly drainage lines meet on the DELEC site's downstream edge and these are referred to throughout the rest of this chapter as a single drainage line, the DELEC Drain. The drainage line immediately north of Coxs Creek has been termed the Central Drain throughout the rest of this chapter. Each of the three drainage lines drains to the east into the Cooks River.

These three drainage lines drain four main catchments (denoted 1-4) upstream of the site, which include the suburbs of Wiley Park, Greenacre, Punchbowl and Chullora. Catchment 4 drains to the DELEC drain, catchment 3 to the Central Drain and catchments 1 and 2 to Coxs Creek at the southern end of the ILC site. These drainage lines and the catchments they drain are illustrated in **Figure 10-1**. All three main drainage lines that cross the site join with the Cooks River at separate discharge points. The majority of the catchments drain heavily urbanised areas, which include industrial and residential land uses.

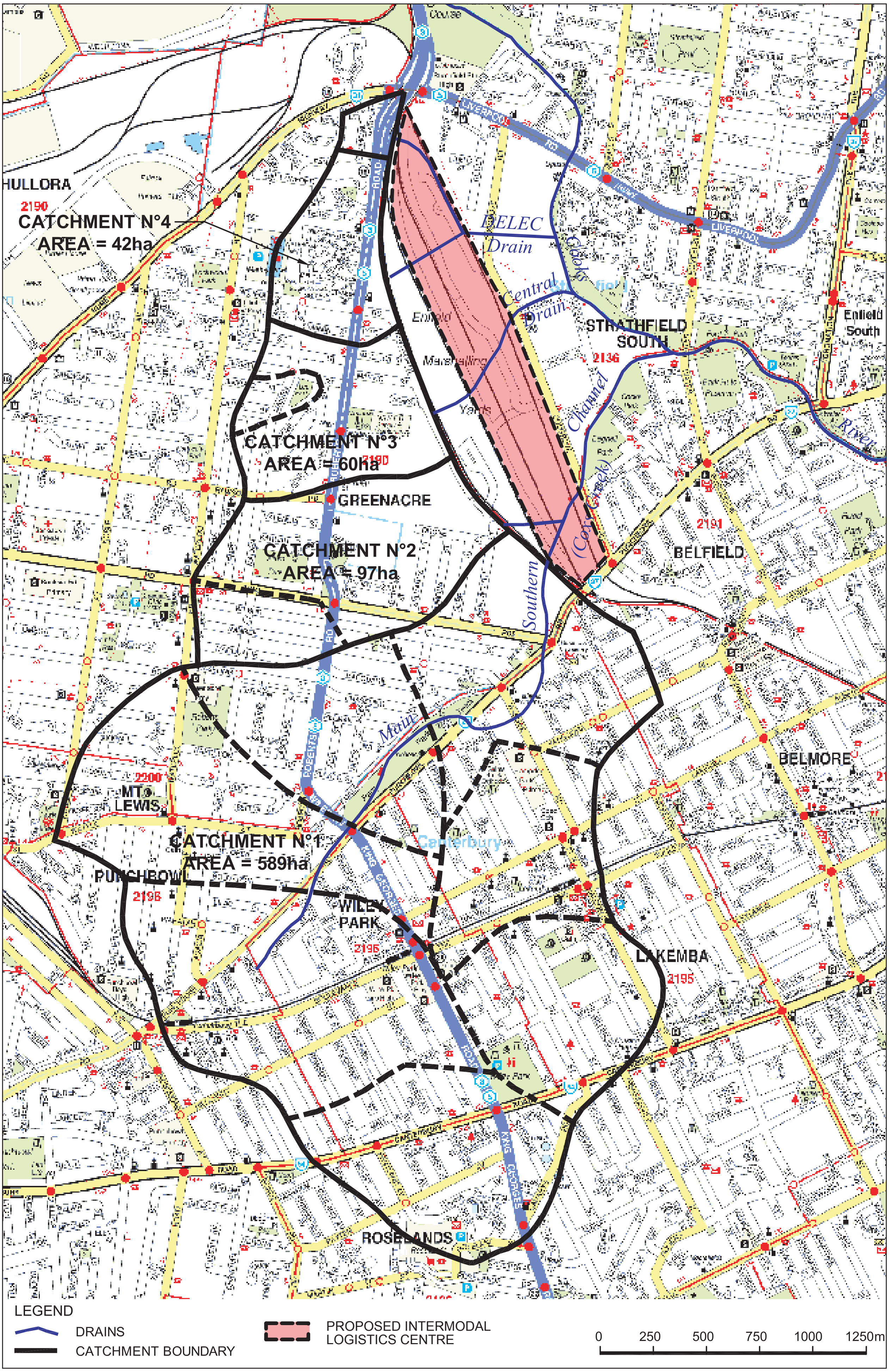

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Figure 10-1
Catchment Boundaries

10.2 Hydrology and Hydraulics

10.2.1 General

The assessment of the hydrology and hydraulic regime of the waterways within the vicinity of the proposed site is described in Appendix D – Hydrology and Hydraulics. The study included an assessment of the existing drainage infrastructure and internal catchment flows within the study area. Significant amounts of reference data were available from previous hydraulic assessments of the site, in particular from Binnie & Partners (1991), and these data were used in preparation of the study. Additionally, computer modelling used in the study adopted parameters and concepts developed in the previous work.

10.2.2 Existing Drainage

Table 10-1 is a summary of local catchment flows and culvert capacities for the drains crossing the ILC site.

Table 10-1: Catchment Flows and Drain Capacities

	Catchment and Drain			
	1 (Coxs Creek)	2 (Tributary of Coxs Creek)	3 (Central Drain)	4 (DELEC Drain)
Area (ha)	589	98	60	42
10-Year ARI Flows (m^3/s)	124	22	16	13
20-Year ARI Flows (m^3/s)	142	25	18	14
100-Year ARI Flows (m^3/s)	186	33	23	19
Capacity of Culverts (m^3/s)	52	14	4.3	15
100-year ARI Excess flow (m^3/s)	134	19	18.7	4

Table 10-1 shows that Coxs Creek receives higher flows than the Central and DELEC Drains, and this flow is directly related to the size of the catchment drained. It is also evident that in the 100-year Average Recurrence Interval (ARI[1]) event, the culvert that is critically under-sized is the Coxs Creek channel. This results in the highest rate of overland flows (flooding) through the proposed site.

10.2.3 Existing Flooding

Figure 10-2 illustrates the areas in the vicinity of the ILC site that are prone to flooding. Flooding is experienced at the southern end of the site in large events, as a result of flows from Coxs Creek (Binnie & Partners, 1991). This flooding of the site has little impact on residents or businesses within the southern end.

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[1] The Average Recurrence Interval (measured in years) is a term used to describe flood size. It is a means of describing how likely a flood is to occur in a given number of years. For example, a 100 year ARI flood is a flood that occurs or is exceeded on average once every 100 years.

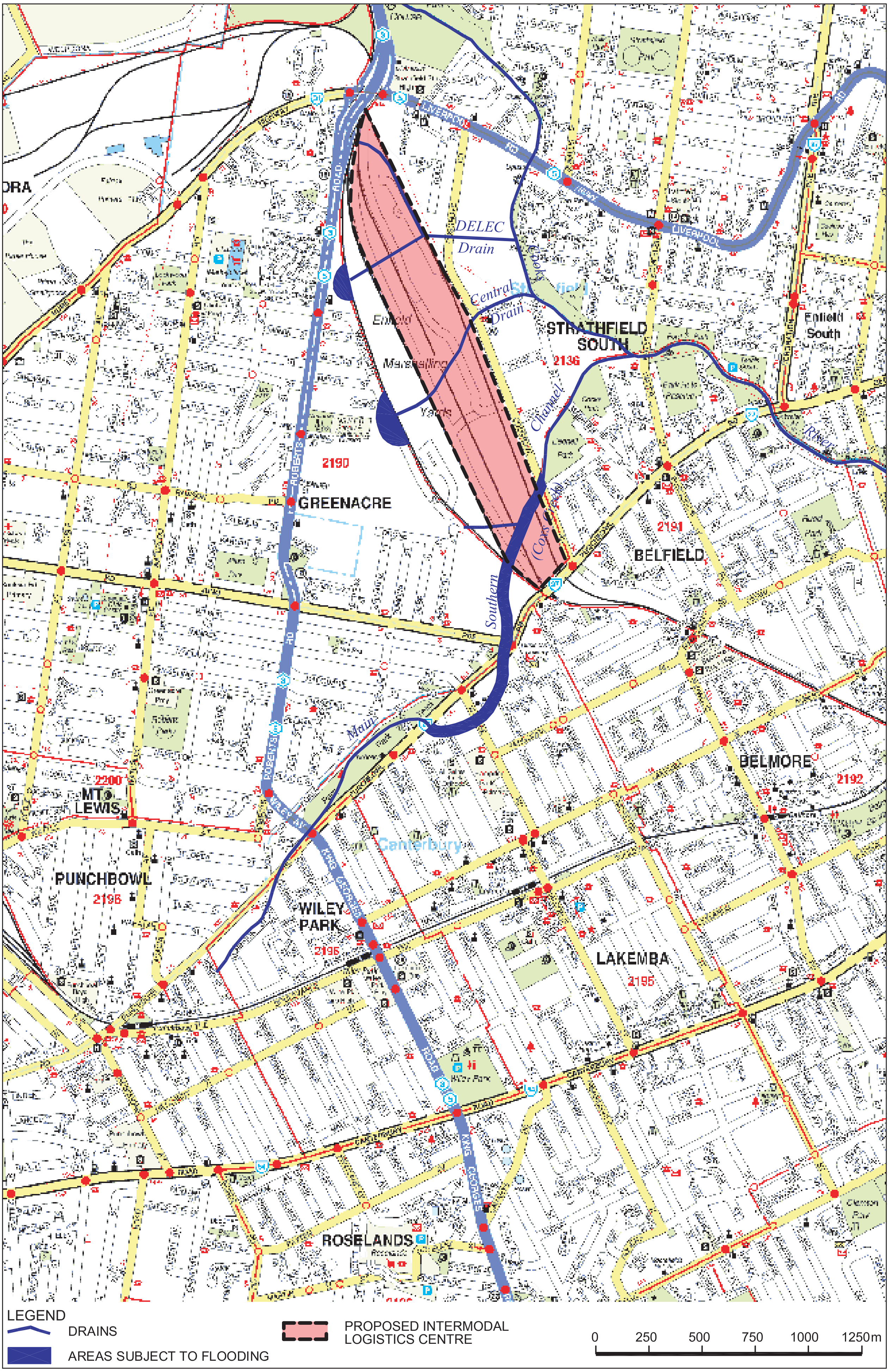

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Figure 10-2
Flood Prone Areas within the Vicinity of the ILC

Previous reports (SKM, 1993 and SKM, 1994) and communications with Sydney Water noted that downstream of the ILC site, residents adjacent to Cosgrove Road and Water Street near the confluence of Coxs Creek and the Cooks River have reported inundation of their properties in significant rainfall events. Flooding is also a known issue along Wentworth Street at the Mayvic Street intersection, upstream from the Central Drain. Flooding here inundates businesses and disrupts traffic in an event as small as the 1-year ARI event. Excess flows at the DELEC Drain are of a lesser magnitude. They still result, however, in minor flooding at the upstream end, near the western side of the ILC site.

10.2.4 Methodology

Hydrologic Modelling

To simulate the rainfall run-off behaviour during operation of the ILC site and develop mitigation options, a RAFTS rainfall run-off model was established. RAFTS is the industry standard tool for the assessment of urban rainfall run-off. The numerical model developed dealt mainly with the internal catchment, as the ILC site is basically an independent catchment.

Storm simulations were assessed to determine the critical storms (1 in 100, 1 in 20 and 1 in 5 ARI) and peak discharge for the pre and post development conditions.

Hydraulic Modelling

A MIKE-11 model of the Coxs Creek channel was set up to represent the hydraulic behaviour of the culverts and overland flowpaths. MIKE-11 is the industry standard tool for the assessment of drainage in open channels. The model was established using the topography of the existing site conditions and survey details of the existing drainage structures.

Internal Sub-catchments

Modifications to the landform over time have resulted in the entire site of the proposed development becoming a separate catchment of the Cook River. Upstream watercourses are diverted underneath the site. As such, water quality and drainage design need only address the development site, as there is no stormwater contribution to the internal site from the upstream catchments.

The ILC site can be subdivided into four internal sub-catchments, draining to the same three separate watercourses, as detailed for the local catchment. The Coxs Creek channel at the southern end of the site drains sub-catchments A and D. The Central and DELEC outlets drain sub-catchments B and C respectively. The proposed internal sub-catchments and corresponding drainage lines are illustrated in **Figure 10-3**. Essentially the sub-catchments represent different land uses within the ILC site.

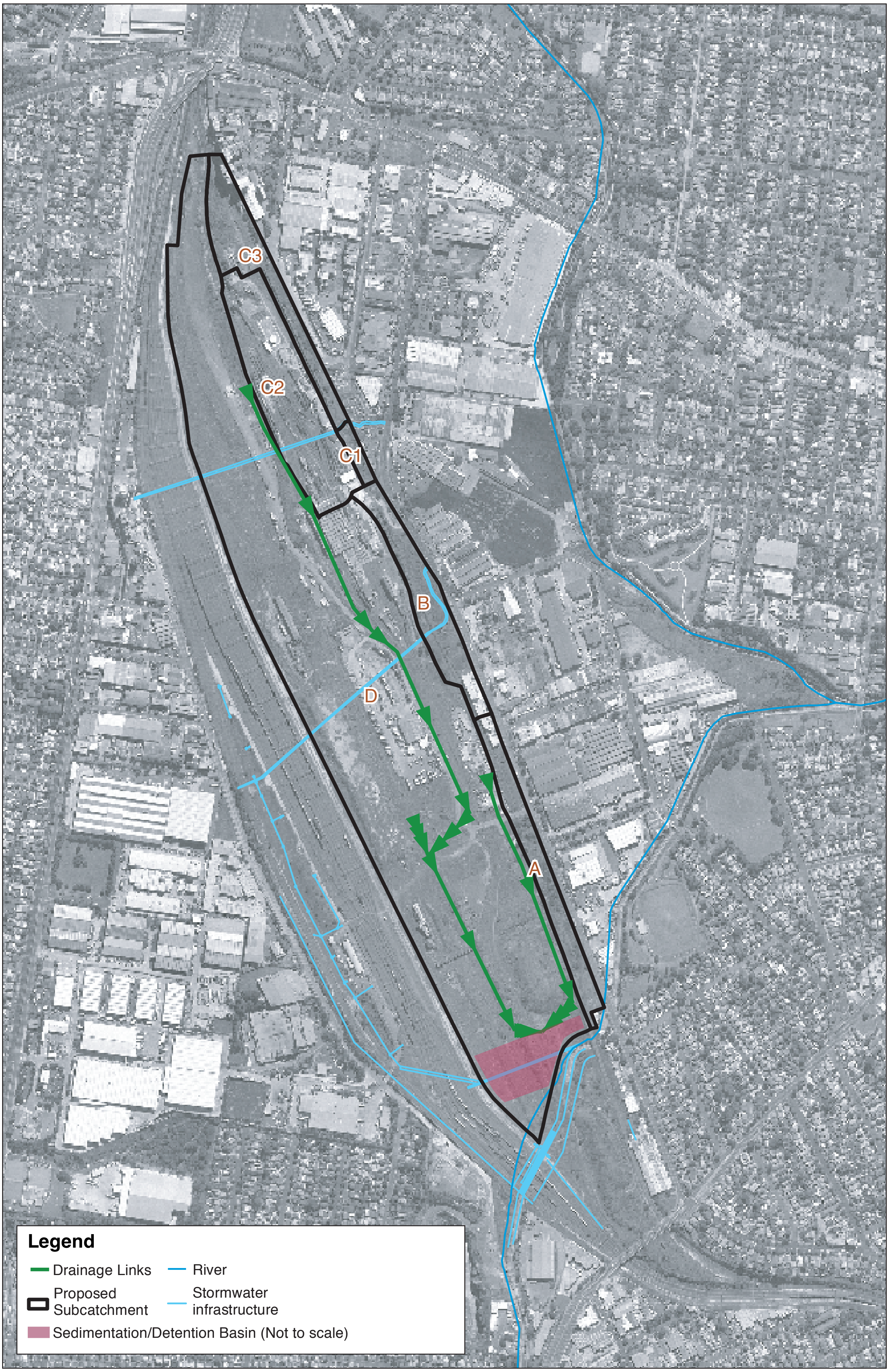

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Figure 10-3
Internal Sub-catchments and Sedimentation/Detention Basin

10.2.5 Hydrological and Hydraulic Impacts

The proposal would involve an increase in the imperviousness of the site, changes to the landscape form, and changes to drainage patterns. Each of these proposed modifications and the resulting impacts to the site are discussed further in this section. Note, these modifications and associated impacts are interlinked and do not operate in exclusion from each other.

Increased Impervious Area

The operation of the ILC requires that a large, essentially level, hardstand area be created for the operation of heavy vehicles used in loading/unloading operations. This would result in a substantial increase in the fraction of the site that is impervious to water. It is estimated that approximately 85% of the internal catchment areas under existing conditions are pervious. The proposed development would increase the quantity of paved area, thus decreasing the pervious area of the internal catchments to approximately 22% of the site. This paved area is represented in **Figure 10-3** by catchment D.

Changes to Landform

The proposed changes to the existing landform include the regrading of the site, so thus allowing more of the runoff to flow towards the southern end of the site and Coxs Creek. This would result in rainfall run-off being predominantly channelled towards the main Coxs Creek drain at the southern end of the site.

Changes to Drainage Patterns

The development of hardstand areas would also reduce the catchment areas contributing to the Central and DELEC outlets, both of which are already under capacity, while correspondingly increasing the catchment area discharging to Coxs Creek. The areas are represented as internal catchments B and C in **Figure 10-3**. Although the Central and DELEC channels would receive some degree of impact, a larger proportion of the flow would be diverted to Coxs Creek via an appropriate detention system. No increase in peak flows will be experienced at any of the drainage lines provided the detention system is appropriately located and sized.

Commercial and Light Industrial Development

The areas of internal catchments A and B are proposed for commercial and light industrial development associated with this proposal. It is possible that the areas would be developed as individual lots. In terms of the drainage issues, it is proposed that each individual development would address issues associated with drainage detention in accordance with Strathfield Council's On Site Detention (OSD) Policy (Strathfield Council Stormwater Management Code, 1994). The general requirement of this policy is that post-development discharges remain at pre-development levels, with no increase in flooding impacts to the surrounding land.

Reduced Floodplain Storage

The proposed ILC development involves modifications to the existing landform of the site in the area which is currently prone to flooding. These modifications include:

- Construction of detention basins and water quality pond on the north side of Coxs Creek;
- Filling above flood level for the hardstand areas;
- Extension of sound and visual mounds; and
- Construction of a new railway line on the western boundary of the site, across Coxs Creek.

The MIKE-11 hydrodynamic model was established to assess the impact of lost floodplain storage and any reduction in flood conveyance. Generally, the concrete channel of Coxs Creek is under-capacity for storm events more frequent than the 10 year ARI event. The above modifications would encroach into the area that would normally be inundated during overland flows, particularly at the southern end of the site. Results from the modelling indicated that the modifications would have an increase in the flood levels at the southern end of the site.

Measures to mitigate against this predicted level of flooding are presented below. The modelling undertaken for the study gave support to the design of the mitigation measures.

Probable Maximum Flood

In addition to the more frequent flood events the Probable Maximum Flood (PMF) event was also modelled with the modifications outlined above. The simulations showed that as a result of the proposed noise barriers located on the old rail embankment at the eastern side of the site, the PMF level would be expected to increase on-site and to a small extent upstream of Coxs Creek. This is due to the restriction of flood discharge at the Coxs Creek culvert outlet near Cosgrove Road.

Note the PMF event has a one in a million likelihood of occurrence and is modelled for the purpose of authority information in order to include in any flood evacuation preparation. Given the magnitude and probability of the event, the magnitude of the rise is not considered significant. However, the influence of the ILC development on the PMF may require future consideration during the detailed design.

10.2.6 Flood Management and Mitigation Measures

Mitigation measures have been restricted to within the site boundary, upstream of Cosgrove Road. If flow were not controlled within the site, increased discharge would be directed to already under-sized culverts at Cosgrove Road and mitigation would need to be achieved by augmenting the stormwater system from this point to the receiving waters. This is a major infrastructure task and is not within the scope of the proposal.

The “choke” resulting from the restricted Cosgrove Road culverts at Coxs Creek will not be removed. If the capacity of the Cosgrove Road culverts were to be increased, this would have the potential to cause additional downstream flooding. Any changes to the culvert arrangement at Cosgrove Road would exhibit far greater impact on the local floodplain than the proposed development.

The existing drainage infrastructure appears to be sound. However, the proposed development would alter the loading conditions on the infrastructure and careful consideration of this impact needs to be assessed at the detailed design stage. The design of the ILC site would have provisions that mitigate against drainage and flooding impacts.

The main mitigation measures that have been incorporated into the design are detailed in the following section on Detention Basins. Model simulations showed that the ILC development, with the inclusion of the proposed flood mitigation measures, would have a net positive impact on flood levels on the site. The proposal would result in improved flood levels both upstream of the site in the new Enfield Marshalling Yards and downstream where there is existing development on the western side of Cosgrove Road, particularly for events up to the 100-year ARI event. A negligible increase (2mm) in flood levels may be experienced, however, on the downstream (eastern) side of Cosgrove Road in the 100 year ARI event.

Detention Basins

To address the issues of additional runoff generated from the increase in imperviousness, detention basins would be incorporated into the design to reduce the post development peak outflow to a level less than or equal to that in the existing case. The requirement for and characteristics of any detention basin(s) were ascertained through use of the hydrologic RAFTS model.

Two stormwater detention basins are proposed, as follows:

- A 33,450 m^3 detention basin at the downstream end of catchment D, located at the southern end of the hardstand area; and
- A 2,000 m^3 detention basin at the downstream end of catchment C, located on the eastern edge of the site.

The RAFTS model simulations indicate that these detention basins would be adequate to reduce peak discharge from the site to pre-development levels.

Figure 10-3 shows the approximate location of the proposed detention basin serving internal catchment D. The smaller detention is not shown in this figure. However, it is anticipated that it would be located within the vicinity of the warehouse in the south east sector of catchment C. The precise location for these basins and whether they would be provided above or below ground would be determined at the detailed design stage.

Note that the larger basin (33,450m^3) serving catchment D would consist of three separate compartments within the same complex. A conceptual diagram of these proposed detention basins and a description of the general operation of the system is provided in the Hydrology and Hydraulics report in Appendix D.

The requirements for water quality "first flush" storage and treatment and requirements for water storage for reuse purposes were considered separately to the detention basins. The first flush and reuse water storage volumes are discussed in the Section 10.6.

10.2.7 Conclusions

This assessment has demonstrated that the development has little or no discernible impact on the environment provided that the proposed mitigation measures such as detention basins are incorporated into the design.

The key feature of the internal drainage system would be the rearrangement of the site catchments in order that the drainage from the main ILC hardstand area is conveyed to a single point of control at the southern end of the site. Here, issues associated with potential flooding and water detention would be addressed with a significant detention basin infrastructure.

A large detention basin of 33,450m^3 comprising of separate detention and water quality basins would be required at the southern end of the site. The sizing of the basins is likely to be optimised at the detailed design stage. Another basin of 2,000m^3 would be required on the eastern side of the site.

In terms of the hydrology and hydraulics, the development is considered appropriate. Neighbours and occupiers are not adversely affected and users of the development are not unduly put at risk.

10.3 Water Quality

10.3.1 General

The assessment of the water quality for the waterways within the vicinity of the proposed site is described in Appendix D – Stormwater Quality and Soil and Water Management Working Paper. The water quality investigation was undertaken with due regard to the requirements of the:

- Water Quality and River Flow Interim Environmental Objectives for the Cooks River Catchment (EPA, 1999);
- *Protection of the Environment Operations Act 1997;*
- Soils and Construction (LandCom, 2004); and
- Managing Urban Stormwater (EPA, 1997).

Reference was also made to the Healthy Rivers Commission's Independent Inquiry into the Georges River – Botany Bay System (HRC, 2001). Among the objectives put forward in this inquiry, those most relevant to the current proposal are:

- Recommendation WM2: Integrated Stormwater Management at the Local Level, recommends that Councils should ensure that the costs of ongoing stormwater and urban stream management should be included as costs of development and redevelopment, and that such costs should be shared by all developers in a subcatchment; and

- Recommendation RHO 4: Water Quality Objectives, recommends that the ANZECC Guidelines (2001) should be adopted and used as indicative values for water quality and ecosystem management.

The water quality investigation included a review of recorded surface water quality data for creeks and drainage lines that cross the ILC site. A number of previous reports have undertaken monitoring within the study area and some include limited monitoring of stormwater quality within the ILC site.

It is anticipated that Coxs Creek, located at the southern end of the site, would convey most of the run-off from the proposed development into the Cooks River. The Central and DELEC drains, which also drain to the east and into the Cooks River, would convey a small amount of the run-off from some remaining areas.

10.3.2 Monitoring Results

A summary of the existing water quality data for these three sites collated from a review of the existing data for the study area is given in **Table 10-2**. Only Coxs Creek had all water quality parameters sampled and as this conveys the majority of the site run-off, the data are represented separately. The data represent the wet weather concentrations taken from Table 2 of Appendix D - Stormwater Quality and Soil and Water Management. The Australian and New Zealand Environment and Conservation Council (ANZECC, 2000) criteria are also provided in **Table 10-2** to indicate whether the water samples collected are meeting the required goals.

The data for the Central and DELEC drains in **Table 10-3** is taken from the mean results shown in Table 4 of Appendix D - Stormwater Quality and Soil and Water Management. No ANZECC criteria are listed for the parameters sampled in **Table 10-3**, as these drains are stormwater channels and not directly connected to a creek system.

Note the downstream results do not directly represent the runoff that concentrates from the proposal site. However they do provide an indication of any increases in concentrations as a result of existing or previous activities at the site.

The monitoring results in **Table 10-2** indicate that the water quality in Coxs Creek is generally poor and unsuitable for the protection of aquatic ecosystems. Faecal coliform levels exceeded the ANZECC guideline for secondary contact recreation and nutrient concentrations were above guideline concentrations. The nutrient and biochemical oxygen demand (BOD) result is not atypical of concentrations expected for an urban catchment area such as the Upper Cooks River Catchment (UCRC).

Table 10-2: Mean Water Quality in Coxs Creek*

Parameters	Guideline concentration (ANZECC 2000)*	Wet weather concentrations	
		Upstream of site	Downstream of site
Faecal coliforms (cfu/100mL)	1000	57000	54000
Total phosphorous (µg/L)	25	198	211
Total nitrogen (mg/L)	0.35	4.10	3.28
Suspended solids (mg/L)	-	14.0	50.0
Turbidity (NTU)	6-50	46	144
Dissolved oxygen (mg/L)	>6	10.6	8.9
BOD (mg/L)	-	4.0	5.0
pH	6.5-8.5	8.1	8.0
Grease (mg/L)	-	10.0	2.0
Copper (µg/L)	1.4	20	34
Lead (µg/L)	3.4	20	36
Zinc (µg/L)	8.0	130	240

* Taken from Scientific Services monitoring 1992.

The results show dramatically elevated concentrations recorded for heavy metals downstream of the site, in particular lead and zinc. However, pH, dissolved oxygen (DO) and turbidity levels were generally within the guideline limits for the protection of aquatic ecosystems. The elevation in suspended solids and turbidity for the downstream sites may indicate that sediments are being transported offsite as a result of soil erosion at the ILC site.

Table 10-3: Mean Water Quality in Central and DELEC drains*

Parameters	Upstream of site	Downstream of site
DELEC Drain		
Suspended solids (mg/L)	6	8.3
BOD (mg/L)	7.6	8.3
pH	7.8	7.6
Grease (mg/L)	2	2.3
Central Drain		
Suspended solids (mg/L)	11.3	11.3
BOD (mg/L)	9	9.3
pH	7.5	7.5
Grease (mg/L)	3.6	4

* Taken from Freight Corp monitoring average results between 1999 - 2001.

Generally, the results in **Table 10-3** indicate that there is a minor increase in grease and suspended solid concentrations as a result of the DELEC site.

10.3.3 Water Quality Impacts

During Construction

During construction, the main water quality impacts from the ILC site would be the export of sediments and other pollutants such as nutrients, to the local waterways due to the exposure of soils to erosion. Erosion and sediment control structures and good site practices would be implemented to minimise the potential for adverse impacts on local surface water quality during the construction phase. The proposed mitigation measures to protect water quality during construction are outlined in Section 10.3.4.

During Operation

During the operation of the ILC site, the main water quality pollutants of concern would be those associated with the operation of railways, trucks, forklifts and other vehicles. The proposal would involve a substantial increase in the paved area and an increased level of activity. This would result in an increase in the volumes of surface water run-off and the potential concentration of the pollutants contained within the run-off.

The primary pollutants likely to be deposited onto the paved areas during operation of the ILC site are solids (asphalt, tyre and brake particles), heavy metals, oils and other hydrocarbon based compounds. These deposits build up on the paved surface during dry weather and are transported to local stormwater outlets during periods of rainfall. Unless such pollutants are retained by pollution control structures they may contribute further to the poor water quality of the Cooks River downstream.

Control of such pollutants is normally undertaken by retaining or filtering the initial run-off from the paved surface. This is referred to as treating the 'first flush', and is generally an effective way of treating urban stormwater pollution. The first flush treatment would be proposed for the operational phase of the ILC site. The proposed mitigation measures for the control of water quality during operation are outlined below in Section 10.3.4.

10.3.4 Water Quality Management and Mitigation Measures

Construction

In order to reduce the potential water quality impacts of the ILC site during construction, general measures to control erosion of soil and sedimentation would be implemented prior to construction works. These measures would be documented within a Soil and Water Management Plan (SWMP), prepared as part of the Construction Environmental Management Plan, which would be prepared in accordance with the principles and practices in Soils and Construction (Landcom, 2004).

Appropriate soil erosion and sedimentation controls would need to be in place during the period of construction until all ground surfaces are stabilised and re-vegetated. The main erosion and sediment controls briefly described below are derived from a more detailed discussion in Appendix D - Stormwater Quality and Soil and Water Management report. The SWMP would include detail on all these measures, including locations.

Erosion Control Measures

Erosion control measures generally function by reducing the duration of soil exposure to erosive forces, either by holding the soil in place, or by shielding it. Carrying out earthworks in stages and the sealing of haul roads would minimise the extent of land exposed to erosive forces. Proper management of surface runoff may be accomplished by interception, diversion and safe disposal of runoff in conjunction with staged construction activities.

Erosion control techniques are based upon effective use of construction practices, structural erosion controls, vegetative and sealing measures. Erosion control measures would be temporary for the construction phase of the project.

Sediment Control Measures

The installation of appropriate erosion control measures would greatly reduce the quantity of soil eroded from a construction site. However, some erosion would inevitably occur, and measures are therefore required to ensure that eroded material is trapped and retained. Sediment controls that can be applied to the construction site include the following:

- Sedimentation Basins

A key component of the SWMP would be the collection of runoff from disturbed areas and filled ground into suitably sized sedimentation basins. A sedimentation basin is a barrier or dam designed to intercept sediment-laden runoff and retain the sediment. Sedimentation basins must be installed prior to development or construction activity on a site, and should remain in place until such activity has been completed and the land stabilised.

A preliminary design of sedimentation basins has been undertaken to identify a preferred location. The exact size of the sedimentation basin would be determined during the detailed design phase of the ILC site.

One sedimentation basin would be required during construction and this would serve the largest on-site catchment area in the southern sector of the ILC site. This sedimentation basin ‘D’, as it is known, would need to be relatively large, requiring a minimum surface area of 3,600m^2 (eg: 90m x 40m). The sediment basin would be constructed in the same location as the water detention basin required for flood mitigation purposes during site operation. The description of these is provided in Section 10.2.6 and the approximate location is shown in **Figure 10-3.**

- Sedimentation Traps

Sedimentation traps are temporary sediment control structures formed by excavation and/or an embankment to intercept sediment-laden runoff and retain the sediment. They function by trapping sediment in runoff before it enters stormwater pipes or channels, and are usually located at inlets that receive runoff from only a small catchment. Sedimentation traps have similar functions to sedimentation basins, but differ in that, generally, they are smaller, simpler to construct, relatively inexpensive, and more easily moved as the development proceeds.

- Sediment Filters

Sediment filters function by intercepting and filtering small volumes of runoff, which mainly occur as sheet flow. These structures are used below small areas of disturbance, along the boundaries of a development, or at the beginning of vegetative filter or buffer strips. Sediment filters would usually be in the form of straw bale sediment filters, sediment fences, straw bale-geotextile fabric or vegetative filter strips.

Operation

Water Quality Detention Basin

The key operational water quality measure and environmental safeguard would be the capture and treatment of the 'first flush' represented by the first 10mm of rainfall runoff. Generally, capturing and treating up to 10mm of rainfall from all storm events would result in the treatment of more than 90% of the average annual runoff volume from the ILC site. It is proposed to contain this runoff within a water quality detention basin that would be located adjacent to the proposed peak flow detention basin at the southern end of the site. This would be constructed within the vicinity of the construction sedimentation basin as illustrated in **Figure 10-3**. From the water quality detention basin the first flush would be treated using a water quality treatment device, before discharging the treated runoff to either the peak flow detention basins or to the stormwater system.

Water Quality Treatment Devices

Runoff from an industrial site such as the ILC site, with the potential of harmful pollutants requires a high level of treatment. In order to manage water quality impacts from the ILC site during the operation of the facility, the following treatment devices are proposed:

- Stormwater treatment by medium filtration; and
- Stormwater treatment by separation of sediments, oil and grease.

Typical stormwater treatment (medium filtration) devices consist of an underground chamber that houses filtration cartridges. These are filled with an appropriately selected medium to suit the site-specific needs and the anticipated types of pollutants. The system works by passing stormwater through the filtration cartridges, which trap particulates and adsorb pollutants such as heavy metals (including solubles), oil and grease and hydrocarbons. The device also incorporates a settling compartment for the settlement of coarse sediments, and a trash rack to trap any gross pollutants such as litter.

Runoff from access roads is expected to be less polluted than runoff from container and warehousing operations, due to less intense usage. Therefore, this runoff would not require as high a water quality treatment that the filtration device offers, rather, a stormwater interceptor would be more suitable. These treatment devices capture sediments, oil and grease by physical separation and contain the pollutant within a chamber. When full the pollutants in the chamber are pumped out and disposed of at an off-site designated disposal facility.

The pollutant removal performance, according to previous tests undertaken, is:

- total suspended solids - 60 to 90%; and
- free oil and grease - up to 97%.

As part of the water quality study estimations were made regarding the potential pollutant load impact on existing creeks and waterways as a result of the ILC site. The assessment looked at the existing pollutant load and estimated the potential loads during operation, with and without the treatment from proposed water quality devices.

As shown in **Figures 10-4, 10-5 and 10-6**, average estimated pollutant loads in stormwater runoff from the site would not be expected to increase as a result of the ILC site operations, provided water quality controls were installed. For each of the pollutants suspended solids, heavy metals, hydrocarbons, oil and grease the estimated net change between existing conditions and with the ILC site in operation (with water quality controls) is a decrease, ranging from 3% for lead and hydrocarbons to 53% for suspended solids.

Sufficient water quality monitoring would be undertaken to ensure that the water quality management devices on site are functioning as expected. In addition, maintenance of the water quality control devices would be undertaken at regular intervals. The frequency of maintenance would be determined from the water quality monitoring.

Accidental Spill Management

Although the ILC site is very unlikely to contribute to chemical spills, some risk of the accidental spillage of hazardous materials would always remain. It is proposed to contain any potential accidental spill within the first flush containment basin by providing isolation valves that ensure that the spill is totally contained. It is estimated that a major accidental spill such that could occur at the ILC site, could be in the order of 20,000 litres, which would be contained in the first flush containment system or the proposed separation type control. Following containment, the first flush system would need to be cleaned and maintained, and the spill would need to be disposed of at a designated disposal facility.

10.3.5 Watercycle Management

Appropriate water cycle management at the ILC site would assist to meet water sensitive urban design and ecologically sustainable development requirements. The available options of implementing water cycle management principles on the ILC site have been considered at a conceptual level.

Several water cycle management opportunities have been considered and their suitability to the ILC site assessed. The reduction in demand for potable water and the re-use of rainwater have been identified as the main suitable opportunities that would assist in meeting the requirements of water sensitive urban design and ecologically sustainable development for the ILC site.

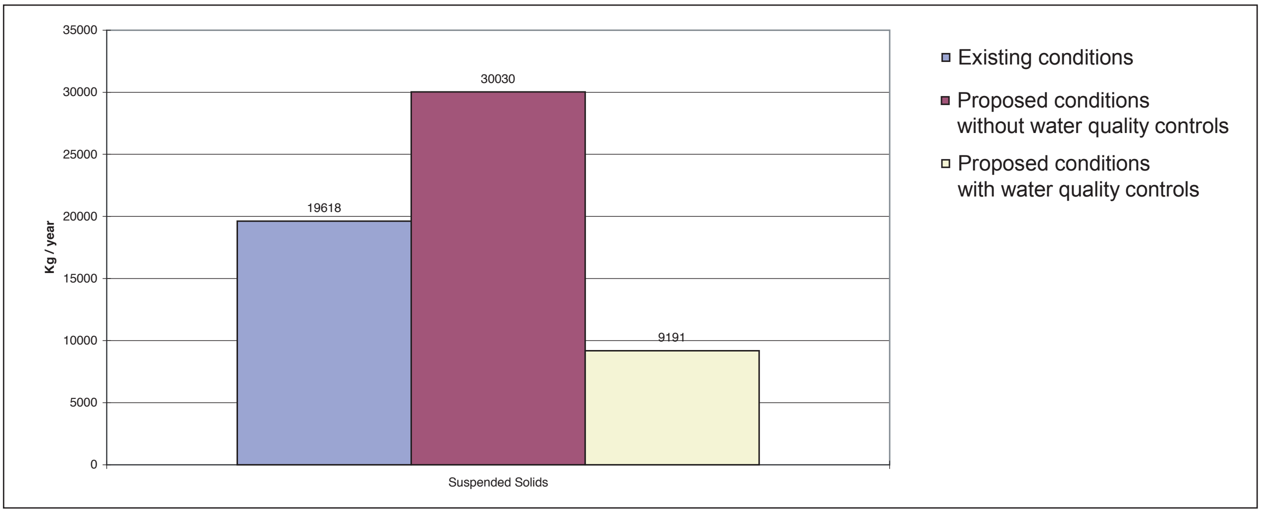

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Figure 10-4
Annual Pollutant Loads for Existing and Proposed Conditions for Suspended Solids

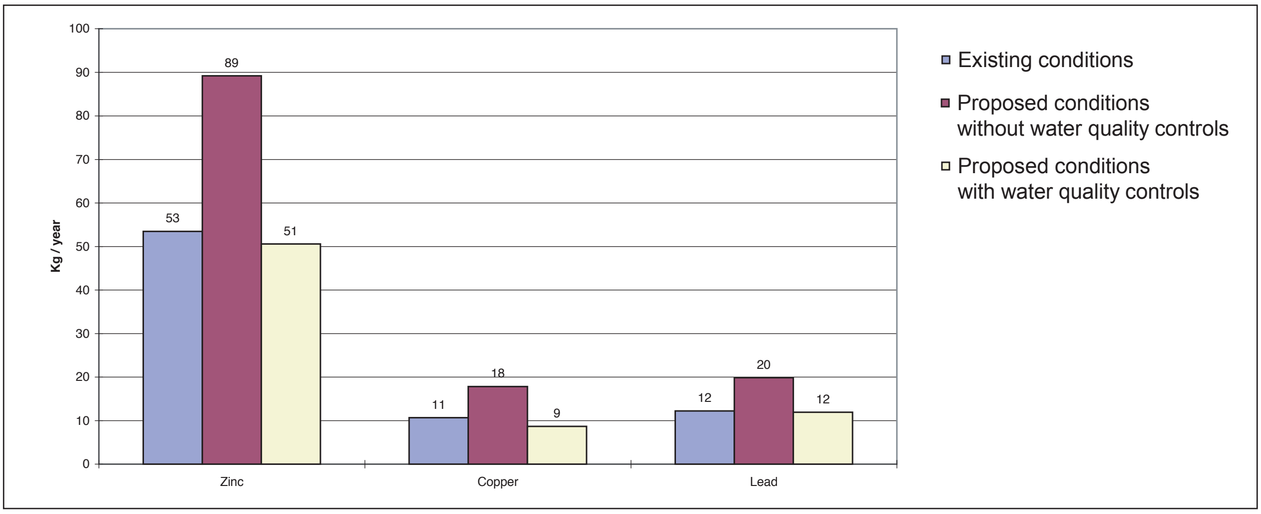

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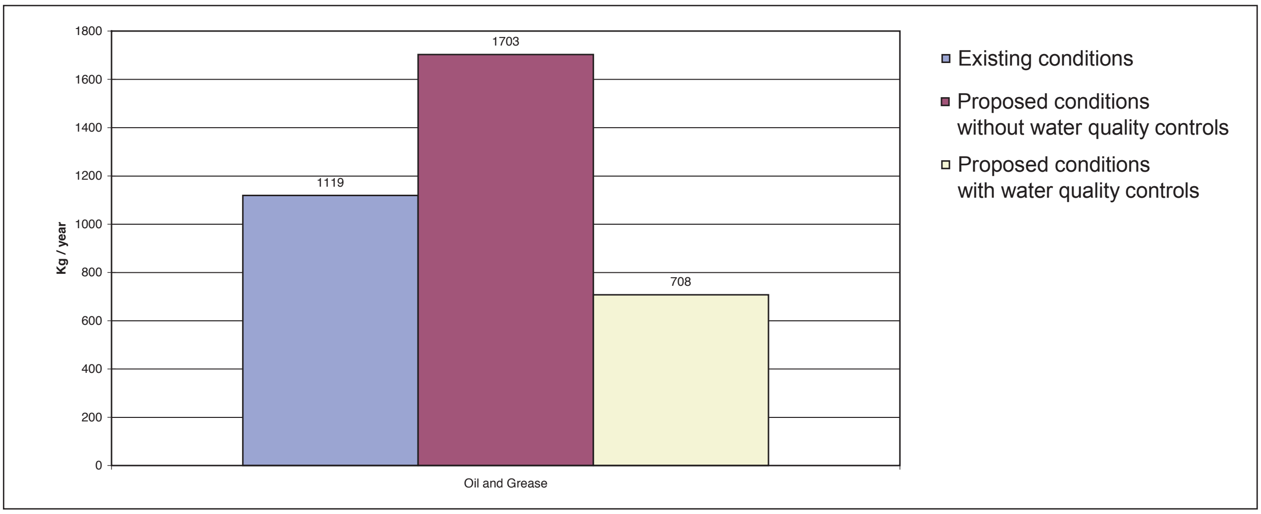
Figure 10-5
Annual Pollutant Loads for Existing and Proposed Conditions for Zinc, Copper and Lead



Intermodal Logistics Centre at Enfield

Figure 10-6
Annual Pollutant Loads for Existing and Proposed Conditions for Oil and Grease

Water Demand

The three main areas of water demand for the ILC site are identified below:

- Container wash down facilities: 14,000 to 20,000 m^3/year (two wash bays to be provided);
- Toilet flushing: 2,400 m^3/year, assuming dual flush toilets are installed; and
- Frog pond top-up: annual total 720 m^3/year.

In addition, there may be the need to provide for on-site storage of water to enhance the fire fighting capability at the site and provision will be made for storage for this purpose. Further reduction in water demand can be achieved through the re-use of rainwater for landscape irrigation, although it is anticipated that the selection of appropriate drought resistant plants for areas on site will mean that, apart from establishment of the vegetation, little or no re-use will be required for landscaping at the site.

The demand for potable water can be reduced through the use of water efficient appliances and fixtures. These appliances should be installed at the site. Water efficient fixtures include water efficient taps and dual flush toilets. A traditional toilet uses over 6 litres of water for each flush, whilst a dual flush toilet can use as little as 3 litres for a half flush.

There are several large warehouses proposed for the ILC site, each of which would generate significant runoff from its roof. This runoff could be captured in above or below-ground rainwater storage tanks and stored for reuse purposes. This water would be relatively clean, and beyond basic filtration to exclude gross pollutants, treatment would not be required.

Rainwater that would be used for toilet flushing purposes at on-site facilities would require disinfection. Chlorine application is the standard method of microbiological treatment. An appropriate disinfection system would need to be further investigated during the detailed design stages of the project.

For a reuse scheme to be reliable, it would have to be capable of meeting the required demand for approximately 80% of the time. A water balance desktop assessment, undertaken for daily needs over 50 years, indicates that there would be sufficient rainwater available to meet the demands of:

- The two wash bays;
- Toilet flushing; and
- Top-up of the frog ponds.

It is not expected that the captured rainwater would be able to meet all demands, all the time, and hence allowance must be made for periods of drought. Therefore, it would be necessary to provide access to the mains water supply, as a back-up system.

10.3.6 Conclusions

In order to reduce the potential water quality impacts during construction, general measures to control erosion of soil and sedimentation would be implemented prior to construction works. These measures would be documented within a Soil and Water Management Plan (SWMP), prepared as part of the Construction Environmental Management Plan, which would be prepared in accordance with the principles and practices in Soils and Construction (Landcom, 2004). Appropriate soil erosion and sedimentation controls would need to be in place during the period of construction until all ground surfaces are stabilised and re-vegetated.

Water quality treatment has been proposed that would treat the first flush runoff from the proposed ILC site. This would improve the water quality in the runoff from the site to Coxs Creek. Stormwater runoff originating in the northern sector would also be subject to water quality controls to ensure that water quality in the Central and DELEC drains is maintained or improved. Sufficient water quality monitoring would be implemented to ensure that the water quality management devices on site are functioning as expected.

Several water cycle management opportunities have been considered and their suitability to the ILC site assessed. The reduction in demand for potable water and the re-use of rainwater have been identified as the main suitable opportunities that would assist in meeting the requirements of water sensitive urban design and ecologically sustainable development for the ILC site.