

## **NITRATE FERTILISER GUIDANCE NOTES**

### **Dealer and Agent Guidance Notes for the Transport,**

#### **Storage, Sale and Use of Nitrate Fertilisers**

These Guidance Notes have been prepared to assist Dealers and Agents with regulatory and product stewardship issues pertaining to nitrate fertilisers.

The Guidance Notes summarise some of the more important legislation on the handling and storage of Class 5.1 Oxidizing Agents, and those products that are classified as Security Sensitive Ammonium Nitrate (SSAN), but are not a complete guide, and should not be used as such. Relevant State Acts and Regulations, national codes and guides should be used as the primary source of information. These are subject to change, and should be reviewed regularly.

Fertilisers that are classified as Oxidizing Agents must be transported in accordance with the Seventh Edition of the Australian Code for the Transport of Dangerous Goods by Road and Rail, and stored in accordance with Australian Standard AS 4326.

Those involved in the manufacture, import, storage, sale, transport or use of Security Sensitive Ammonium Nitrate (SSAN) must be licensed by the relevant State Departments to do so. SSAN fertilisers are banned in Tasmania.

Incitec Pivot Limited hereby expressly disclaims liability to any person, property or thing in respect of any of the consequences of anything done or omitted to be done by any person in reliance, whether wholly or in part, upon the whole or any part of the contents of these Guidance Notes.

## **INDEX**

1. Summary
2. Nitrate Fertilisers
3. Decomposition Reactions
4. Dangerous Goods Legislation
5. Hazardous Substances
6. Safety Data Sheets
7. Security Sensitive Ammonium Nitrate Fertilisers
8. Security Arrangements for Other Nitrate Fertilisers
9. Fertiliser Blends
10. Cal-Gran Blends
11. Storage & Handling Characteristics, Maintenance And Safety Considerations
12. Agronomic Advice and Product Use

## 1. Summary

- Straight Ammonium Nitrate fertilisers, such as **Nitram**, which is no longer marketed by Incitec Pivot, are classified as Dangerous Goods.
- Calcium Ammonium Nitrate (CAN) is the only ammonium nitrate fertiliser marketed by Incitec Pivot. It is sold as **Cal-Am**. Cal-Am is comprised of 80 % ammonium nitrate and 20% calcium carbonate. It is applied in the dry state to the soil, either on its own or in blends. The calcium carbonate it contains is insoluble, making Cal-Am unsuitable for use in the preparation of fertiliser solutions. Cal-Am is not classified as being a Dangerous Good, but is Security Sensitive. It must be kept secure at all times, and only be provided to those licensed to receive it.
- Cal-Am is used as an ingredient in dry blends. Solid fertilisers containing more than 45% ammonium nitrate (55% Cal-Am) are classified as **SSAN** (Security Sensitive Ammonium Nitrate). Because of concerns that SSAN fertilisers may be misused as raw materials for explosives, the Council of Australian Governments (COAG) has implemented a licensing system to ensure these products are not freely available to members of the public. Licenses are only available to those who can demonstrate a legitimate need for SSAN, who will transport and secure it securely, and who are not of security concern. Dealers, Agents, transport operators and farmers who do not have a license to store, transport or use SSAN will not be supplied. SSAN fertilisers have been banned in Tasmania.
- **Potassium Nitrate** is classified as a Dangerous Good (Class 5.1 Oxidizing Agent). It must be transported in accordance with the Seventh Edition of the Australian Code for the Transport of Dangerous Goods by Road and Rail, and stored in accordance with Australian Standard AS 4326 - 2008. It is not treated as being Security Sensitive. Potassium Nitrate is available in two grades:
  - **Prilled Potassium Nitrate** – for dry application to the soil; and
  - **Liquifert K Nitrate** – a soluble (solution) grade for application in fertigation programs and foliar sprays.
- The other solid nitrate fertiliser marketed by Incitec Pivot is **Yara Calcinit** (Calcium Nitrate). It is used in the preparation of solutions for use in fertigation programs and foliar sprays. It is neither a Dangerous Good nor Security Sensitive.
- While Prilled Potassium Nitrate, Liquifert K Nitrate and Yara Calcinit are not subject to the same tight security arrangements and licensing arrangements as SSAN, those involved in the distribution and sale of these products should ensure they are only supplied to bona fide farmers. Cash sales to customers not known to the business should be refused. Agents and Dealers should ensure all nitrate fertilisers are stored securely and be on the lookout for suspicious customers. In doubt, refuse supply and report the incident to the police.
- Incitec Pivot markets Urea Ammonium Nitrate (UAN) Solution as **EASY N**. Being a solution, is exempt from security provisions applying to solid ammonium nitrate fertilisers.

## 2. Nitrate Fertilisers

Fertilisers contain nitrogen (N) in various forms, including amide (urea), ammonium (NH<sub>4</sub>) and nitrate (NO<sub>3</sub>).

Nitrate fertilisers that are (or have been) marketed by Incitec Pivot are listed in the following table. Of these, Nitram is the only product that is no longer available.

### Nitrate Fertilisers

Product Name	Common Name	Nitrogen (N)		Other Nutrients		Dangerous Goods Class	Security Sensitive
		Total % N	Nitrate % NO <sub>3</sub> -N	Potassium % K	Calcium % Ca		
<b>SOLIDS</b>							
Nitram <sup>®</sup>	Ammonium Nitrate	34	17	-	-	5.1 UN No. 1942	Yes
Cal-Am	Calcium Ammonium Nitrate (CAN)	27	13.5	-	8	-	Yes
Prilled Potassium Nitrate	Potassium Nitrate	13	13	38.3	-	5.1 UN No. 1486	No
Liquifert K Nitrate							
Yara Calcinit	Calcium Nitrate	15.5	14.4	-	19	-	No
<b>LIQUIDS</b>							
EASY N	Urea Ammonium Nitrate (UAN) Solution	42.5 w/v	10.5 w/v	-	-	-	No
EASY Cal	Calcium Nitrate Solution	12.6 w/v	12.6 w/v	-	18.1 w/v	-	-

Nitram<sup>®</sup> is a registered trademark of Orica Australia Pty Ltd.

## 3. Decomposition Reactions

Nitrate has the chemical formula of NO<sub>3</sub>. It contains three atoms of oxygen (O) to every one atom of nitrogen (N).

When subject to heat and/or in the presence of catalysts, nitrate will decompose, releasing gaseous compounds. This may occur slowly, or instantaneously, the latter being referred to as detonation and explosion.

The decomposition reactions involving nitrate fertilisers that are of concern are:

- Firstly, nitrate fertilisers may decompose when heated to release oxygen. This may cause fires to burn more intensely.
- Secondly, when mixed with certain other products, the blend may be subject to self-sustaining decomposition. If exposed to heat, the blend may start to smoulder, releasing toxic gases in the process. This will continue until the entire mass of the fertiliser has been consumed, even if the original heat source is removed. It is Incitec Pivot's policy not to market any blend that is capable of self-sustaining decomposition.

- Thirdly, nitrate fertilisers may be misused as a raw material in the preparation of explosives in politically motivated acts of violence. This has led the Council of Australian Governments (COAG) to classify a number of fertilisers as Security Sensitive Ammonium Nitrate (SSAN). Strict controls on their storage, transport and use have or are being implemented.

Note: Urea [ $\text{CO}(\text{NH}_2)_2$ ] also contains oxygen (O) in its molecular structure, but oxygen ( $\text{O}_2$ ) is not one of the decomposition products of urea. The gases that are liberated when urea is heated include ammonia and oxides of nitrogen. Urea does not contain nitrogen as nitrate. The nitrogen in urea is present in the amide form.

## 4. Dangerous Goods Legislation

### 4.1 Oxidizing Agents

On their own nitrate fertilisers are not combustible. However, if subjected to heat or caught in a fire, they will decompose to release gases, including oxygen. In the event of a fire, this adds to the intensity of the blaze.

While this is a characteristic of all nitrate fertilisers, their oxidizing capacity is not as strong as that of many other Oxidizing Agents, and not all are classified as being a Dangerous Good (Class 5.1 Oxidizing Agent).

Potassium Nitrate is the only fertiliser that is marketed by Incitec Pivot that is classified as such. Two grades are available:

- Prilled Potassium Nitrate, for dry application to the soil;
- Liquefert K Nitrate, for application in solution, either in fertigation programs or in foliar sprays.

Oxidizing Agents must not be confined or mixed with combustible or flammable materials. They must not be carried with or stored near fire risk substances, e.g. fuel, hay, grain, agricultural chemicals, and timber. If wooden pallets are used, these must be hardwood, and periodically washed to remove all traces of nitrate.

### 4.2 United Nations Numbers

Products that are classified as being a Dangerous Good are given a UN Number.

Ammonium Nitrate is made in different ways for different markets, depending on the intended use:

- Low density porous grades of ammonium nitrate are used in the explosives market.
- High density grades of ammonium nitrate, which are less likely to absorb moisture and other fluids, for use in agriculture, e.g. Nitram<sup>®</sup>.

Both of these grades fall under UN No. **1942**.

UN No. **2067** is used for Ammonium Nitrate Based Fertilisers that do not exhibit explosive properties that contain:

- > 90 % ammonium nitrate and less than 0.2% combustible organic material; or
- 70 – 90% ammonium nitrate with other inorganic materials, and less than 0.4% combustible organic material; or
- 80 – 90% ammonium nitrate with calcium carbonate, dolomite or calcium sulfate, and less than 0.4% combustible organic material; or
- 45 – 70% ammonium nitrate with ammonium sulfate, in combined concentrations > 70%, and less than 0.4% combustible organic material.

Cal-Am is exempt. It contains 80% ammonium nitrate, 20% calcium carbonate, less than 0.4% combustible organic material, and is not capable of detonation on its own.

The UN No. for Potassium Nitrate is **1486**.

For Calcium Nitrate the UN No. is **1454**.

Yara Calcinit, the fertiliser grade of Calcium Nitrate marketed by Incitec Pivot, is a solution grade combination product that is not classified as being a Dangerous Good.

### 4.3 Transport

Dangerous Goods must be transported in accordance with the 7<sup>th</sup> Edition of the Australian Code for the Transport of Dangerous Goods by Road and Rail.

#### Licensing

A Dangerous Goods License is required for the transport of Dangerous Goods in bulk.

For solids, bulk transport occurs if the net contents of the cargo exceed 450 L or 400 kg.

A Dangerous Goods license is not required for the transport of

- Up to 3 000 L of dangerous goods in Intermediate Bulk Containers (IBCs), e.g. three standard 1 000 L bulk bags);
- Packaged fertilisers, i.e. small packs of 25, 40 or 50 kg, in any quantity.

Dangerous Goods driver licensing and training is subject to State Regulations.

#### Placarding.

If one tonne or more of a class 5.1 Oxidizing Agent is carried, irrespective of the pack size, the vehicle must be placarded, showing:

- The Hazchem Code (**1[Z]** for Potassium Nitrate),
- The United Nations Number, and
- The DG Class 5.1 Oxidizing Agent Diamond.

This means that placarding is necessary if the load consists of one pallet of bagged fertiliser or a single tonne bag.

#### EPG

A **Transport Emergency Procedure Guide** (EPG) must be carried at all times when a Dangerous Good is being transported on public roads.

The EPG summarises some of the information in the Safety Data Sheet (SDS) - see Section 6, and contains instructions on what to do in the event of an emergency.

The relevant EPG for Potassium Nitrate in the Australian and New Zealand Standard: SAA/SNZ HB76:2004 is **31**.

#### 4.4 Storage

Class 5.1 Oxidizing Agents such as potassium nitrate must be stored in accordance with **Australian Standard AS 4326 – 2008 (The storage and handling of Oxidizing Agents)**.

Various State and Local Government regulations may also apply. These vary, and are subject to change.

Above certain quantities, stores carrying potassium nitrate must be placarded, showing the Hazchem Code, UN No., and the Dangerous Good Class 5.1 Oxidizing Agent Diamond.

“Outer Warning Placards” are required at all main entry gates and doorways.

Exemptions may apply to rural places, but there is still a “Duty of Care” to ensure workers and visitors are properly protected, and emergency personnel can respond in an appropriate manner in the event of a fire or other mishap.

Storage facilities should be made from materials that do not readily burn, and must be dry and well ventilated. The property should be fenced and secured to prevent unauthorised access. Inspect regularly.

Concrete floors are recommended, but the surface should be kept clean and spillage cleaned up promptly. Ammonium nitrate can react with calcium compounds in the concrete to form calcium nitrate and calcium nitrate aluminate. This can leave the surface pitted and pot-holed, which can endanger the safety of fork-lift drivers.

An epoxy coating can be used to protect concrete in areas that are not subject to heavy traffic.

Asphalt floors are more resistant to corrosion. These should contain no more than 7% bitumen as a binder.

Do not keep vehicles, including fork-lifts, overnight in storage sheds used for Class 5.1 Oxidizing Agents. Equipment should be well maintained and checked regularly for leaks, e.g. of oil or hydraulic fluid. Servicing of equipment, e.g. grease and oil changes, should be done outside the building.

Oxidizing Agents must be kept away from fires and other sources of heat. Keep them away from driers, and do not allow smoking or the use of naked lights in storage areas.

#### 4.5 Primary Producers and Rural Places

Primary producers are not exempt from Dangerous Goods regulations applying to the transport of ammonium nitrate, potassium nitrate or sodium nitrate on public roads.

On farm, primary producers may be exempt from storage provisions provided they comply with the legislative definition of a Rural Place.

As an example, in Queensland, a rural place must meet the following requirements:

- > 5 ha;
- Used by the occupier for agricultural purposes;
- DGs and combustible liquids stored on the property must not be offered for resale.

However, in a practical sense primary producers have to comply with Dangerous Goods legislation, as they are required to reduce the risk associated with such materials, e.g. potassium nitrate. This involves:

- Risk Assessment,
- Worker Training,
- Provision of PPE (personal protective and safety equipment),
- Keeping Safety data Sheets (SDS) on hand,
- Preventing interaction between incompatible goods, and
- Preventing unauthorised access.

## 5. Hazardous Substances

Prilled Potassium Nitrate, Liquifert K Nitrate and Yara Calcinit are classified as Hazardous Substances, according to NOHSC criteria.

## 6. Safety Data Sheets

Safety Data Sheets (SDS) contain information on the product's physical and chemical properties; transport, handling, storage and clean-up procedures; toxicological data and first aid.

It is a legal requirement that SDS be made available for Dangerous Goods and Hazardous Substances.

Prilled Potassium Nitrate and Liquifert K Nitrate are classified as Dangerous Goods.

Prilled Potassium Nitrate, Liquifert K Nitrate and Yara Calcinit are classified as Hazardous Substances.

Incitec Pivot also markets a calcium nitrate solution known as EASY Cal. It too is a Hazardous Substance.

A SDS must be supplied on the first occasion a Dangerous Good or Hazardous Substance is supplied to a new customer; thereafter on any occasion the product is re-supplied after any change has been made to the SDS; and on request.

While it is not a legal requirement to have SDS for products that are neither a Dangerous Good nor a Hazardous Substance, it is Incitec Pivot's policy to have SDS for all products that are offered for sale, and that these are made available on request.

Increasingly, many companies and Government organisations will not buy from companies that cannot supply SDS for their products.

## 7. Security Sensitive Ammonium Nitrate (SSAN) Fertilisers

### 7.1 What is Security Sensitive Ammonium Nitrate?

#### Why has legislation controlling its use been enacted?

Nitrate compounds are used in the preparation of explosives for the mining and construction industries. Some of these compounds are also used as fertilisers.

Because of concerns that fertilisers may be misused by politically motivated terrorists, the Council of Australian Governments (COAG) has determined that any solid fertiliser containing more than 45% ammonium nitrate will be classified as being Security Sensitive.

These products are described in various ways in State legislation, i.e. Security Sensitive Ammonium Nitrate (SSAN), Security Risk Substances, Security Sensitive Substances, Security Sensitive Dangerous Substances and High Consequence Dangerous Goods.

Liquid fertilisers such as EASY N, i.e. Urea Ammonium Nitrate (UAN) Solution, are excluded.

Cal-Am (Calcium Ammonium Nitrate) is the only fertiliser on the Incitec Pivot Product Range that is classified as Security Sensitive. Cal-Am is not classified as a Dangerous Good and can not be detonated on its own. However, it may become explosive when mixed with or contaminated by other materials.

A license is required to manufacture, import, store, sell, transport or use security sensitive fertilisers. Licences will not be granted to persons of security concern, who are not allowed to purchase security sensitive fertilisers, or have responsibility for its custody in storage or transit.

Customers who do not have a licence will not be supplied.

Customers ordering SSAN for the first time will need to provide Incitec Pivot with details of their SSAN licence, which will then be verified with the State authority.

The legislation ensures that only people with a legitimate need, such as farmers, can purchase and use SSAN fertilisers. Home gardeners are not allowed to buy SSAN fertilisers.

SSAN fertilisers are only available on the Australian mainland. They have been banned in Tasmania.

As well as determining who can purchase and use SSAN, the legislation also ensures that SSAN fertilisers are stored, handled and transported safely and securely.

There is no minimum quantity below which the legislation does not apply. All pack sizes used for fertiliser are covered by the legislation.

### 7.2 Who needs to be licensed?

Anyone who is responsible for or is involved in the unsupervised transport, storage, handling or application of SSAN must be licensed.

These people will need to be authorised under licence to have unsupervised access to SSAN and will require a:

- police check, and a
- politically motivated violence (PMV) check.

If businesses arrange their storage and handling procedures so that only one or two people have unsupervised access to SSAN, then only these people will need to undertake the above checking to become 'authorised'.

Other workers under the supervision of these authorised persons will not require checks.

SSAN must not be supplied to anyone, e.g. reseller, primary producer, or transport driver, who is not licensed to receive it.

### 7.3 What is a Security Plan?

SSAN must be kept secure from:

- theft,
- sabotage,
- unauthorised access.

Unexplained losses must be reported.

To obtain a licence to transport or store SSAN, a security plan must be submitted to the regulatory authority for approval. The licence to store may also authorise the purchase and sale of SSAN, or use, depending on the nature of the business, e.g. reseller, primary producer.

A security risk assessment is a necessary prerequisite to developing a security plan. This assessment will describe existing security measures and examine the level and type of security risks to your particular business.

Fertiliser resellers and farmers should consider whether current security arrangements leave the SSAN vulnerable to theft or sabotage, and consider security improvements appropriate to manage the assessed risk.

The Security Plan will provide information to the regulatory authority about how security requirements will be met. It will have three main elements:

- personnel management;
- site security; and
- procedures.

### 7.4 What are the Minimum Security Requirements for Storage of SSAN?

These vary with the location and risk.

As a guide, minimal storage security requirements are:

- The facility must be locked or under constant surveillance.
- There must be procedures for controlling access, including:
  - designating a responsible person to maintain the security plan,
  - training of staff on the security plan procedures,
  - ensuring anyone who has unsupervised access is licensed.
- Keeping stock records, and reporting any unexplained loss, theft, attempted theft or any other security incident to the authorities.

Bulk bags may be stored in the open provided that:

- The storage area is surrounded by a security fence:
  - that meets Australian Standard AS 1725;
  - The chain wire fence must be at least 2.45 metres high, be galvanised or plastic coated, with both selvages twisted and barbed, and capped with three rows of barbed wire at 150 mm spacings.
- Access is controlled.
- The bags are not stored within 3 metres of the fence.
- The bags are sealed so that theft of product is easily detectable.

Customers who intend to store Cal-Am or custom blends containing more than 55% Cal-Am in the open should advise Incitec Pivot of this when ordering the product and request that tamper-proof seals be fitted. This can be done on request.

### **7.5 What are the Minimum Security Requirements for Transport of SSAN?**

The minimum security requirements for transport of SSAN are:

- Designating a responsible person to maintain the security plan. In the case of a company or other entity, training, audits and ongoing maintenance of the plan must be confirmed regularly by the owners and senior officers.
- Procedures for checking and authorising drivers.
- Ensuring that SSAN is secure for the duration of the entire journey, e.g. locked containers or under constant surveillance.
- Ensuring loading or temporarily storage areas are secure.
- Reporting any unexplained loss, theft, attempted theft or any other security incident.

Limits may apply to the amount of SSAN that can be transported on a farmer licence, e.g. five tonne in Queensland.

### **7.6 Which State Departments are Responsible for Licensing?**

Licensing arrangements are administered by the States. While the Departments vary from State to State, the intent of the legislation is the same, so that there is a uniform national approach across the mainland States. Security Sensitive Ammonium Nitrate fertilisers are banned in the State of Tasmania.

The State and Territory agencies administering the licensing system, their contact details and the words used to describe security sensitive fertilisers, are listed in the following table.

Go to the website, and search under the descriptive product name listed.

**QLD: Security Sensitive Ammonium Nitrate (SSAN)**

Explosives Inspectorate  
 Department of Mines and Energy  
 Web: [www.dme.qld.gov.au](http://www.dme.qld.gov.au)  
 Phone: 07 3224 7512  
 1800 657 567  
 Email: [explosives@dme.qld.gov.au](mailto:explosives@dme.qld.gov.au)

**NSW: Security Sensitive Dangerous Substances**

WorkCover NSW  
 Web: [www.workcover.nsw.gov.au](http://www.workcover.nsw.gov.au)  
 Phone: 13 10 50  
 Email [contact@workcover.nsw.gov.au](mailto:contact@workcover.nsw.gov.au)

**ACT: Security Sensitive Substances**

Office of Regulatory Services  
 Dangerous Substances, Gas and Plant  
 Web: [www.ors.act.gov.au](http://www.ors.act.gov.au)  
 Phone: 02 6205 0200  
 02 6207 3000  
 Email: [workcover@act.gov.au](mailto:workcover@act.gov.au)

**VIC: High Consequence Dangerous Goods**

WorkSafe Victoria  
 Web: [www.worksafe.vic.gov.au](http://www.worksafe.vic.gov.au)  
 Phone: 03 9641 1444  
 1800 136 089  
 Email [info@worksafe.vic.gov.au](mailto:info@worksafe.vic.gov.au)

**SA: Security Sensitive Ammonium Nitrate (SSAN)**

SafeWork SA  
 Web: [www.safework.sa.gov.au](http://www.safework.sa.gov.au)  
 Phone: 08 8226 4885  
 1300 365 255  
 Email: [clifford.ray@saugov.sa.gov.au](mailto:clifford.ray@saugov.sa.gov.au)

**WA: Security Risk Substances**

Department of Mines and Petroleum  
 Web: [www.dmp.wa.gov.au](http://www.dmp.wa.gov.au)  
 Phone: 08 9358 8001  
 Email: [rsdclientservices@dmp.wa.gov.au](mailto:rsdclientservices@dmp.wa.gov.au)

**NT: Security Sensitive Substances**

**Security Sensitive Ammonium Nitrate (SSAN)**

NT WorkSafe  
 Web: [www.worksafe.nt.gov.au](http://www.worksafe.nt.gov.au)  
 Phone: 1800 019 115  
 Email: [ntworksafe@nt.gov.au](mailto:ntworksafe@nt.gov.au)

**TAS: Security-sensitive Dangerous Substances**

Workplace Standards Tasmania  
 Web: [www.wst.tas.gov.au](http://www.wst.tas.gov.au)  
 Phone: 1300 366 322 (inside Tasmania)  
 03 6233 7657 (from outside Tasmania)  
 Email: [wstinfo@justice.tas.gov.au](mailto:wstinfo@justice.tas.gov.au)

Note. SSAN fertilisers are banned in Tasmania.

## 8. Security Arrangements for other Nitrate Fertilisers

While enhanced security arrangements have been enacted for ammonium nitrate (which was considered the highest priority), there are other chemicals, biological agents and radiological materials that may be misused.

These chemicals include potassium nitrate (Prilled Potassium Nitrate and Liquifert K Nitrate) and calcium nitrate (Yara Calcinit) fertilisers. Ammonium nitrate based fertilisers containing less than 45% ammonium nitrate that are not classified as SSAN can be added to this list.

While legislative controls have not been enacted for these products, it is important that everyone involved in their sale and distribution is aware that politically motivated terrorists, denied access to SSAN products, may turn to other less effective alternatives. Vigilance is required. We need to do whatever we can to prevent their inappropriate use.

In the interests of Australia's domestic security, potassium nitrate and calcium nitrate should only be sold to farmers. These fertilisers should not be sold to home gardeners or anyone who does not have an account with and is not known to the reseller.

Where terrorism is involved, the quantities may be small, e.g. a few small packs, rather than for full pallet lots or bulk bags.

Agents and Dealers should:

- Know their customers, and only supply bona fide farmers for whom full address and contact details are recorded.
- Establish the credentials of all new customers before supply and ask them to open an account. If they are not known to you, ask for and record photo identification details, e.g. driver's licence. Only supply once you are satisfied that the inquiry is for genuine agricultural use. If you are not sure, you can refuse a sale.
- Maintain records of who has been supplied and the quantities involved. For all transactions, record the date, and number and size of bags.
- Report unexplained loss, theft, attempted theft or any other security incident, either in transit or storage, to the police.
- Be on the watch for cash customers who are seeking to purchase one or two bags of product. Refuse supply. Report suspicious inquiries to the police or on the 24 Hour National Security Hotline (1800 123 400).

The following signs may indicate a suspicious buyer:

- New customer;
- Not from the local area;
- Does not want product delivered;
- Insists on paying cash;
- Will not supply adequate identification;
- Is nervous or impatient;
- Has little knowledge of fertilisers or agriculture, e.g.
  - Vague about the quantity required;
  - Vague about use;
  - Purchasing out of season;
  - Not interested in alternatives.

## 9. Fertiliser Blends

The reactivity of nitrate fertilisers may change when mixed with other products.

Dry solid blends containing ammonium nitrate can decompose when subjected to heat or a fire. Some formulations will continue to decompose when the fire or heat source is extinguished or removed, even when air is excluded. These fertilisers are said to be capable of “self-sustaining decomposition” and are called “cigar burners”. Toxic fumes are given off in the process.

Cal-Am is inherently safer than other ammonium nitrate formulations. The decomposition reactions involving ammonium nitrate are enhanced by acidity and are suppressed under alkaline conditions. Cal-Am contains 20% calcium carbonate (lime).

Incitec Pivot has established Guidelines for the use of Cal-Am and Prilled Potassium Nitrate in blends, covering which other ingredients may be used, and the concentrations at which Cal-Am, Prilled Potassium Nitrate and other ingredients may be used.

These Guidelines are strictly adhered to.

It is Incitec Pivot's policy not to sell any blend that is classified as being a Dangerous Good or is subject to self-sustaining decomposition.

## 10. Cal-Gran Blends

When the State legislation relating to Security Sensitive fertilisers was enacted, Incitec Pivot reformulated its product range so that no Range Blends contained more than 55% Cal-Am (equivalent to 45% ammonium nitrate). A SSAN Licence is not required to purchase and use these blends.

In order to achieve the desired nutrient ratio (N:P:K), many of the blends were bolstered with extra nitrogen (N) in the form of Gran-am (granulated ammonium sulfate). These blends have the prefix **Cal-Gran** in their names, e.g. Cal-Gran Aftergraze and Cal-Gran 140, denoting the use of Cal-Am and Gran-am (granulated ammonium sulfate) in the formulation.

NOTE. Blends containing more than 55% Cal-Am can only be ordered as Custom Blends by SSAN licensed customers.

## 11. Storage and Handling Characteristics, Maintenance of Equipment and Safety Considerations

### 11.1 Critical Relative Humidity

The Critical Relative Humidity (CRH) is the relative humidity (at a given temperature) above which a fertiliser readily absorbs moisture from the atmosphere, and below which it will not absorb atmospheric moisture.

Ammonium nitrate fertilisers, including Cal-Am, have a lower Critical Relative Humidity than many other commonly used nitrogen fertilisers such as urea and Gran-am (granulated ammonium sulfate).

Consequently, ammonium nitrate fertilisers are more hygroscopic, and take up moisture from the atmosphere more readily, than most other fertilisers. While this does not influence their safety, it does have implications on how the products should be handled and stored.

Typically, the Critical Relative Humidity of blends is depressed further than that of the ingredient with the lowest Critical Relative Humidity.

Cal-Am, and blends containing Cal-Am should be ordered as required and used quickly. They should not be stored for any length of time.

Critical Relative Humidity values for various nitrogen fertilisers marketed by Incitec Pivot are shown in the following table.

***Critical Relative Humidity of various Incitec Pivot products.***

Product(s)	%
Potassium Nitrate	90
Urea, Gran-am.	70 - 75
Cal-Am	50 - 60
Cal-Am Blends	40 - 55

### 11.2 Heat Cycling

Ammonium nitrate and blends or compounds containing ammonium nitrate are subject to heat cycling.

If fertilisers containing ammonium nitrate are subjected to diurnal changes during which the temperature exceeds 33° C, phase changes in the crystal structure of the ammonium nitrate will occur. In the evening or night, when the temperature falls, the ammonium nitrate reverts to its original crystal structure. This results in gradual and irreversible breakdown of the fertiliser particles. Eventually the granules will shatter and degrade to dust.

The degradation will be most evident towards the edges of the packs, which have been exposed to more heating.

This occurs in all solid fertilisers containing ammonium nitrate, including Cal-Am, and blends containing Cal-Am.

Fertilisers containing ammonium nitrate should not be stored in the open, placed in sheds so that they are exposed to direct sunlight, or against the walls or rooves of buildings where extreme and fluctuating temperatures are experienced. They should be stored in a cool shaded part of the building. Do not store outside under tarpaulins.

### 11.3 Handling and Storage

Potassium Nitrate, being a Dangerous Good (Class 5.1 Oxidizing Agent) must be transported and stored in accordance with the 7<sup>th</sup> Edition of the Australian Code for the Transport of Dangerous Goods by Road and Rail and Australian Standard AS 4326 – 2008 (The storage and handling of Oxidizing Agents).

While not classified as being Dangerous Goods, Cal-Am and Yara Calcinit can decompose to release oxygen if subject to heat or caught in a fire. This can add to the intensity of the blaze.

All nitrate fertilisers should be stored away from heat and ignition sources, fuel and other combustible materials, sulfur, reducing agents, acids, active metals, plastics, farm chemicals, e.g. insecticides, fungicides and herbicides, and foodstuffs.

If using wooden pallets to store bagged fertiliser, these should be made from hardwood and periodically washed down with large amounts of water to remove all traces of the fertiliser.

### 11.4 Floor Construction

Concrete floors are recommended where stored in bulk, with the floor surface being treated so that it is resistant to attack by an oxidising agent.

Ammonium nitrate can react with calcium compounds in the concrete to form calcium nitrate and calcium nitrate aluminate. This can leave the surface pitted and pot-holed, which can endanger the safety of forklift drivers. At the very least, an epoxy coating should be used to protect concrete in areas that are not subject to heavy traffic.

Asphalt floors are more resistant to corrosion. These should contain no more than 7% bitumen as a binder.

### 11.5 Care of Equipment

All fertilisers are corrosive, but nitrate fertilisers tend to be more so than most.

Following application, machinery should be thoroughly cleaned by pouring sufficient water through it to dissolve any fertiliser particles or residues. Moving parts should be lubricated as recommended by the manufacturer.

Nitrate solutions may be corrosive to some metals and alloys, e.g. phospho-bronze and yellow brass. Stainless steel fittings may be required where concentrated solutions are prepared and used. Rinse all equipment thoroughly after use.

Flush irrigation lines by irrigating for some time after the fertiliser has been applied. Metering devices should be dismantled and thoroughly cleaned.

## 11.6 Maintenance

Nitrate fertilisers are not explosive, but there may be a violent reaction if they are heated while confined.

They become explosive if mixed with carbon (fuel) sources and detonated.

Knowledge of these characteristics helps ensure maintenance work can be done safely.

In machinery, fertiliser dust can come in contact with and mix with oils and lubricants. Fertiliser can also build up in confined spaces, e.g. around shafts and bearings.

Extreme care must be exercised when undertaking hot repair work such as welding, cutting, or straightening of machinery which has been used to handle or apply nitrate fertilisers, particularly when welding on hollow shafts of screw conveyers, augers and applicators. A thorough washing/cleaning of machinery is essential to remove all build up, deposits and caking before undertaking repair. If practical and safe, a vent should be provided as an additional precaution.

Serious accidents (including fatalities) have been recorded where nitrate fertiliser residues have been heated under confinement causing explosion and subsequent rupture of shafts or screws.

## 11.7 HSE (Health, Safety and Environment)

Like other fertilisers, the dust from nitrate fertilisers can irritate the eyes, nasal passages and skin.

If ingested, nitrate fertilisers may cause nitrate poisoning (methaemoglobinemia). After ingestion, nitrate is converted to nitrite. When absorbed into the blood, nitrite combines with and takes the place of oxygen in the red blood cells, interfering with the transport of oxygen throughout the body.

Nitrite reduces oxyhaemoglobin (the oxygen carrier in the red blood cells) to methaemoglobin, which cannot carry oxygen. A lack of oxygen may cause breathing difficulties, cramps, disorientation, heart beat irregularities and a loss of blood pressure. In severe cases, it can be fatal.

Precautionary and first aid measures are discussed in more detail in the individual product SDS.

As with other fertilisers, contamination of waterways should be avoided. Spills should be cleaned up promptly. The loss of nitrogen fertilisers into surface water bodies may result in algal and excessive weed growth.

## 12. Agronomic Advice and Product Use

While access to Potassium Nitrate and Calcium Nitrate by farmers is essentially unchanged, access to security sensitive ammonium nitrate based fertilisers is restricted.

An understanding of the behaviour of nitrogen in soils and commonly used fertiliser products will assist you in helping farmers make informed decisions on fertiliser use.

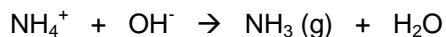
### Plant Uptake of Nitrogen

Plants take up most of their nitrogen from the soil as nitrate, though it can be taken up as ammonium. In the soil, ammonium is converted to nitrate by soil bacteria. This process is mostly complete within a matter of days under warm moist soil conditions. The process is slowed at low soil temperatures.

### Volatilisation

Ammonium nitrogen can be lost to the atmosphere through the volatilisation of ammonia gas when fertilisers that contain or form ammonium are applied to the soil surface without incorporation, e.g. covering harrows, irrigation or rain.

Ammonium ( $\text{NH}_4^+$ ) ions are positively charged and are attracted to and held tightly on the surface of soil colloids (clay and organic matter). If all the adsorption sites within the vicinity of the fertiliser granules are taken or filled by ammonium, or the soil is alkaline (has a high pH), then ammonium ions can be converted to ammonia ( $\text{NH}_3$ ) and lost as a gas to the atmosphere.



Fertiliser that has been applied into the soil, e.g. by cultivation, or is washed into the soil by rain or irrigation is not subject to volatilisation. This exposes the ammonium to a lot more adsorption sites in the soil.

All the nitrogen in urea and ammonium sulfate is subject to volatilisation, and half of that in ammonium nitrate.

### Urea

Urea is the most commonly used nitrogen fertiliser. It offers a number of advantages over ammonium nitrate:

- Urea is more economical, costing less per kg of nitrogen (N);
- It is concentrated (46% N), providing savings in freight, storage and application costs;
- It is not classified as a Dangerous Good, and is therefore not subject to the same storage and transport regulations as ammonium nitrate;
- It is not Security Sensitive. Customers do not have to be licensed to buy it.
- Urea stores better. It has a higher Critical Relative Humidity than ammonium nitrate and is not subject to heat cycling.

## Cal-Am

Ammonium nitrate fertilisers are popular:

- where a quick response to nitrogen is required, e.g. side-dressing short season vegetable crops, and top-dressing pasture and forage crops during winter, when responses to fertilisers supplying all their nitrogen in the ammonium or amide forms may be slower;
- for top-dressing rain-grown crops and pastures where ammonia volatilisation losses may be high, e.g. on alkaline soils, and surface applications over the top of trash blankets in ratoon sugarcane.

Urea is usually preferred where the fertiliser can be applied into the soil or it can be incorporated by rain or irrigation.

Cal-Am is Security Sensitive, and can only be purchased by those licensed to do so.

Cal-Am is only suitable for dry application to the soil. It can not be used in fertiliser solutions as the calcium carbonate it contains is insoluble.

## Cal-Gran

Cal-Gran is a two ingredient blend comprised of Cal-Am and Gran-am, formulated so that it contains less than 45% ammonium nitrate. As such, it is not classified as SSAN. It can be used in place of Cal-Am without a SSAN licence.

Cal-Gran contains 23.9% N, 10.8% S and 4.4% Ca. 16.5% of the N is in the ammonium form, and 7.4% (31% of the total) as nitrate.

## Cal-Am and Cal-Gran Blends

Cal-Am and Cal-Gran NPK Blends are formulated so that they contain no more than 55% Cal-Am. None of these blends is Security Sensitive.

Blends containing more than 55% Cal-Am can only be requested as Custom Blends, and only by customers who are licensed to buy and use them.

## EASY N

EASY N Liquid is Urea Ammonium Nitrate (UAN) Solution. It contains approximately half its nitrogen as urea and half as ammonium nitrate.

EASY N contains 425g/L N or 42.5% N on a weight/volume basis (21.5% w/v as urea, 10.5% w/v as ammonium, and 10.5% w/v as nitrate).

On a weight/weight basis, EASY N contains 320 g/kg N or 32% w/w N.

EASY N can be applied directly to the soil. It is also popular in fertigation programs where it is convenient to apply, avoiding the need to dissolve dry fertilisers in water.

## Prilled Potassium Nitrate Liquifert K Nitrate

Prilled Potassium Nitrate is applied dry to the soil, Liquifert K Nitrate is used in the preparation of fertiliser solutions, for use in fertigation programs and foliar sprays. Both products are classified as being Dangerous Goods.

While potassium nitrate contains nitrogen, it is used as a potassium fertiliser. The other commonly used potassium fertilisers are Muriate of Potash and Sulfate of Potash.

Muriate of Potash (potassium chloride) is the most economical and therefore the most commonly used.

Sulfate of Potash (potassium sulfate) and Potassium Nitrate are used in preference to Muriate of Potash in crops and soils in which the chloride in Muriate of Potash is likely to be detrimental, and in foliar sprays in which chloride will burn the leaves.

Potassium Nitrate is more soluble than Sulfate of Potash, and is preferred to the latter where concentrated potassium solutions are required, e.g. for injection into irrigation lines (fertigation) and low volume foliar sprays.

The solubility of the three potassium fertilisers in water is shown in the following table.

### ***Solubility (kg/100 L) of Potassium Fertilisers in Water at 20<sup>o</sup> C.***

PRODUCT	Solubility (kg/100 L) at 20 <sup>o</sup> C.
Potassium chloride	34
Potassium nitrate	32
Potassium sulfate	11

For low volume foliar sprays in crops such as cotton, there is really only one choice, Potassium Nitrate. Potassium Sulfate isn't soluble enough, while it is recommended that chloride be avoided in foliar sprays to minimise leaf burn.

Potassium nitrate is compatible in solution with calcium fertilisers, e.g. Yara Calcinit, whereas potassium sulfate is not. Calcium sulfate (gypsum) will be precipitated if potassium sulfate and calcium nitrate are added to the same mixing tank.

## Yara Calcinit

Yara Calcinit is a soluble (solution) grade of calcium nitrate. It has two major uses in agriculture:

- as a soluble calcium fertiliser in fertigation programs and in foliar sprays;
- as a non-acidifying nitrogen fertiliser through drip and trickle irrigation systems, and under-tree sprinklers. Straight nitrogen fertilisers such as urea and ammonium nitrate acidify the soil around the emitters. Calcium nitrate does not.

## EASY Cal

EASY Cal is a liquid fertiliser containing calcium nitrate in solution. It contains 12.6% w/w (126 g/L) N and 18.1% w/w (181 g/L) Ca.

On a w/w basis, EASY Cal contains 8.4% or 84 g/kg N and 12% or 120 g/kg Ca.

These Notes are for guidance only. They summarize existing knowledge at the time of their preparation, and are not complete. They are provided as general information only and do not take into account your particular circumstances. Up to date and more detailed information should be sought from the relevant State Authority.

## **Incitec Pivot Fertilisers**

A business of

**Incitec Pivot** Limited

PO Box 1322

Melbourne VIC 3001

Phone 03 8695 4400

[www.incitecpivot.com.au](http://www.incitecpivot.com.au)