

TECHNICAL NOTE

RISK AND LAND USE PLANNING ADVICE

DRAFT DEVELOPMENT PLAN NAVAL POINT

CHRISTCHURCH CITY COUNCIL

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ABBREVIATIONS

AS	Australian Standard
CCC	Christchurch City Council
CDP	Christchurch District Plan
CJQ	Charlotte Jane Quay
GSQ	George Seymour Quay
HIPAP	Hazardous Industry Planning Advisory Paper
LPG	Liquefied Petroleum Gas
QRA	Quantitative Risk Assessment
Sherpa	Sherpa Consulting Pty Ltd

1. INTRODUCTION

1.1. Background

A mixture of recreational and industrial land uses, (including fuel terminals and an LPG pumping station), currently coexist in the Naval Point area at Lyttelton Port. The need for a Naval Point Development Plan was first identified through the Lyttelton Master Plan 2012 and then again in the Lyttelton Port Recovery Plan 2015. Christchurch City Council (CCC) has proposed various development options since 2015 and the preferred option is being refined over 2020 to produce the draft Naval Point Development Plan (referred to as 'the plan' in this report). The plan primarily improves the existing sporting and recreational facilities and associated amenities including parking improvements. The plan does not introduce any new industrial land uses or facilities handling hazardous materials.

A cumulative land use safety planning risk profile for the area was developed and reported in the Lyttelton Port Quantitative Risk Assessment (QRA), prepared by Sherpa Consulting Pty Ltd (Sherpa) in 2016 (doc ref 21026-RP-002 Cumulative QRA Rev 0 Sept 2016).

The increase in people associated with the draft Naval Point Development Plan may result in an increase in societal risk from the existing facilities in the area handling hazardous substances.

CCC has requested that Sherpa review the draft Naval Point Development Plan and provide risk and land use safety planning advice to ensure that the proposed developments are consistent with the risk levels reported in the QRA.

CCC has also requested that Sherpa provide recommendations for risk management where required.

1.2. Objectives and scope

The overall objective is to:

- identify potential risk or land use safety planning incompatibilities
- provide recommendations for further risk reduction or control measures if required to address identified issues for CCC consideration in the draft Naval Point Development Plan.

1.3. Exclusions and limitations

The scope of work does not include:

- verification that the basis of the 2016 QRA is still applicable.
- any updates to existing QRA modelling

- risk reduction options associated with the sources of risk as these are not within CCC's Naval Point Development Plan scope.
- review of any risks associated with construction activities (for example impact on the underground LPG pipeline) are excluded.

It is also assumed that the relatively simple mitigation measures suggested as part of the original risk work that were aimed at: eliminating public parking immediately adjacent to the fuel terminals and pipelines, clearly and securely delineating risk source property boundaries, and providing warning signs to minimise ignition sources (no smoking etc) will be implemented (as per CCC Resolution Dec 2016 to adopt Option 1) and will remain in place as part of the development plan. These recommendations are not revisited.

1.4. Approach

The review was undertaken in two broad steps as follows:

- 1) Cross check the proposal against the assumptions made in the 2016 QRA Future Case model:
 - Summarise any known changes in operations on risk source sites and qualitatively assess implications to predicted risk levels. Note that this was based only on QRA updates that Sherpa has carried out for operators in the Lyttelton area. No other attempt has been made to identify change in operating basis for risk sources.
 - Overlay the QRA individual fatality risk contours for the 'Future Case¹' in the 2016 QRA and compare the proposed land uses in the draft Naval Point Development Plan against the risk levels. Identify potential conflicts of proposed land use with risk level.
 - Compare populations assumed in the 2016 QRA Future Case societal risk modelling against the predicted populations associated with the draft Naval Point Development Plan. Qualitatively assess implications of any differences on societal risk levels.
- 2) Summarise other identified issues that do not directly affect the QRA model but may affect land uses safety planning risk and should be addressed as part of the plan, e.g. emergency planning considerations.

¹ The 2016 QRA covered a Future Case, Case 1 and Future Case, Case 2. There is no material difference between these cases (which differentiate between pipeline export and road tanker export of products) as they relate to the Naval Port area, with differences relating to risk in the northern part of the overall Lyttelton Port area only. Case 1 is used in this report.

2. RISK REVIEW

2.1. Risk sources

Risk sources are listed in Table 2.2. Two fuel terminal sites (BP and Mobil) are known to have made changes and had these approved via a resource consent process. Risk implications were assessed as part of the consenting process and offsite fatality risk profile found to be similar to or lower than the Future Case considered in the 2016 QRA.

There are no resource consents at other risk source sites known to Sherpa.

2.2. Draft Naval Point Development Plan

2.2.1. Land use

Figure 2.1 shows the proposed land uses in the Draft Naval Point Development Plan. These are generally related to recreational and sports use of the oval, or boating / marine activities.

The majority of work under the plan is in relation to improving outdoor facilities.

Work in relation to buildings associated with recreational and marine uses includes:

- There is an existing rugby pavilion building on the eastern edge of the oval across the road from the fuel terminals. This building will be removed, and its function will be replaced with a new building on the south edge of the oval which increases the separation distance between the pavilion and to the fuel terminals.
- The Sea Scouts building will remain in existing location.
- Canterbury Coastguard building will be re-located to the west of the site in a proposed new Marine Rescue Centre Trust building which increases the separation distance to the fuel terminals.

Parking currently occurs in the eastern area of Charlotte Jane (CJQ) and George Seymour Quays (GSQ), immediately adjacent to the fuel terminals and to aboveground pipelines. Dedicated parking areas will be provided in the western and southern area of the Naval Point area, increasing separation from the fuel terminals and pipelines.

From a land use safety planning perspective all land uses shown on the draft development plan would be categorised as 'recreational' land use, i.e. use of active open space or sporting complexes.

2.2.2. Populations and societal risk

CCC's population basis for estimating parking spaces is provided in APPENDIX A. This shows coincident populations of between approximately 100 and 300 people are anticipated.

These populations are in the area labelled 'P01/P02' in Figure 2.4 (reproduced from the 2016 QRA).

Comparison of the estimated populations with the 2016 QRA Future Case population in P01/P02 area is summarised in Table 2.3. This comparison indicates that the expected populations in the recreational land use areas are higher in the redevelopment plan than assumed in the 2016 QRA Future Case (i.e. future populations may be underestimated in the 2016 QRA).

The population data table also identifies ‘freedom campers’ as a group. This could include overnight stays (i.e. parked campervans). This type of population would be categorised as ‘residential’ from a land use safety planning perspective, i.e. are regarded a more sensitive group than recreational users as they may be present overnight.

The 2016 QRA does not allow for overnight or residential populations in the societal risk assessment.

2.2.3. Risk criteria

At the time of the 2016 QRA, CCC did not confirm any specific risk criteria as applicable to particular land uses. Individual fatality risk results were therefore presented in two forms:

- Order of magnitude levels from 100×10^{-6} per year to 0.1×10^{-6} per year.
- Australian NSW Department of Planning (2011): *Hazardous Industry Planning Advisory Paper No. 4 – Risk Criteria for Land Use Safety Planning criteria* (known as HIPAP 4, which had been applied in other parts of NZ in the absence of NZ specific criteria) which cover a range from 50×10^{-6} per year to 0.5×10^{-6} per year.

Since 2016, the Christchurch District Plan (CDP) has been released by CCC and this required application of HIPAP 4 criteria to fuel facilities in Woolston (where the Lyttelton facilities send their product via pipeline). Therefore, for this review the HIPAP 4 criteria are assumed to be applicable and have been applied. The HIPAP 4 criteria are reproduced in Table 2.1.

Table 2.1: HIPAP 4 individual fatality risk criteria

Description	Risk Criteria (per year)	Applicability to Naval Point area?
Fatality risk to sensitive uses, including hospitals, schools, aged care ('sensitive')	0.5×10^{-6}	No (no sensitive land uses)
Fatality risk to residential and hotels ('residential')	1×10^{-6}	Yes (freedom campers)
Fatality risk to commercial areas, including offices, retail centres, warehouses ('commercial')	5×10^{-6}	No (nothing with)
Fatality risk to sporting complexes and active open spaces ('recreational')	10×10^{-6}	Yes (most of CCC area)
Fatality risk to contained within the boundary of an industrial site ('site boundary')	50×10^{-6}	Yes (most users apart from recreational)

2.2.4. 2016 QRA future case individual fatality risk results

Figure 2.2 (all contours) and Figure 2.3 (zoomed in view) show the 2016 QRA Future Case HIPAP 4 individual fatality risk contours overlaid onto the draft development plan land uses. This shows:

- The eastern part of the oval is within the 10×10^{-6} per year risk contour so this area does not meet the risk criteria for active open space. This affects the oval, but there are no buildings or areas of high occupancy proposed within this area by the draft development plan. The existing pavilion building on the eastern side of the oval within this risk contour is being relocated as part of the development plan to an area to the west where the risk is below 10×10^{-6} per year.
- The 'start box' (occupied only periodically to start boat races or similar) has been relocated slightly further west and is now outside the 10×10^{-6} per year risk contour.
- The 50×10^{-6} per year risk contour extends outside the site boundary to the west of the methanol storage site. To meet the HIPAP 4 criterion, this contour should remain within the site boundary, and only industrial land uses should be located in areas with a risk level greater than 10×10^{-6} per year. The draft development plan allocates the area affected by the 50×10^{-6} per year risk contour to parking (i.e. not an active open space / recreational use). This is regarded as an appropriate use.
- All other areas within the scope of the Naval Point draft development plan are outside the 10×10^{-6} per year risk contour so comply with the HIPAP4 criterion for active open space.

It is not clear where 'freedom campers' would be located as they are not specifically provided for. However, it is probable that the parking areas closest to the water would be the most attractive. As per Figure 2.3, the public parking area in the south east corner is exposed to risk levels greater than 1×10^{-6} per year and from a land use safety planning perspective is not regarded as suitable for overnight uses.

2.3. Review of Oil Company submission

The operators of the fuel terminals (the Oil Companies) provided feedback to CCC via their planning adviser 4Sight Consulting on development options for Naval Point (submission number item 26851). CCC requested that Sherpa review the submission to determine if there were issues raised that did not appear to have been addressed in the draft redevelopment plan. The issues raised related to avoidance of parking in immediate vicinity of the terminals and pipelines, greater separation of buildings to the terminals and concern relating to overnight use of the area by freedom campers.

These issues are covered by the points identified in Section 2.2 above.

Table 2.2: Risk sources

Site (Lessee)	Operator	Operation	Changes?	Risk implications
BP Z Energy	NZOSL (operate both the BP and Z Energy site)	Fuel terminal	2020 BP site. Additional storage capacity provided within existing site boundary. Additional control measures provided (high level trips on all existing and new tanks).	Resource consent application included project specific QRA update which demonstrated risk contours similar to or smaller than 2016 QRA Future Case. No significant impact
Mobil	Mobil	Fuel terminal	2019 Mobil leased additional land to the west of their GSQ site and provided additional tankage to replace capacity in tanks damaged in western Naval Pt area in Christchurch earthquakes.	Resource consent application included project specific QRA update which demonstrated risk contours similar to or smaller than 2016 QRA Future Case. No significant impact
Hexion	Hexion	Methanol terminal	No known changes	None
Liquigas	Liquigas	LPG pumping station	No known changes	None
Fulton Hogan	Fulton Hogan	Bitumen blending and storage	No known changes	None
BP	Downer Group (operate site which is sub leased from BP to Emulco)	Bitumen blending and storage	No known changes	None
Hazardous materials Berth (LPC's infrastructure)	NZOSL (fuels and bitumen) Liquigas (LPG, mercaptan) SGS (Logistics contractors for Hexion's methanol)	Import products from ship/ Fuel bunkering	No known changes	None
Pipelines	Various. (A variety of under ground and above ground pipelines).	Transfer hydrocarbon products within Port area	No known changes	None

Figure 2.1: Draft Naval Point development plan and existing risk sources

(locations approximate only)

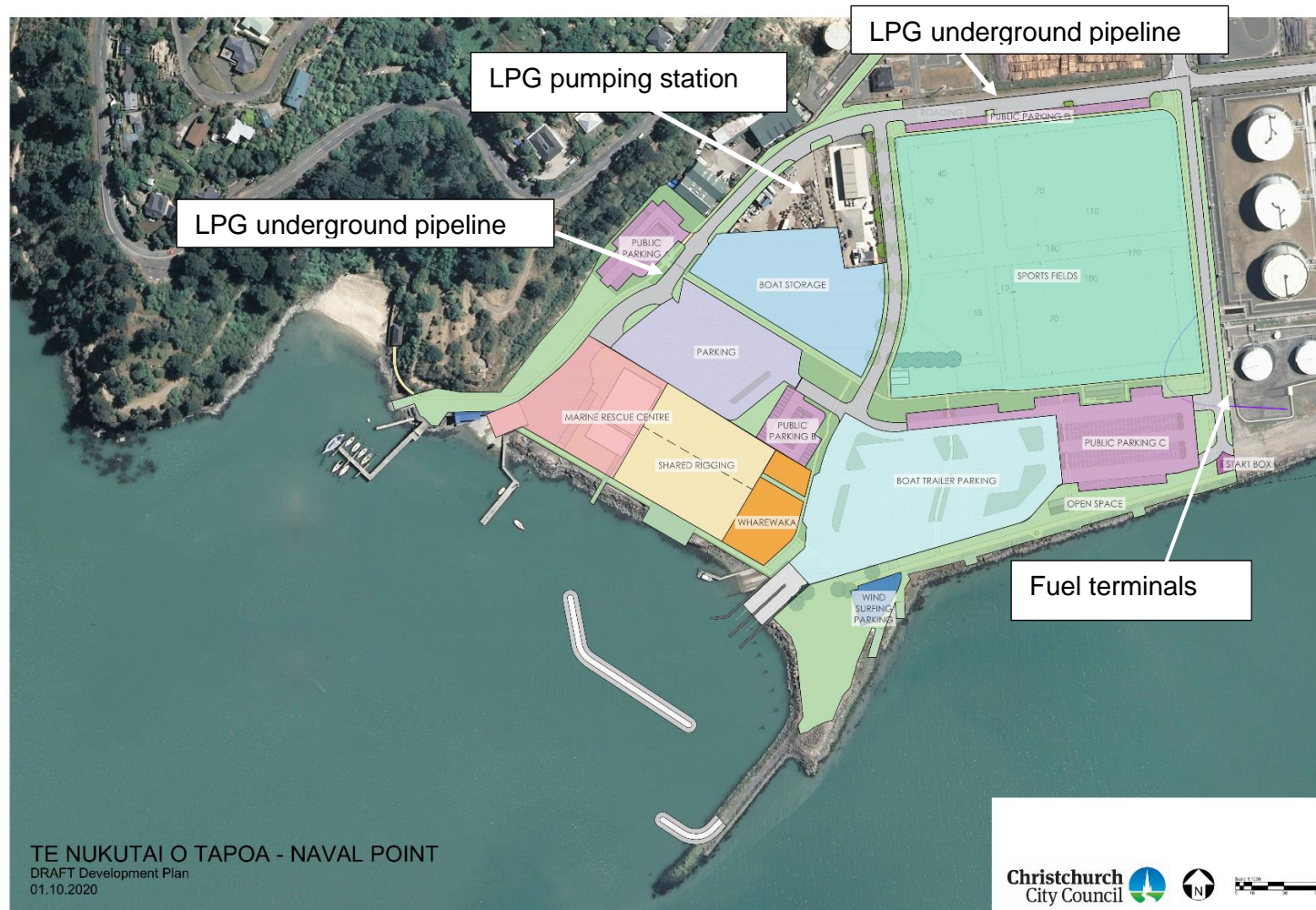


Figure 2.2: Redevelopment plan area with risk contours overlaid

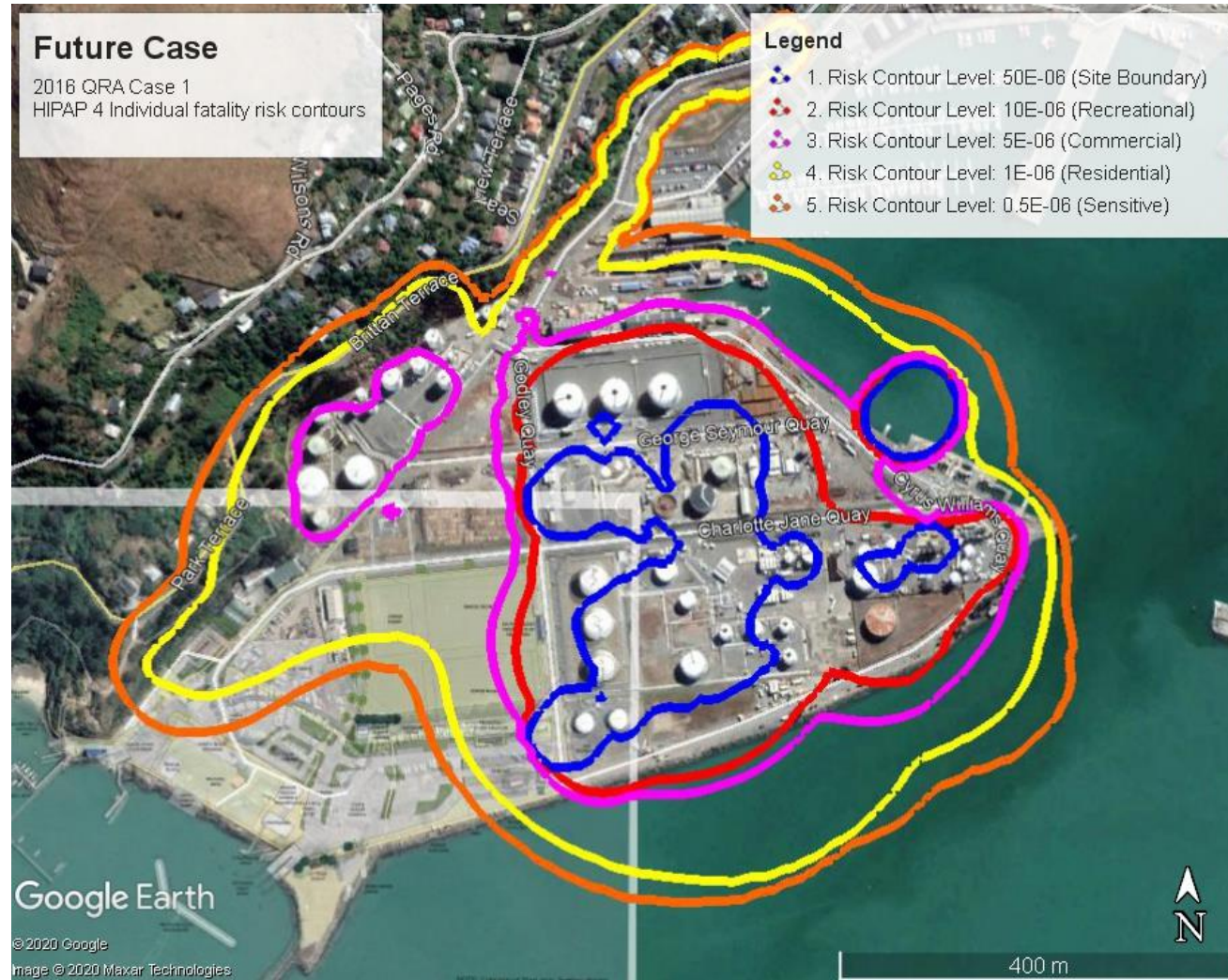


Figure 2.3: Redevelopment area with risk contours overlaid – zoomed in

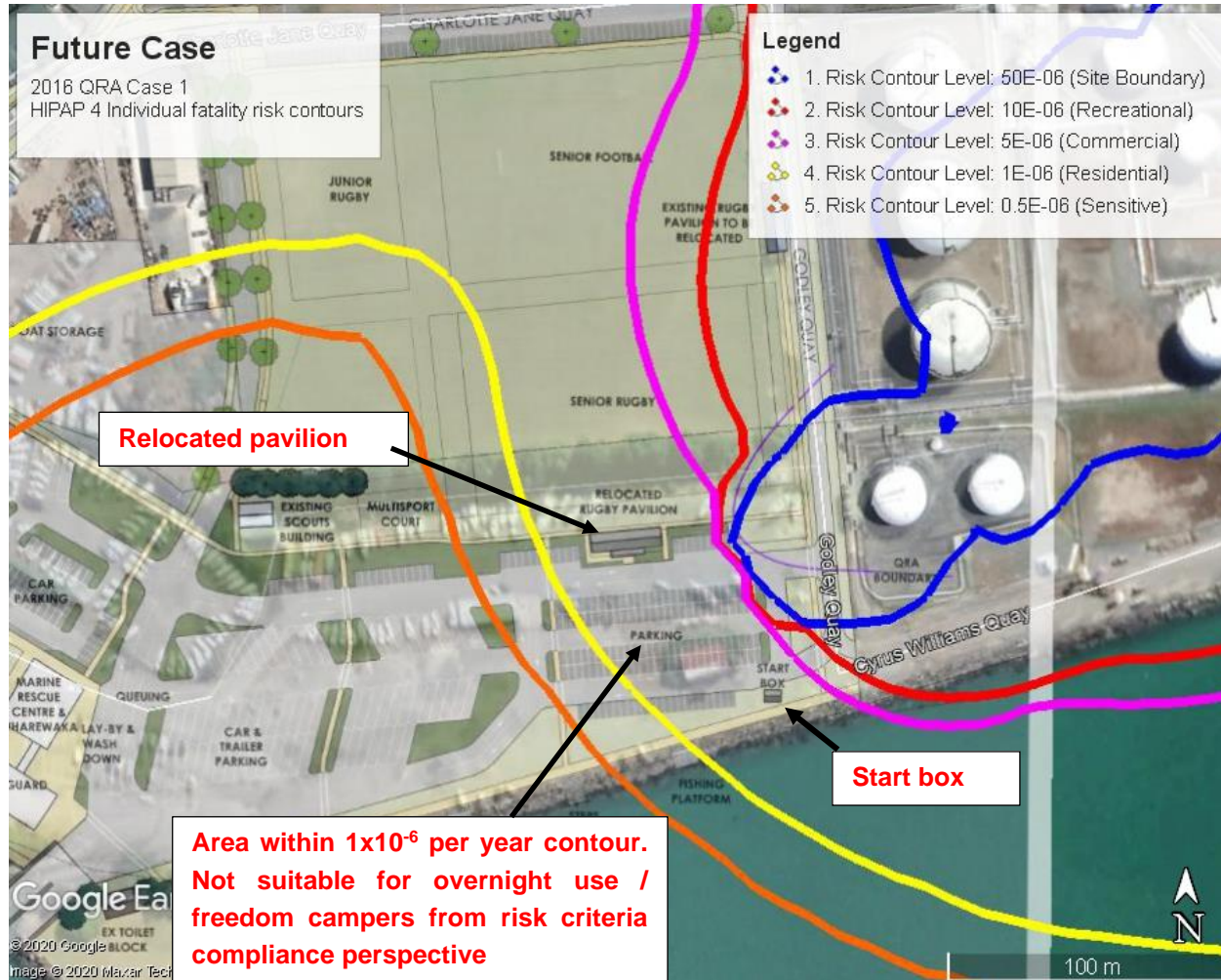
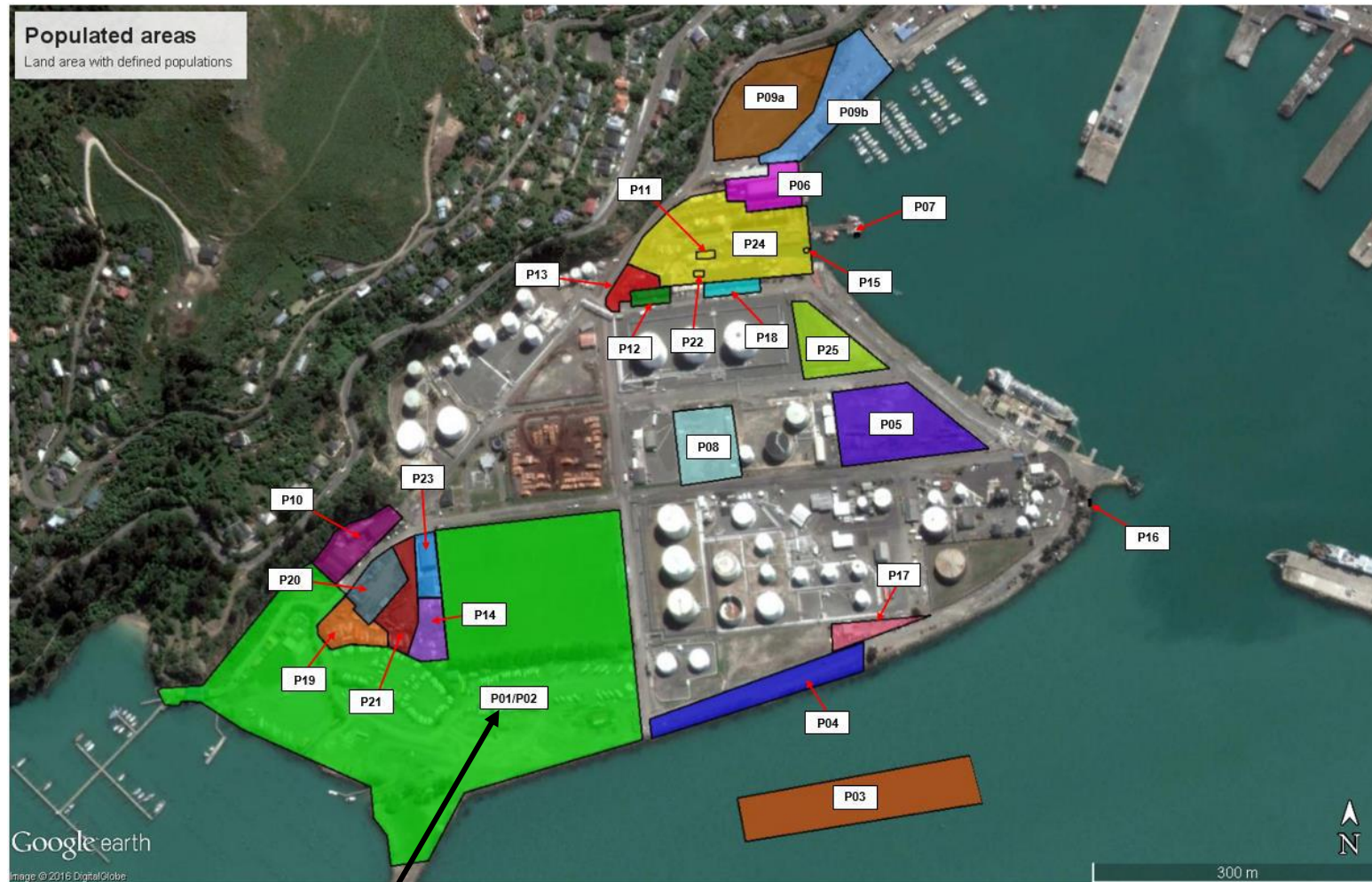


Figure 2.4: 2016 QRA – population polygons

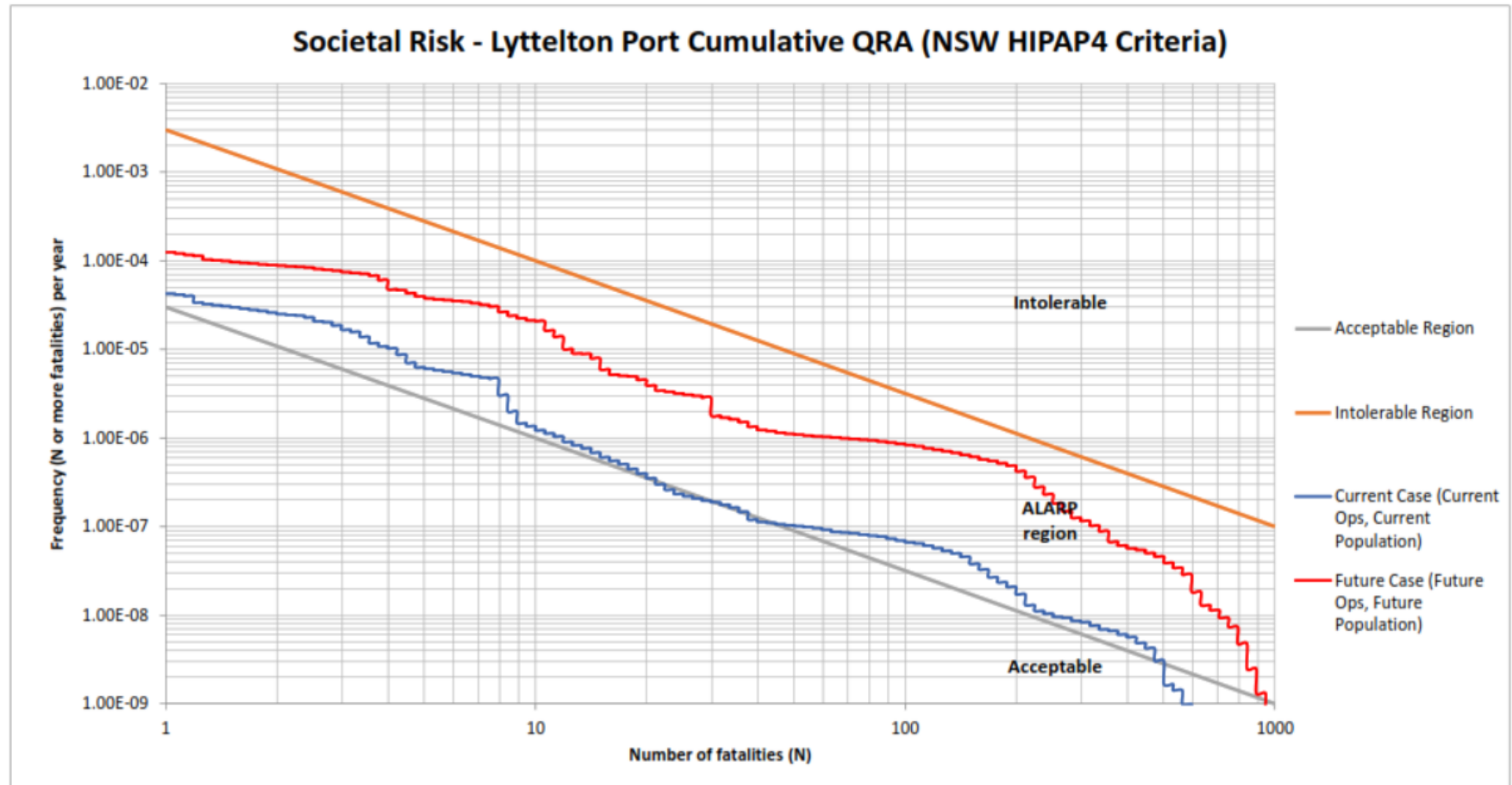


Note: P01/P02 **green** area is the Naval Point redevelopment plan area

Table 2.3: Population comparison

Category	Number of people		Risk implications
	CCC draft development plan (as per APPENDIX A)	2016 QRA Future Case (area P01/P02)	
Weekday	114 - 255	87 (12 hours presence)	2016 QRA future case societal risk curve is reproduced in Figure 2.5. Note: The 2016 QRA Future Case societal risk includes the proposed cruise ship terminal populations which did not go ahead so it is difficult to estimate what the effect of the specific increase in recreational population would be. However it can be stated that the societal risk would be higher than the 'current case' but would most likely remain in the ALARP region (i.e. not reach intolerable) levels as the main difference is in temporary populations (weekends) which will affect the lower frequency area of the FN curve
Weekend	204 - 288	109 (12 hours presence)	
Peak	Not provided	3773 (low probability of presence – 2 days per year)	

Figure 2.5: 2016 QRA – societal risk results



3. RECOMMENDATIONS

Overall the draft Naval Point Development Plan land uses are generally consistent with the individual fatality risk levels in the area. Additional recommendations / clarifications are summarised in Table 3.1.

Table 3.1: Recommendation summary

Risk item	Comment	Recommendation
Land use	Active open space land use with relatively low populations (compared to very high densities such as stadiums or similar which would be considered commercial land uses) such as proposed in the draft development plan is generally compatible with the individual fatality risk levels which are below 10×10^{-6} per year in most of the Naval Point development area.	None
Individual fatality risk	The areas where risk exceeds the active open space risk criterion of 10×10^{-6} per year are allocated to parking (i.e. use by people playing sports or engaged in marine activities) or are part of the eastern area of the oval with no buildings / area of high occupancy. However, it is possible that freedom campers may use the parking area. The risk in this area exceeds 1×10^{-6} per year (the applicable target for residential / overnight uses) and is therefore not suitable.	1) Review options for discouraging freedom campers or as a minimum ensuring the parking area used is further west outside the 1×10^{-6} per year risk contour.
Societal risk	2016 QRA Future Case societal risk (results in ALARP region, do not reach 'intolerable') includes the proposed cruise ship terminal populations which did not go ahead. The predicted populations associated with the redevelopment plan are higher than the populations assumed in this area in the Future Case 2016 QRA.	2) It is recommended that the change in societal risk be quantified (based on confirmed CCC populations), including removing the cruise populations, to confirm that societal risk remains tolerable. It may also be relevant to cross check the risk model inputs for each of the risk sources to confirm that that risk model is still applicable.

Risk item	Comment	Recommendation
	<p>Therefore it is difficult to estimate what the effect of the specific increase in recreational population would be (without the cruise ship contribution). The societal risk would be higher than the 'current case' in the 2016 QRA but would most likely not reach intolerable levels.</p>	
Other	<p>Emergency planning considerations. Egress / safe 'emergency assembly location' is constrained to the south west area of the Naval Point area</p>	<p>3) The information provided does not cover any proposed emergency alarms (e.g. audible, visual) / communications / accountabilities in an abnormal event, assembly area locations or evacuation / egress routes. It is recommended that these aspects be explicitly defined as part of the operational planning associated with the redevelopment plan including any testing for alarms / communication methods. The two scenarios to be considered from this perspective (i.e. detection, alarm and egress) are:</p> <ul style="list-style-type: none"> - Fires (all risk sources) - Flammable gas cloud (Liquigas LPG leak or gasoline overfill scenarios from fuel terminals)
	<p>Peak population timing</p> <p>The highest risk times for the terminals and LPG pumping station are whilst a ship is being unloaded. It is recognised that it may not be practicable to schedule shipping operations to always avoid coinciding with peak recreational usage.</p>	<p>4) Both operators and CCC should periodically consult to ensure that there is mutual awareness of timing when ships will be making a delivery and / or larger events are planned for Naval Point. As part of the operational planning, review whether a test is required to ensure that alarms or any other relevant items are functional prior to any import that coincides with events / larger populations.</p>

A2. Summer population summary

Activity	Summer													
	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
	Mon_AM	Mon_PM	Tue_AM	Tue_PM	Wed_AM	Wed_PM	Thu_AM	Thu_PM	Fri_AM	Fri_PM	Sat_AM	Sat_PM	Sun_AM	Sun_PM
Naval Point	10	10	10	10	10	100	10	10	10	10	50	30	40	20
Waka Groups	5	5	5	5	5	5	5	5	5	5	40	0	20	0
Public	33	33	33	33	33	33	33	33	33	33	93	93	93	93
Freedom Camping	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Sports Grounds	0	22	0	22	0	22	0	22	0	2	4	7	2	3
Miscellaneous	0	0	0	20	0	21	0	0	0	0	35	0	41	0
Magazine Bay	6	14	7	14	6	14	7	14	6	14	6	14	6	14
Total	114	144	114	164	114	255	114	144	114	124	288	204	262	189

Note:

- equivalent information is not presented for winter but CCC has advised populations should be similar as the summer and winter activities do not coincide.
- freedom campers are a significant proportion of the estimated population

A3. 2016 QRA Future Case (extract)

Current & Projected Future Population (Day and Night) - Lyttelton Port QRA								Future Case									
Year First Used								Riskcurves Inputs	Base Population			Temp 1			Temp 2		
Total Population Area Number Code	Lot Number (Refer to Map)	Site Area (m ²)	Land Owner	Occupier	Property Description	Future Occupier	Change to future population (Y/N)	Total Population Area Number Code	Description	Day	Night	Description	Day	Night	Description	Day	Night
P01			CCC	Recreational sporting ground	Recreational	No change	Y	P01	Weekday	87	50	Weekend	109	52	Peak	3773	0
P02			CCC	Yacht Club	Recreational	No change	Y	P02									
P03			LPC	No current occupier (cruise ship terminal not built)		Cruise Ship Terminal	Y	P03	-	-	-	Typical cruise ship (70 days/year)	1000	0	Large cruise ship (2 days/year)	5200	0
P04			LPC	Area used for fishing	Land south of BP/Hexion terminals	Land connecting to cruise ship terminal	N	P04	Weekday	2	0	Weekend	8	0	Peak	23	0