PCU039208

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Dear Sir

As a resident of Stockton please accept this submission of **objection** regarding Incitec Pivot's proposed ammonium nitrate plant on Kooragang Island (SSD-4986).

In my opinion the proposal creates an unacceptable risk to nearby residents and Incitec's Environmental Impact Statement does not address my concerns of explosive risk, noise, air and water pollution and possible impacts to house values.

Newcastle and the suburbs that surround the Port are demanding responsible planning decisions and the mere thought of two ammonium nitrate plants, operating side-by-side just 800 from residents is a planning disaster.

The direct impacts from Incitec's proposal for me and my family include the following.

Risks and Impacts

Air Pollution

The Incitec plant will increase the air pollution levels in surrounding suburbs in a number of ways including:

- Release of very fine particles (PM 10 and PM2.5) of ammonium nitrate from the Prill tower including particles dangerous to the health of the community.
- Release of toxic nitrogen dioxide from:
    - The nitric acid plant. These emissions are dangerous to the health of surrounding communities
    - Large releases of nitrogen dioxide from an ammonium nitrate fire or explosion
- Release of toxic ammonia gas from:
    - Fugitive emissions from the huge (30,000 t) ammonium storage tank
    - Fugitive emissions form unloading operations from ships and tankers
    - Leaks from pipework and connections
    - Large release from a damaged pipeline of damaged storage tank and destroyed storage tank from AN explosion brisance, earthquake, aircraft accident, truck accident and malicious damage
    - Large release of ammonia from an ammonium nitrate fire or explosion

As well the plant will release a large amount of greenhouse gas N_20 which is 310 worse than carbon dioxide as a greenhouse gas.

Particles

The health effect of fine particles including PM10 and PM2.5 and now PM1 are well documented and PM1 is subject of further investigation. There are no safe levels of PM2.5 particles with increasing levels causing increased health concerns and issues.

Already PM10 levels monitored only every 6 days at the Orica monitoring station at Stockton are experiencing exceedances of the NEPM standard of 50 ug/m^3 in the last 12 months and there have been a significant increase in PM10 particles since 2010 when the NCIG coal stockpiles where constructed on Kooragang Island. The continuous monitoring of PM10 particles would very likely have shown many more exceedances and it is highly likely PM 2.5 particles have regularly exceeded the target level of 25 ug/m^3.

Figure 1 and 2 shows the Orica data since recording started. It shows the increasing trend since 2010 of PM10 and TSP values and exceedances of the NEPM standard. This is a worrying trend for the health of the Stockton community and other surrounding communities. The proposed new Incitec plant will add to the PM10 and PM 2.5 levels resulting in further exceedances. The cumulative impacts from the proposed T4 coal loader will result in further increases in these dangerous fine particles and further exceedances of the NEPM standard for PM10 particles and PM 2.5 target levels.

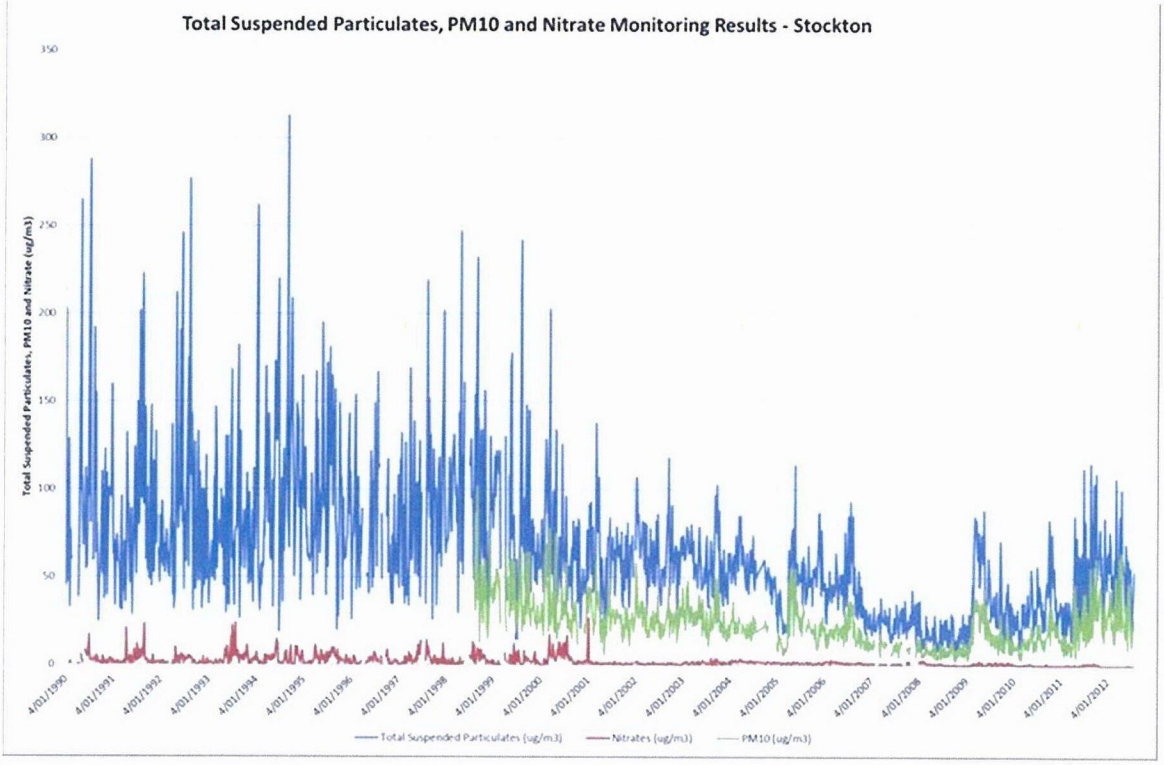
Following the emission of carcinogenic hexavalent chromium from the Orica plant onto the Stockton community, an air quality monitoring station was recently installed at Stockton by Orica. This station has recently been opened (13 October) and is now operating. The station includes continuous monitoring of PM 2.5 and PM 10 particles using the same equipment the EPA has in the Upper Hunter air quality monitoring stations.

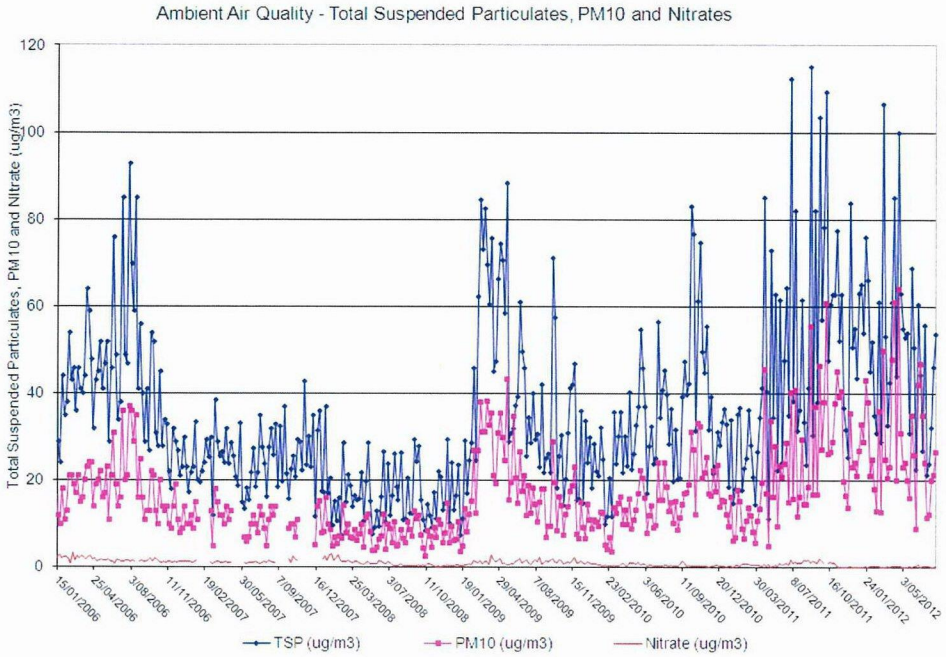
Despite the station having only operated for a week there is a worrying trend in particle levels. Currently after one week the 24 hr rolling average for:

- PM 10 is 57 .9 ug/m^3 and above the NEPM standard of 50 ug/m^3 with a maximum 1 hr value 100 ug/m^3
- PM2.5 is 26.5 ug/m3 above the target value of 25 ug/m3 with a maximum 1 hr value 50 ug/m^3

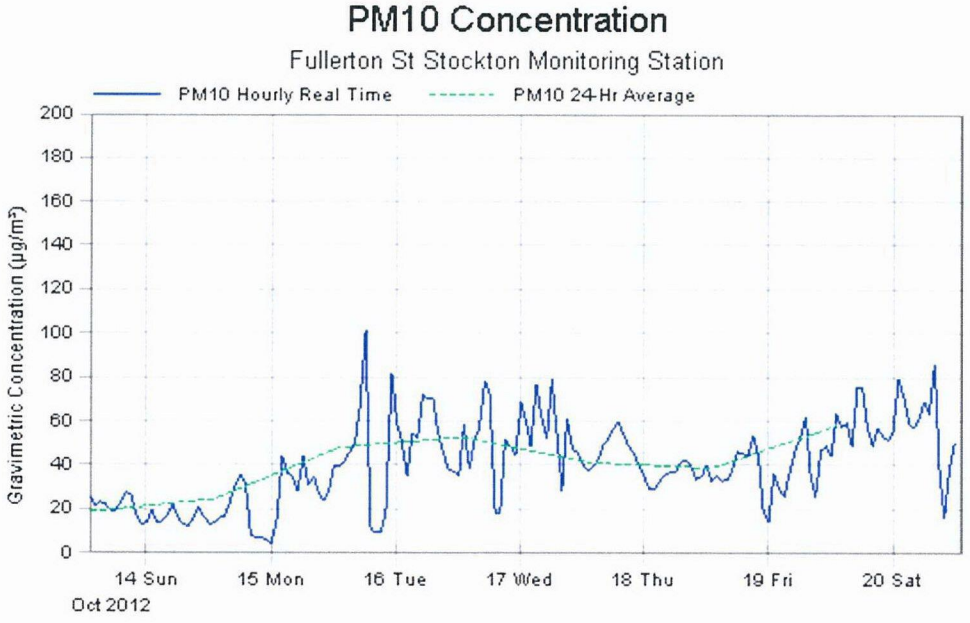
A trend is evident with PM 10 and PM 2.5 particles increasing significantly as soon as the wind direction turns into a direction between west and north which brings pollution from Kooragang Island onto Stockton. These results are troubling to the community and this further indicates the need to reduce fine particles in Stockton rather than adding further fine particle pollution with the proposed Incitec plant.

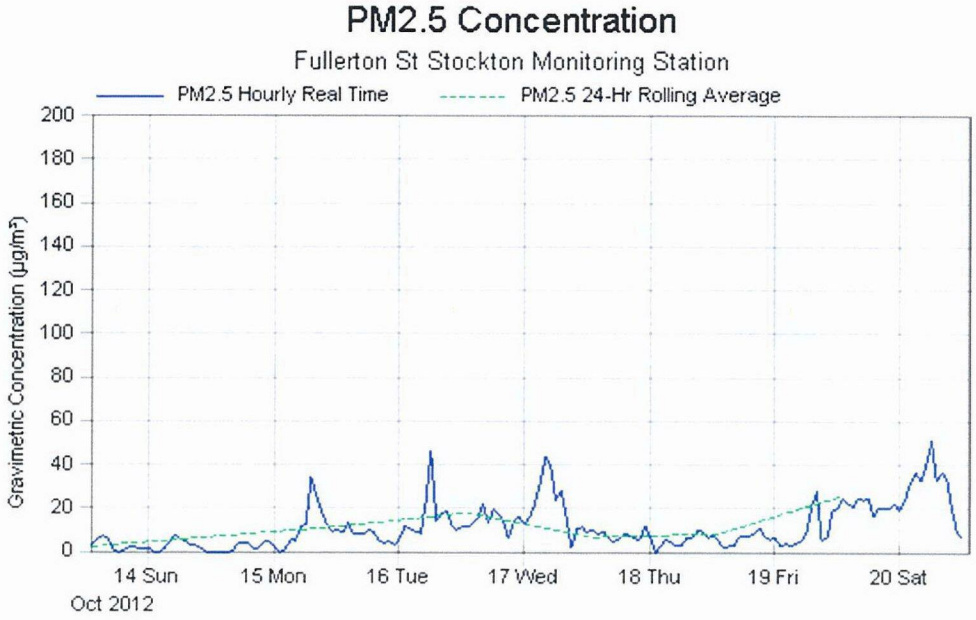
Figure 1 and 2: Orica Particle Monitoring for TSP and PM10 (Every 6 days)

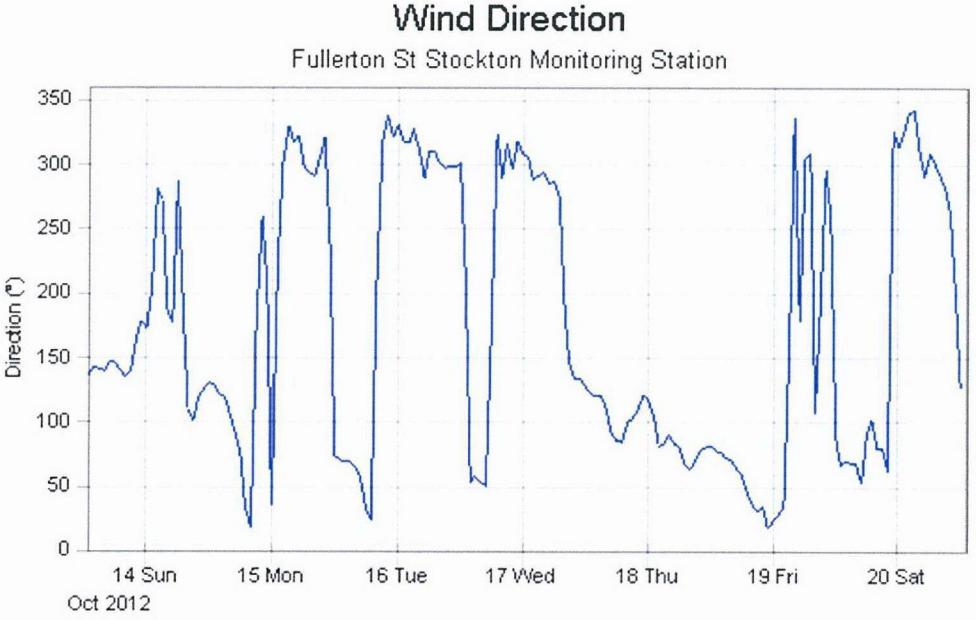




Figures 3, 4 and 5: New Orica Air Quality Monitoring Station at Stockton PM10 and PM 2.5 Results and Wind Direction







Industries that further increase fine particles such as the Incitec plant should not be permitted on Kooragang Island rather PM 10 levels should be reduced from existing sources by installation of a new Prill tower at Orica and more effective control of coal dust emissions from coal stockpiles and greening of

open spaces on Kooragang Island.

While the technology to be employed on the Incitec plant will be substantially better than the existing 40 year old Prill tower at the Orica plant it will add to the cumulative impact of particles from Orica, the coal loaders and other industries to surrounding suburbs and cause further exceedances of the NEPM standards at Stockton.

The air quality assessment in the EIS neglected to assess and model PM 2.5. While this is not a NEPM standard yet it is likely to be in the near future and a target level has been set at 25 ug/m^3. Due to the dangerous nature of PM 2.5 particles and the fact that there is no safe level with increasing health issue with rising MP 2.5 levels PM 2.5 particle dispersion modeling and contours should be developed for this project as part of the EIS.

Nitrogen Dioxide

Nitrogen dioxide maximum hourly levels in Stockton, as measured at the Orica monitoring station, have ranged from 2 to 8 pphm below the 12 pphm standard.

However it is undesirable to have further increase in NO_2 levels at Stockton. The propose plant would result in increases in NO_2 levels in Stockton by 50% above average levels. This is a significant increase and while not indicating an exceedance of the standard this is a significant adverse change and will result in maximum levels approaching the NEPM maximum 24 hour standard.

Ammonia

The transfer and storage and such a very large amount of ammonia (30,000 t) on Kooragang Island 800 m from residents is a major concern for the community. Health effects of toxic ammonia emissions are well known.

Communities have been exposed already to low levels of ammonia from the Orica plant and two people were sent to hospital last year as a result of an ammonia leak from the ammonia storage tank at the Orica plant. This large transfer and storage of ammonia at the proposed Incitec plant adds to the cumulative effect of ammonia release from the Orica plant.

Damage to the 30,000 t ammonia storage that could release its contents would be catastrophic for communities surrounding Kooragang Island

depending on the wind direction and strength and has the potential to cause severe injuries and death. Such a failure could be caused by an earthquake, accident involving the tank or pipelines to and from the tank, a plane crash and explosion of ammonium nitrate with tank failure due to the pressure wave. Explosion overpressure has the potential to destroy tanks located close to an explosion which in this case would release a massive amount of ammonia.

This failure mode of the 30,000 t ammonia tank should have been assessed in the EIS as a worst case scenarios and air quality modeling undertaken on this scenario to understand the effect on surrounding communities in such a failure mode. This has not been undertaken in the EIS and the injuries and possible deaths from this scenario are unknown due to this omission.

Noise

The current noise levels in Stockton have been measured by Atkins consultancy for Orica as part of the expansion project and noise reduction program by Orica. The night time noise levels measured are between 49 to 51 dB. The noise measurements as part of Incitec's EIS showed a discrepancy with Orica's testing with night time noise levels higher at 58 to 59 dB. These levels exceed the NSW Industrial Noise Policy amenity criteria for suburban residence night time level of 40 dB.

Currently Stockton residents are experiencing problems with industrial noise levels including sleep disturbance and complaints have been made to the EPA, the Port Corporation and industries. These noise complaints and issues have been brought to the Newcastle Consultative Committee on the Environment a group set up by Minister Robyn Parker. Industrial noise is a considerable problem currently at Stockton.

Currently the Orica plant on Kooragang Island has a requirement by the EPA to reduce noise emissions from the plant under their Environmental Protection Licence (828) under the Pollution Reduction Program. This noise reduction program recongises the high noise levels being experienced in suburban Stockton from industry on Kooragang Island.

The NSW Industrial Noise Policy outlines the requirements for new noise sources. To limit continuing increases in noise levels the maximum ambient noise level within an area from industrial noise sources should not exceed the

acceptable noise levels specified in the amenity criteria table (Table 2.1) in the in NSW policy. If total noise level from industrial sources already exceeds the acceptable noise levels, as in Stockton's case, the equivalent noise levels (L_{Aeq}) should not be greater than 10 dB below the acceptable noise level if there is a reasonable expectation that existing levels may be reduced in the future. This reduction in noise will be happening in the future through the Orica noise reduction program as required by the EPA. In this case this would mean the Incitec plant noise levels would be required to be 10 dB lower than the acceptable noise level for suburban area of 40 dB in the night resulting in a requirement for the night time noise level to be < 30 dB from the proposed plant.

This is not the case with the Incitec project with predicted night time noise level of 42 dB. This value will also exceed the requirement of <40 dB night time noise for a suburban area.

The Incitec EIS states that if noise levels from industrial sources already exceed the acceptable noise level in an area in question the L_{Aeq} noise level from any new sources should be at least 10 dB below the existing level. However as there is a reasonable expectation that existing levels will be reduced in the future, as evidenced by the Orica noise reduction program requirement, the L_{Aeq} is required to be 10 dB below the acceptable noise level which has not be addressed in this EIS. In this case the basis of the EIS noise evaluation is incorrect.

Further for Incitec in their EIS to try and justify Stockton changing from a suburban environment to and industrial/urban environment to accommodate their plant is an insult to Stockton residents who are already suffering from industrial noise problems and in some cases sleep deprivation. This is unacceptable to the community and contrary to the NSW Industrial Noise Policy.

It is clear any new sources of noise on Kooragang Island have to be <30 dB to meet the requirement of the NSW Industrial Noise Policy and the proposed Incitec ammonium nitrate plant does not meet this criterion.

Polluting the Hunter River

It's concerning that Incitec will be handed yet "another license to pollute" the Hunter River. If Incitec truly want to build a world-class plant then their EIS

should reflect a plant with no effluent into the Hunter River. The river is an important recreational estuary for thousands of fisherman, not to mention that Kooragang is an international recognised RAMSAR wetland.

Excessive industrial development with licenses to pollute the river close to a RAMSAR area is not common sense planning, nor does it position the Hunter River in a positive light to tourists.

Hazards and Risk Assessment – Ammonium Nitrate Explosion Risk

The NSW Government Hazardous Industry Planning Advisory Papers (including papers 4 and 6) for the protection of the community outline a number of key points in the assessment of risks from hazardous industries. These include:

Principles

1. Aid in choices between location of the facilities
2. Due regard should be given to cumulative impacts
3. Study should consider natural disasters, deliberate acts or hazardous events
4. The analysis should apply to atypical and abnormal events and conditions
5. The analysis should be well documented to permit adequate technical review of the work to ensure reproducibility, understanding of the assumptions made and valid interpretations of the results

Hazard Identification

1. Careful attention should be given to identifying worst case scenarios
2. Accident scenarios should not be dismissed because they are thought to be unlikely. All credible accidents with off-site consequences should be carried forward for further analysis
3. The identification process should consider:
    a. natural events such as floods, cyclones, earthquakes or lightning strikes
    b. Technological events such as vehicle impact on a support structure or impact of an aircraft
    c. Malicious acts
    d. Hazardous events on neighbouring sites

4. It is important no significant events are omitted
5. All possibilities need to be considered in creating a set of scenarios arising from each incident
6. Propagation or domino effects should also be considered
7. Attention should be paid in defining the worst case scenario
8. It must not be limited to the largest event within the capacity of existing protection systems, on the basis that events worse than this cannot be managed
9. The potential effects of the worst event on people, plant and the environment should be taken into account
10. All available information including historical records should be considered in developing the worst case scenario

Consequence Analysis

1. Where simplifying assumptions are used they should err on the side of conservatism
2. Assumptions should be made on a conservative best estimate basis
3. In addition to overpressure, explosion incidents can also produce a significant hazard in the form of high momentum projectiles. Their consideration is particularly important with regard to the potential for incident propagation, and the prediction of maximum effect distances, since fragments are often projected well beyond the thermal radiation or blast overpressure effect zones.

Likelihood Analysis

1. Event likelihood might be estimated directly through the consideration of historical failure data
2. Other data that may be required includes:
    a. Natural events such as flooding, earthquakes, cyclones etc
    b. External events such as likelihood of aircraft impact or events on neighbouring sites

Incitec Risk Assessment – Ammonium Nitrate

The risk assessment undertaken is not transparent to the public as the detailed information on:

1. Hazard Identification
2. Consequence Analysis
3. Frequency Analysis

4. Risk Assessment

was not included in the EIS for public exhibition. This information should be included to allow a more detailed review of the key assumptions and inputs. It is well know that these assumptions and inputs can be manipulated to provide whatever answer is required in a quantitative analysis and this has been outlined as a key issue in relying on these quantitative analyses by researches in this field.

Hazard Identification – Ammonium Nitrate

Incitec would have the following maximum storage of ammonium nitrate at the plant.

- 4,500 t of bulk Technical Grade Ammonium Nitrate (TGAN) - (2 x 2,250 t piles)
- 5,000 t TGAN (10 x 500 t stacks)
- 500 t of off-specification AN
- 1,000 t of AN (2 x 500 t stacks)
- 1,060 t ANSOL

This equates to 11,000 t of ammonium nitrate prills and 1,650 t of ammonium nitrate solution (88%).

Located adjacent to the proposed Incitec storage at the Orica plant there is up to 9,000 t of ammonium nitrate prills (TGAN grade) stored in stacks plus some ammonium nitrate solution.

This equates to a huge storage of ammonium nitrate totaling 20,000 t of solid prills and greater than 1, 650 t of ammonium nitrate solution located in an area only 800 m from the closest residents, 3 km from the Newcastle CBD with around 50,000 people in an area similar to the area affected by the Toulouse accidental ammonium nitrate explosion of 300 t of in 2001 in France.

Ammonium nitrate is used as an explosive in the mining industry by the addition of a fuel and a detonator. However most accidental explosions of ammonium nitrate have not been via this route. Ammonium nitrate can become less resistant to detonation/initiation and explode due to the following conditions:

- The presence of contaminants including chlorides, some metals, oil, diesel, paper, rag or straw.
- Exposure to high temperatures (fire) especially when confined including confinement in larger stacks.
- Exposure to shock including shock waves from a nearby explosion. A small detonation can trigger an explosion in a larger quantities stored nearby causing a domino effect.

There have been over 30 major accidental explosions of ammonium nitrate since its production including over 8 explosions since 2000. This has been in storages, during the production process and during transport.

Ammonium nitrate explosions also results in the release of large amounts of toxic gases including nitrogen dioxide and ammonia.

The explosion scenarios to be assessed should pay particular attention to identifying worst case scenarios. No significant events should be omitted and propagation and domino effects should be considered. Accident scenarios should not be dismissed because they are thought to be unlikely.

Contrary to the requirements of the NSW Planning Department Hazardous Industry Planning Advisory Papers the worst case scenarios have not been assessed but rather dismissed as not credible, despite such events occurring in ammonium nitrate plants and storages elsewhere in the world. Despite up to 11,000 t of ammonium nitrate planning to be stored at the Incitec plant it would appear the scenario chosen to assess an explosion is a small quantity and minimal frequency. This is again contrary to the requirements of the Planning Department requiring a conservative approach with the worst case scenarios.

A review of major ammonium nitrate explosions worldwide would indicate that an explosion is possible at the plant while unlikely however as indicated in the Planning Departments requirements these accident scenarios should not be dismissed and should be used in the risk assessment.

Possible scenarios that should be considered in the hazard identification are outlined in Figure 6 below and take into account accidents worldwide.

Figure 6: Ammonium Nitrate Explosion Scenarios for Risk Assessment – MAEs ([1]) ([2])

Initiation	Scenario	Tonnes of Ammonium Nitrate in Explosion Scenario	Comment
Fire	Fire in off speciation AN	500	
	Fire in 2,250 stack of AN	2,250	Detonation due to melting AN and confinement in stack leading to detonation
Explosion	Creating detonation from shock	500	
	Creating detonation from shock	4,500	Domino effect
Terrorism	Detonation from terrorism or malicious act	500 and 2,250	
Aircraft crash	Leading to explosion from shock and/or fire	500 and 4,500 and 11,000	Plant located near flight path for Newcastle airport and for air force jet exercises (< 1 km from plant)
Contamination	Leading to explosion	500 and 2,250	
Earthquake or Lightning	Leading to shock or fire	500 and 2,250	
Worst case scenario	Multiple	20,000	Cumulative impact Incitec and Orica, domino effect

Note: 1. Accidental explosions of ammonium nitrate have occurred due to fire, contamination, shock and terrorism and should be considered as scenarios in the risk assessment rather than being dismissed. 2. All scenarios have off-site effects.

Off-site effects from the scenarios are related to overpressure from an explosion and also release of toxic gases from AN due to a fire.

In the case of a fire in a warehouse storing ammonium nitrate a liquid pool will form. If this pool is hit by a fragment with high speed (a falling object)

then a local explosion will occur. This explosion will send a shock wave to piles which are not melted which could lead to detonation or deflagration both releasing explosive power.

Consequence Analysis

The potential fatalities, injuries and building damage from an accidental explosion of ammonium nitrate depends on the quantity that explodes of the total inventory of 11,000 t at the Incitec proposed plant and 9,000 t at the adjacent Orica plant.

In Toulouse in 2001 the explosion of just 300 t of ammonium nitrate at a fertilizer factory caused injuries and damage to buildings over a 5 km radius from the plant with up to 14,000 people injured 2,500 seriously and with 31 people killed by the blast. In Texas City in 1947 2,300 t of ammonium nitrate exploded and damaged buildings up to 60 km from the blast with 15,000 people injured and 700 people killed by the explosion. An explosion with the worst case scenario at Orica and the planned Incitec ammonium nitrate plants would have a domino effect and could result in an explosion at least half the force of the Hiroshima atomic bomb.

During the Toulouse event a huge cloud of coloured toxic gas smelling of ammonia also moved towards the city centre. Within a radius of 700 to 1500m doors and windows were shattered, roofs and walls damaged; windows burst in the centre of Toulouse (5 km away from direct pressure impact). Five hundred flats were uninhabitable, 86 schools had to be closed and Toulouse airport, main railway station and metro system were closed. Police blockaded roads around the site at the same time as many citizens tried to leave Toulouse in cars leading to extensive traffic jams and panic.

The conversion of the explosive potential of ammonium nitrate to tonnes of TNT varies depending on the condition and sensitivity of the stored ammonium nitrate. Allowing for the conversion and explosion efficiency the conversion factor can range from 0.32 to 0.82. The US military use 0.7 TNT equivalent for solid ammonium nitrate.

Figure 7: Explosive Potential of Ammonium Nitrate

Quantity (tonnes)	TNT equivalent (tonnes) (0.32/0.7)	Area Affect (km radius)	Effects
300	9.6/210	5	Toulouse explosion, killed 31, injured 14,000, damaged 30,000 houses, 5 km damage radius
2,300	736/1,610	50	Texas City explosion, killed 700, injured 15,000, windows shattered 60 km away
11,000	3,520/7,700	Unknown >>50 km	
20,000	6400/14,000	Unknown >> 50 km	Hiroshima atomic bomb equated to 18,000 t of TNT
Closest residents to the proposed Incitec plant on KI 0.8 km, 3 km from Newcastle CBD, approximately 50,000 people within 5 km of the proposed plant			

When ammonium nitrate is heated and becomes molten the sensitivity to detonation is increased dramatically. Confinement in a stack of ammonium nitrate is enough to initiate an explosion.

In the EIS (in the Impairment Criteria Section) an overpressure of 7 kPa from an explosion has been used to assess when an injury will occur off-site and 14 kPa for property damage. These are high values of overpressure for injury and damage with a number of European countries using much lower values of overpressure for injury and property damage. These European overpressure values have been adopted following accidental explosions as such more conservative. A conservative approach is proposed in the Planning Department documents. Figure 8 below outlines the overpressure values used compared to values used in the Incitec EIS.

Figure 8: Overpressure Values European Comparisons used for Land Use Planning

Country	Overpressure Value (kPa)	Effect	Comment
France	20	High lethality, destruction of concrete buildings and metal structures	
	14	Partial collapse of walls in buildings, injuries, possible fatalities	
	5	Damage of buildings and breakage of windows, injuries	Injuries
	2	Breakage of windows possible injuries	Possible injuries
Italy	30	High lethality and total destruction of buildings	
	14	Beginning of lethality	
	7	Partial destruction of house and injuries	Injuries
	3	Window breakage possible injuries	Possible injuries
Austria	2.5	Breakage of windows and injury	Uses only 2.5 kPa for Land Use Planning Level
NSW	70	Lung damage, 100% chance of fatality	
	35	50% chance of facility if in building and 15% if outside, eardrum damage	
	21	Reinforced structure distort, storage tanks fail, 20% chance of fatality	
	14	House uninhabitable	
	7	Damage to internals of building, 10% probability of injury	Injury
	3.5	90% glass breakage, low probability of injury	Possible injury

A conservative approach should be taken as recommended and a value between 2 and 3.5 kPa should indicate window breakage and probability of injury rather than the much higher and value of 7 kPa which is not a conservative value and higher than levels used in France, Italy and Austria.

These values also can be compared to the explosion of approximately 300 t of ammonium nitrate in Toulouse where the explosion estimates for overpressure and actual damage and injuries are shown below in Figure 9.

Figure 9: Overpressure and Effects Calculated for the Toulouse AN Explosion

Toulouse Explosion AN Quantity (tonnes)	Overpressure Value (kPa)	Effect	Distance from explosion
Assumed 250	0.7	Possible breakage of windows, very loud noise	5.4 km
	1.0	Minimum safe distance possible window breakage	4.2 km
	2.0	Minor damage to frame of house window breakage	2.6 km
	3.5	Significant window breakage and minor damage to frame of the house, injuries possible	1.8 km
	5.0	Injury from flying glass	1.3 km
	7.0	Partial demolition from houses injury from glass, debris and building damage	1.0 km
	20.0	Partial collapse of walls and roofs of houses; Eardrum rupture; significant human lethality from flying glass and missiles	0.5 km
	70.0	Probable total building destruction; many deaths; lungs haemorrhage	0.2 km
Toulouse actual outcome experienced window breakage and injuries up to 5 km from the explosion, deaths up to 1.0 km from the plant correlated reasonable well with the calculation which used 0.7 TNT equivalence for 250 t of ammonium nitrate.			

A list of a number of accidents with ammonium nitrate is shown in Figures 10 and 11. This has included ammonium nitrate in storage, in transport, during production process and has included initiation/detonation from fire, shock and contamination.

Figure 10: Accidents with Ammonium Nitrate

Location	Date	Details
Morgan, New jersey	1918	Explosion of AN stored due to explosion at nearby artillery depot
Kriewald, Germany	1921	Explosion of AN in railway wagons – 19 killed
Oppau, Germany	1921	Explosion of AN/ammonium sulphate mix – killed 450 people and destroyed 700 houses
Nixon, New Jersey	1924	Fire and explosion of stored AN
Muscle Shoals, Alabama	1925	Rail cars carrying AN caught fire and exploded
Rouen, France	1940	Explosion of AN due to bomb landing on storage during the war
Miramas, France	1940	240 tonnes of AN exploded after being hit by a shell from a fire in a munitions train
Tessenderlo, Belgium	1942	150 tonnes of stored AN exploded – several hundred people killed
Texas City, US	1947	Cargo ship being loaded had 2,600 tonnes of AN on board – fire broke out and AN exploded killing several hundred people and destroying nearby ship. Also created a powerful earth shock and knocked two small planes out of the shy flying at 1500 m
Brest, France	1947	Cargo ship loaded with 3300 tonnes of AN caught fire and exploded – caused 29 deaths and serious damage to Port of Brest
Red Sea	1954	Fire on cargo ship while carrying 4000 tonnes of AN – ship abandoned and exploded
Roseburg, Oregon	1959	Truck carrying AN caught fire and exploded killing 14 people and injuring 125 and destroying several blocks of the city.
Kansas City, Missouri	1988	Two trucks carrying 23 tonnes of AN

Location	Date	Details
		exploded at a construction site killing 6 people
Papua New Guinea	1994	AN emulsion exploded at a mine site killing 11 workers- involved only few tonnes of AN however fire exploded stored 80 tonnes of AN

Figure 11: Accidents with Ammonium Nitrate

Port Neal, Iowa	1994	Two explosions at AN processing plant with 4 people killed and 18 injured. Released large amount of ammonia.
Sioux City, Iowa	1994	AN processing plant explosion during processing of AN - killed 4 people and there were many injuries
Toulouse, France	2001	Explosion at a Fertilizer factory of 200 to 300 tonnes of stored AN killed 31 people and injured 14,000 people 2,500 seriously. Blast shattered windows up to 5 km away with 10 m deep crater 50 m wide. Material damage estimated at 2.3 billion euros
Cartagena, Muricia, Spain	2003	Fertiliser factory had self-sustained decomposition fire - fire was controlled.
Barracas, Spain	2004	Truck carrying 25 tonnes of AN exploded after an accident killing 2 people and injuring 3. Explosion heard 10 km away and crater was 5 m deep
Mihailasti, Buzau, Romania	2004	Truck carrying 20 tonnes of AN tipped over and fire started and truck exploded killing 18 people and injuring 13. The crater was 6.5 m deep and 42 m diameter.
Ryongchon, North Korea	2004	Freight train carrying AN exploded killing 162 people and injuring over 3,000. Train station was destroyed and 8,000 buildings destroyed
Estaca de Bares, Spain	2007	AN fertilizer cargo underwent self-sustained combustion fire – fire was extinguished before an explosion
Monclova, Coahuila, Mexico	2007	Truck loaded with 22 tonnes of AN crash and fire started and then explosion resulting in the death of 37 people and 150 people injured
Bryan, TX, US	2009	AN Plant caught fire and emitted toxic fumes.

As well as explosion toxic gases can be released in a fire involving ammonium nitrate including ammonia and nitrogen dioxide. This is a scenario that should be assessed through dispersion modeling however the details of this work and outcomes are not available in the EIS due to the missing documents related to the Hazard and Risk Assessment. This information should be available for review in the EIS and the fact this was not included in the EIS for public review is unacceptable to the public.

Frequency and Likelihood Analysis

The details of the frequency analysis data are missing from the EIS and this prevents public review and scrutiny of the critical assumptions for the explosion risk assessment. A table with a frequency scale used in previous assessments is shown below in Figure 12.

Figure 12: Frequency Scale

Likelihood	Qualitative Description	Range (per annur
Almost Certain	Will occur at least once a year	>1
Very Likely	very likely to occur at least once during a 10 year period of operation of the facility/business	10^{-1} to 1
Likely	Very likely to occur at least once during the operating life of the facility/business	10^{-2} to 10^{-1}
Unlikely	Known to have happened within the industry periodically in small industries and more often in large industries	10^{-4} to 10^{-2}
Very Unlikely	Has occurred somewhere in the world in all related industries	10^{-6} to 10^{-4}
Extremely Unlikely	Could theoretically occur but not aware of any instances	$<10^{-6}$ (around 10^{-7})

The frequency of an explosion of ammonium nitrate should be taken as unlikely and be in the 10^{-4} to 10^{-2} range given that explosion events have occurred in the industry and storages and continue to occur. It is possible that a much lower frequency of an ammonium nitrate explosion of stored material at the plant has been selected skewing the results. This would result in a much lower risk to communities surrounding Kooragang Island than would be

indicated by the selection of a more appropriate frequency and explosion scenarios that include worst case scenarios and conservative approach.

Risk Analysis

The overall risk analysis in relation to ammonium nitrate explosion risk is flawed due to the following problems with the key assumptions:

- Worst case scenarios have not been chosen
- Applicable accident scenarios have been dismissed as not credible
- Cumulative impacts have not been correctly assessed
- Domino effects haven't been properly assessed
- Natural disasters or deliberate acts such as terrorism haven't been assessed properly
- Simplifying assumptions did not err on the side of conservatism
- Overpressure values used are not conservative and are much higher than used in a number of European countries for Land Use Planning. A value of between 2 and 3.5 kPa should be used as a conservative approach especially where residents are 800 m from the plant and up to 50,000 people live within 5 km of the plant.
- Likelihood and frequency level chosen is likely to have been not conservative and the unlikely level of frequency of 10^{-4} to 10^{-2} should be chosen for a number of the scenarios.

The hazard identification scenarios with the recommended frequency for risk assessment are based on frequency table Figure 13 descriptions and MAEs worldwide.

Figure 13: Ammonium Nitrate Explosion Scenarios in Storages and Frequency for Risk Analysis

Initiation	Scenario	Tonnes of Ammonium Nitrate in Explosion Scenario	Frequency
Fire	Fire in off speciation AN and explosion	500	10^{-2} (occurred in AN storages including Toulouse)
	Fire in 2,250 stack of AN and explosion	2,250	10^{-3} (occurred in

Initiation	Scenario	Tonnes of Ammonium Nitrate in Explosion Scenario	Frequency
			storages however larger amounts less common)
Shock	Creating detonation from shock	500	10^{-2} (occurred in AN storages)
	Creating detonation from shock	4,500	10^{-3}
Terrorism	Detonation from terrorism or malicious act	500 and 2,250	10^{-4}
Aircraft crash	Leading to explosion from shock and/or fire	500 and 4,500 and 11,000	10^{-5} (more unlikely than other scenarios however still a possibility given Newcastle airport location and RAAF and commercial flights close to plant)
Contamination	Leading to explosion	500	10^{-2} (occurred at AN storages)
		2,250	10^{-3} (occurred in AN storages however larger amounts less common)
Earthquake or Lightning	Leading to shock or fire	500 and 2,250	10^{-7} (extremely unlikely however a scenario)
Shock, fire, terrorism, aircraft crash	Domino effects	20,000	10^{-7} (extremely unlikely however a scenario)

These hazard scenarios, frequency figures should be used in the risk analysis together with lower overpressure levels to assess injuries, fatalities and building damage. The overpressure recommended based on some

major European countries Land Use Planning overpressure requirements are:

- 2.5 kPa for window breakage and possible injuries
- 7.0 kPa for building damage and some building destruction and higher level of injuries
- 14.0 kPa for the start of fatalities

These scenarios and frequencies would conform to the Planning Department requirements in HIPAP No4 and HIPAP No6 on Hazard Analysis and Risk Criteria for Land Use Safety Planning. This would ensure the requirements from these documents are met including:

- Careful attention should be given to identifying worst case scenarios
- Accident scenarios should not be dismissed because they are thought to be unlikely
- The identification process should consider:
    - Natural events such as floods, cyclones, earthquakes or lightning strikes
    - Technological events such as vehicle impact on a support structure or impact of an aircraft
    - Malicious acts
    - Hazardous events on neighbouring sites
- It is important no significant events are omitted
- All possibilities need to be considered in creating a set of scenarios arising from each incident
- Propagation or domino effects should also be considered
- The potential effects of the worst event on people, plant and the environment should be taken into account
- All available information including historical records should be considered in developing the worst case scenario
- Assumptions should be made on a conservative best estimate basis
- In addition to overpressure, explosion incidents can also produce a significant hazard in the form of high momentum projectiles. Their consideration is particularly important with regard to the potential for incident propagation, and the prediction of

maximum effect distances, since fragments are often projected well beyond the blast overpressure effect zones.

- Event likelihood might be estimated directly through the consideration of historical failure data
- Other data that may be required includes:
    - Natural events such as flooding, earthquakes, cyclones etc
    - External events such as likelihood of aircraft impact or events on neighbouring sites
- Due regard should be given to cumulative impact

As outlined in the risk matrix below the chance of an ammonium nitrate explosion at the proposed Incitec plant is in the "Unlikely" range and the outcome would be Catastrophic making the plant a Level I unacceptable risk for the community and requiring a different location for the plant to be assessed in detail.

Figure 14: Risk Analysis Risk Matrix

Likelihood of Occurrence	Notable Event	Significan Event	Highly Significant	Serious Event	Extremely Serious Even	Catastrophic Event
Almost Certain	Level II	Level II	Level I	Level I	Level I	Level I
Very Likely	Level III	Level II	Level II	Level I	Level I	Level I
Possible (Likely	Level III	Level III	Level II	Level II	Level I	Level I
Unlikely	Level IV	Level IV	Level III	Level III	Level II	Level I
Very Likely	Level IV	Level IV	Level IV	Level IV	Level III	Level II
Extremely Likel	Level IV	Level IV	Level IV	Level IV	Level IV	Level III

The use of these worst case and conservative scenarios and appropriate frequencies and overpressure will result in substantially different risk analysis outcomes indicating the location of the Incitec ammonium nitrate plant on Kooragang Island:

1. Is not viable due to the risk of injury, fatalities and building damage in communities surrounding Kooragang Island at a risk level greater

than the required risk contours $1x10^{-6}$ per annum (p.a.), 10×10^{-6} p.a. and 50×10^{-6} p.a.

2. Puts the community at too higher risk level from the possible explosion of stored ammonium nitrate
3. Should be changed so that the plant is located beyond the distance from communities as indicated by the analysis with the scenarios and frequencies in Figure 13 and overpressures as outlined above.

The proposed Incitec plant location on Kooragang Island has to be rejected as providing a risk level unacceptable to the communities surrounding Kooragang Island and unacceptable to the Planning Departments guidelines due to the effects of possible explosions of stored ammonium nitrate resulting in injuries, fatalities and building damage in surrounding communities.

Cumulative Impacts for Explosion Risk

The cumulative impacts from explosion risk have not been fully assessed. The cumulative risk in regard to explosion risk included:

1. Orica plant stored ammonium nitrate in relation to domino effect from explosion shock including worst case scenario of a domino effect and all the stored ammonium nitrate exploding.
2. Orica plant in regard to fire spreading onto the Incitec plant and causing an explosion.
3. Hydrogen emitted from Orica plant as AN contaminant and possible explosion of hydrogen initiating an explosion of stored ammonium nitrate
4. A large biofuel storage and processing plant has been approved by the Planning Department for Manildra Park Pty Ltd adjacent to the proposed Incitec plant and existing Orica plants. A fire and explosion in the storage and processing plant or transfer pipeline from the wharf has not been assessed at all in the cumulative impact as required from this development.
5. Fire and explosion of ammonium nitrate being loaded on ships at the wharf appears not to have been assessed for cumulative effect
6. An explosion in the grain storage resulting in a grain dust cloud explosion appears not to have been assessed for cumulative impacts

The cumulative effects also relate to the brisance effect of an ammonium nitrate explosion which could damage or destroy tanks and cause release of large amounts on toxic gases and result in secondary fires as well as explosions. This would include:

1. The 30,000 t ammonia storage tank at Incitec releasing a large amount of toxic and potentially lethal ammonia gas onto surrounding suburbs
2. The storage of ammonia at the Orica plant again releasing toxic ammonia
3. Large fuel tanks at the proposed Manildra biofuels storage adjacent to the proposed Incitec plant and the Orica plant leading to fire and explosion

The requirements of the Director General for this proposal required all cumulative impacts to be fully assessed and this has not been undertaken in this EIS and does not meet the Director Generals requirements including the omission of the Manildra approved fuel storage adjacent to the proposed Incitec plant.

Other Australian State Information Related to Explosion Risk

Information relevant to explosion risk is outlined below.

South Australia

Following a SafeWork SA report assessing the risk of ammonium nitrate storage at Port Adelaide in South Australia the SA Government is negotiating for Incitec Pivot to shift their storage of ammonium nitrate to a location away from residents.

The report from SafeWork SA and recommendation from the EPA is this storage represents an unacceptable explosion risk to the surrounding communities. Incitec has agreed to shift if tax payers fund the move. The Safe Work SA report said the ammonium nitrate material stored at the Incitec Pivot plant had the potential to mass explode in certain circumstances such as accidental contamination with other chemicals, in a fire situation or through malicious action or terrorism where other energetic materials are used to initiate such an explosion. Although the

company has developed a safety and security management plan for the facility, such an explosion still has the possibility of occurring.

The University of Adelaide Head Of Chemistry said an ignition of the stockpiles would cause a gigantic blast of devastating consequences. The SA EPA has demanded the expansion of residential area be abandoned because of the explosion and air quality risks.

Western Australia

The Western Australian Government Code of Practice on Safe Storage of Solid Ammonium Nitrate Second Edition includes a table with separation distance from various quantities of stored ammonium nitrate from off-site protected works, vulnerable facilities and critical infrastructure. In the case of ammonium nitrate stored on Kooragang Island, would include key port facilities, coal terminal, Stockton Bridge as a key link to Newcastle airport, Stockton Hospital, schools, childcare facilities and dwellings. This table is shown below in Figure 15.

Figure 15: Western Australian Government Safe Distances for Ammonium Nitrate Storage

Table 4.1 Recommended minimum separation distances for AN stores

Quantity of AN stored (kg)	Recommended minimum separation distances (D)	
	Off-site protected works (m)	Vulnerable facilities and critical infrastructure (m)
10,001	240	300
15,000	280	350
20,000	330	410
30,000	350	440
40,000	380	480
50,000	410	520
75,000	470	590
100,000	520	650
125,000	560	700
150,000	600	740
175,000	630	780
200,000	660	820
250,000	710	880
300,000	750	940
350,000	790	990
400,000	825	1,030
450,000	860	1,070
500,000	890	1,110

The separation distance for 500 t of ammonium nitrate is 1.11 km. For the quantities proposed to be stored at the Incitec plant the maximum stack capacity would be 2,250 t and the separation distance would be many kilometres. This would prohibit the storage of such large quantities of ammonium nitrate adjacent to the infrastructure and facilities such as Kooragang Island in Western Australia. Yet in NSW this critical infrastructure and facilities appear to have a different assessment of criticality in its risk assessment.

The WA Code in relation to Evacuation distances says:

Explosions resulting from fires involving AN, even in recent years, have killed and injured emergency personnel and others.

When a fire involving AN is judged to be out of control, or if the fire is engulfing the AN, everyone, including fire fighters, should be evacuated to a safe distance where they will not be harmed if there is an explosion. The evolution of toxic brown nitrogen dioxide is a sign that immediate evacuation is required.

The process of promptly evacuating on-site and off-site people in the event of a fire involving AN must be clearly documented in the dangerous goods emergency plan for the site, with a clearly established process for alerting people and preventing entry into an evacuated area.

For a storage quantity greater than **1 t but not exceeding 500 t** per individual stack or pile, where the stacks or piles are separated from one another by a distance sufficient to prevent a detonation in one propagating to another (see Chapters 4 and 5), the recommended **minimum evacuation distance for all personnel (including emergency personnel) is 2,200 m**. Where the quantity of AN that may detonate in a single event **exceeds 500 t** then an **evacuation distance of greater than 2,200 m needs to be considered.**

The Western Australia Code also stipulates ammonium nitrate in packages, IBCs or as loose prill may be stored in maximum stack sizes of 500 t, separated from each other in a manner that prevents sympathetic detonation.

Other Risks

The location of the proposed Incitec plant exposes it to a number of significant risks that could cause major incidents at the plant. This includes exposure to flood, sea level rise, storm and earthquake exposure.

As outlined by the Institute for International Development there is an urgent need for a comprehensive audit of the exposure of Major Hazardous Facilities (MHFs) and potentially dangerous sites to the impacts of natural disasters.

The evaluation of potential impacts from natural disasters appears to be cursory and inadequately addressed in the EIS.

There appear to be strong forces that work against community awareness with hazardous facilities including:

- Infrequent events
- Endemic apathy
- Political sensitivities
- Commercial sensitivities
- National security sensitivities
- Bureaucratic inertia
- Media disinterest
- This means that inappropriate developments escape informed scrutiny.

Community Consultation

The community consultation process undertaken by Incitec was poor and minor. Many residents from Stockton, Carrington, Tighes Hill and Mayfield have been left in the dark on this project. Letter drops and one information session two months after the Orica disaster is not proper consultation for a project of such magnitude and widespread impacts.

The an initial community information session was held during the Orica pollution event aftermath at the same time as an Orica meeting was being held which was already attend by the public preventing attendance at the Incitec meeting with only 3 people attending.

The minor contact with the community was restricted initially to only Stockton and Fern Bay and there were was no contact with the community from the many suburbs that had the potential to be affected by this proposal including Newcastle, Maryville, Wickham, Islington, Carrington, Warrabrook, Hamilton etc.

It wasn't until community questions around community information distribution that Incitec finally sent letters to some people in Mayfield, Tighes Hill and Carrington in July 2012.

A website was set up for the project however poorly advertised by Incitec. The Community Liaison Group meeting attend by some SCAG members was

seen as a farce with obvious little interest in what the community had to say and obvious annoyance at community speaking out against the project. The request for key information around risk particular explosion risk was ignored by Incitec at these meetings. It appeared to the community to be an exercise in ticking the box for the EIS that Incitec had carried out community consultation.

Incitec's own 'community perception' survey conducted in April 2012, identified less than a third of residents were unaware of the Project. Another example of poor consultation is many residents that live within a 5 km radius have been excluded in any communication material. Suburbs such as Cooks Hill, Newcastle West and East, The Hill and Hamilton South have received no information regarding the proposal.

Now, Incitec has declared a two year delay in making any decision on the Project. This may please IPL's investors; however it prolongs resident uncertainty, stymies local investment and provides Incitec with an extended period to lobby Government ministers.

Overall it is clear the community consultation process was poor and ineffective and the communication that was provided was to a limited number of suburbs potentially affected by this proposed development.

Impacting house prices

Incitec's EIS fails to address the concern that a second ammonium nitrate plant may impact house prices. If Incitec's development is approved, the risk profile increases for all suburbs close to Kooragang and it's highly likely that the value of properties may decrease. Downward pressure on properties would be a direct result from fewer new families moving into areas like Stockton and a reputational stigma for suburbs closest to two ammonium nitrate plants.

Incitec's EIS does not acknowledge this issue, nor does it address who would be responsible if property values were lowered by their Project.

Transport

Traffic is already a major problem on Kooragang Island which is a major link road and the amount of traffic associated with truck movements and

general traffic with the plant will further add to the traffic problems being experienced by the community.

The extra diesel truck movements will add to dangerous carcinogenic fine particles and nitrous oxides levels.

There is also an explosion risk with ammonium nitrate transport as seen by a number of explosions of ammonium nitrate truck accidents worldwide including Australia. The recent accident in Maitland involving the collision between an ammonium nitrate truck and petrol tanker highlights the real potential for an accident and explosion resulting in deaths and injury to the public. The transport of ammonium nitrate required improved controls however reduced frequency of ammonium nitrate truck movements through populated suburbs would reduce risk around explosion from truck accidents.

Emergency Response Plan

The draft Kooragang Island Plan for emergencies I understand does not include Stockton in the emergency evacuation procedures it is understood most likely due to the difficult of an evacuation being on a peninsular with one road in and out. Considering the possible emergency scenarios at Incitec and Orica ammonium nitrate plants this is a major concern for the Stockton community.

Incitec Pivot Ltd Environmental Record

Incitec has a record of environmental non-compliance in Australia and the US which is a major concern for communities surrounding Kooragang Island for the proposed ammonium nitrate plant.

When Incitec operated the Orica ammonium nitrate plant on Kooragang Island for over 10 years it recorded over 100 environmental incidents. The operation of the fertiliser plant on Gibson Island in Brisbane again has recorded close to 200 environmental incidents in the last 10 years. This year in the Incitec operations on Kooragang Island has also received two environmental breaches.

In the U.S. the US Environmental Protection Agency has launched a criminal investigation into a large leak of ammonia from a Columbia County Dynobel fertiliser plant in 2010 that went undetected for five days. The plant is

owned by Incitec and has a history of other EPA penalties including other ammonia leaks. A leak of ammonia in 2008 resulted in a civil fine for the company from the EPA after they took 11 hours to report the leak.

A 2010 Toxic Release Inventory issue by the EPA for Oregon showed Dynobel company, (part of Incitec and the company operating the Columbia plant), as sixth in the state for toxic chemical release with more than 700,000 total releases.

Incitec is a company with a poor environmental record and little concern or involvement in the local communities and is not the company suitable to be operating a hazardous and polluting plant 800 m from the nearest communities.

Employment and economic impacts in Newcastle and Lower Hunter

If operational, Incitec's plant will employ just 60 people, many of whom will be transfers from the company's Mooranbah ammonium nitrate plant. Considering the risk and impacts the plant brings to tens of thousands of people, 60 jobs are not commensurate with the more obvious and insidious impacts the plant will bring.

Furthermore, Incitec have stated that rising construction costs and a failing coal price has forced a two year delay in making a decision on this Project. These outside economic forces impact the viability and longevity of the plant and should be included in EIS.

Summary

The proposed Incitec ammonium nitrate plant on Kooragang Island is unacceptable for the following reasons.

1. The hazard risk analysis has not been undertaken adequately and doesn't address the requirements on the NSW Government Hazardous Industry Planning Advisory papers in that it:
    a. Doesn't considered the worst case scenarios with hazard analysis dismissing key scenarios
    b. Significant events are omitted
    c. Domino effects haven't been effectively considered
    d. Cumulative events haven't been fully assessed
    e. The frequency of likelihood analysis has selected inappropriate values compared to actual events in history
2. The risk analysis is contrary to what is happening in other states with the SA Government negotiating a shift of the storage of ammonium nitrate away from communities in Adelaide due to explosion risk and as well the comparison to safe distances recommended by WA Government from ammonium nitrate storage.
3. Accidental explosion of stored ammonium nitrate has resulted in injuries and deaths in communities up to 5 kilometres from such explosions for relatively small amounts of ammonium nitrate.
4. The overpressure value chosen for likely injuries is significantly higher than a number of European countries including France, Austria and Italy and a lower overpressure level should be adopted for assessing injuries, fatalities and building damage.
5. The selection of worst case explosion scenarios with a more suitable frequency based on actual events would lead to a risk assessment indicating unacceptable risk contours which do not meet the Planning Department requirements for risk and would lead to injuries and fatalities in the event of an ammonium nitrate explosion.
6. The plant emissions will lead to increase in fine particles with likely further exceedances of the NEPM standard for PM 10 particles of 50 ug/m^3 in Stockton and levels of PM 2.5 particles above the PM 2.5 target of 25 ug/m^3.
7. Nitrogen dioxide levels from the plant would lead to a 50 % increase

in the average NO2 levels in Stockton and maximum levels approaching the NEPM standard.

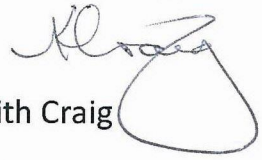
8. Ammonia accidental emissions are a concern for the community with the massive 30,000 t storage of ammonia proposed for the plant. A major failure of the tank was not assessed in the EIS and such an event will lead to serve injuries and possible deaths in the surrounding communities.
9. Noise levels already significantly exceed the NSW Industrial Noise Policy amenity criteria in Stockton and the proposed noise levels from the plant exceed the requirements for a new noise source when the current levels are being reduced in the future (Orica noise reduction program). Noise levels from the plant are required to be < 30 dB for night time noise and this plant will significantly exceed this requirement.
10. There are alternative locations for the plant that were not adequately assessed.
11. There are alternative supplies from other Australian plants and other Australian plants can be expanded to provide for supplies in Australia and the Hunter Valley.
12. There is a down turn in the mining sector and requirement for ammonium nitrate.
13. The expansion of the ammonium nitrate plant at Orica is significantly increasing the supply of ammonium nitrate to the Hunter Valley. This Incitec project seems to be more about competition for Orica to supply cheaper ammonium nitrate explosives to the Hunter Valley mining industry at the same time as increasing the hazards, risks and pollution to communities surrounding Kooragang Island.
14. There are only a small number of jobs being created and the hazards, air and noise pollution far outweighs the benefit from any potential employment.

The proposed Incitec ammonium nitrate plant on Kooragang Island has to be rejected for the safety and health of the surrounding communities and alternatives sites and supplies be considered for the mining industry in the Hunter region.

As submission makers are required to disclose political donations totaling

$1000 or more in the past 2 years, I can state that **I have not made a disclosable donation**.

Yours Sincerely,



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