



# **The NSW Sugar Industry Best Practice Guidelines for Acid Sulfate Soils**

**March 2005**

## **What is best practice?**

Best practice is the currently recognised farming techniques capable of delivering environmentally and economically sustainable sugar cane production. Best practice in acid sulfate soil management is set out in the ASSMAC Manual and summarised in these guidelines.

Significant areas of NSW canelands contain acid sulfate soils. The intended purpose of this document is to provide guidelines, based on the best available information, for canefarmers with these soils in order that they:

1. minimise the export of acidity from their farms;
2. minimise any downstream environmental impacts caused by acid export; and
3. maximise production from their land
4. comply with the relevant legislative provisions and statutory plans including Local Environment Plans

## **Commitment to Best Practice**

The Sugar Industry is committed to minimising the production and outflow of acid from the acid sulfate soils which occur beneath much of our cane land to protect and improve the soil and water quality on farms and to protect surrounding ecosystems for current and future generations. The industry's objective is to ensure that activities of its members do not contribute to or exacerbate acid sulfate runoff. To this end, the Sugar Industry will adopt current best management practices in its farming operations. All members of the NSW Sugar Milling Co-operative Ltd are signatories to a Memorandum of Agreement that individually confirms this commitment. The Co-operative will refuse to accept or pay for cane from land where the Co-operative concludes that the landholder continues to refuse to comply with best practice.

## **Extent of Application**

These guidelines apply to all the existing cane lands (with Production Area Entitlements – PAE's) of members of the NSW Sugar Milling Co-operative Ltd. The intention is to give effect to clauses in Local Environmental Plans (LEPs) that exempt certain drainage works on sugar cane lands from the development assessment process providing the works are undertaken in accordance with an endorsed drainage management plan consistent with these guidelines.

The guidelines have been prepared by the NSW Sugar Milling Co-operative Ltd and the Acid Sulfate Soil Management Advisory Committee and will be reviewed periodically. They are subject to the approval of the Director General of the Department Of Urban Affairs and Planning and the Council of the Local Government Area to which they apply.

These guidelines do not apply to drainage union drains, new drains and earthworks in areas not subject to a PAE. Any works in these areas will be subject to the full development assessment process as outlined in the relevant Council's LEP.

Exemption for the sugar industry from the development assessment process as outlined in relevant local environment plans pertains to farm areas with an existing PAE and drainage management plan only.

All new PAEs will be assessed and approved by the NSW Sugar Milling Co-operative Ltd using the procedure detailed in Appendix (2). Such PAEs will be subject to the annual audit in the year of their completion

Once the acid hazard is established, a drainage management plan for that PAE can be established in accordance with the NSW Sugar Milling Co-operative Ltd procedures and the exemption will operate subject to compliance with the grower's agreement.

## **Previous ASS Initiatives**

The sugar industry has previously taken initiatives to manage acid sulfate soils including:

- Survey of all cane farms for ASS
- Funding of external research
- Development of ASS management protocols
- Subsidy of intensive soil sampling and analysis of cane lands for pH and nutrient monitoring
- Monitoring of water quality
- Extensive use of lime to improve field pH
- Extensive laser grading and filling of existing open drains
- Opening of floodgates to provide tidal flushing
- Education of farmers and excavator contractors

On-going technical support is also provided for members to manage acid sulfate soils.

The Co-operative will only support expansion onto new land where new acidity will not be produced and existing acidity can be managed according to best practice.

### **What are acid sulfate soils?**

Acid sulfate soils (ASS) contain iron sulfides and their acidic oxidation products. Iron sulfides are found in soils below the watertable, and while under the water do not cause a problem. When the iron sulfides are exposed to air by excavation or lowering of the watertable, they form sulfuric acid that can enter drainage systems and cause severe damage to drain and river ecosystems and reduce agricultural productivity.

### **Where do acid sulfate soils occur?**

Acid sulfate soils occur in low lying areas generally at, or just above, the mean tide level. They are associated with estuarine or marine sediments laid down in the past 6,000 years. Extensive tracts of low-lying coastal land in NSW and Queensland contain acid sulfate soils.

Acid sulfate soils occur below many cane growing areas in NSW. They are closest to the surface and are more likely to cause problems to the environment in low lying backswamp areas than on higher river levees.

The NSW Sugar Industry has identified ASS risks for each farm in the industry through a farm sampling project. This information forms the basis for drain management plans for each farm. Additional sampling will be undertaken at the discretion of the NSW Sugar Industry to improve individual drain management plans.

The NSW Department of Land and Water Conservation (DLWC) has also produced 1:25,000 scale ASS risk maps.

### **What farming activities may cause a problem?**

Any activity that disturbs acid sulfate soil or lowers the water table below the upper level of the sulfidic soil will create an acid sulfate management problem.

Common activities that can disturb acid sulfate soil or can excessively lower the water table on cane farms include:

- 1 constructing drains
- 2 land grading.
- 3 floodgate management activities.
- 4 cleaning drains
- 5 constructing dams and water holes
- 6 stockpiling of spoil

- 7 pump drawdown of water table below the sulfidic layer
- 8 farm access works

In most cases, the problem for best practice with ASS requires land and drain management that maximises the retention of existing acidity under the cane crop and minimises its export from the site.

### **Other disturbances of ASS**

These guidelines apply to all ASS disturbances associated with canefarming such as the maintenance of cane pads and farm tracks. All disturbances of ASS require liming at rates specified in the drain plan..

Construction of farm dams, buildings, stockyards, bridges and other works that disturb ASS but are not directly associated with the production of sugar cane are not covered by these guidelines and may require development consent from Council.

### **Managing Acid Sulfate Soils**

Inappropriate management of Acid sulfate soils may decrease farm productivity. Management procedures are available for ASS. It is important to recognise the constraints that ASS soils pose to agricultural activities and to incorporate their management into the overall management of the farm. An objective of the sugar industry with respect to ASS is to discharge drainage waters at pH 6 or greater.

ASS Management is based on:

- Retaining existing acidity in the landscape
- Minimising the conduits that deliver acidity to waterways
- Minimising the volume of acid drainage
- Avoiding the creation of new acidity
- The use of lime on existing canelands and in freshly disturbed areas
- Control of floodgates

To do this it is necessary to know:

- where the ASS occurs (location and depth)
- the intensity of the acid hazard
- the size, location and number of drains.

The drain management plans produced for each farm contains information on location, depth and intensity of acid hazard and the size, location and number of drains. Growers need to be aware of the topography and surface runoff characteristics of the property and drainage characteristics due to the permeability of the farm soils. Sensible management decisions based on these principles will minimise production and discharge of acid from cane lands.

## **Drainage Management Plans**

All cane farms are required to have a drainage management plan, which must be lodged with and endorsed by the NSW Sugar Milling Co-operative Limited.

These plans provide information on depth, location and nature of acid sulfate soils. They also provide information on the location and dimensions of existing, new or redesigned drains (on existing PAE's) that will provide efficient drainage without creating an acid hazard. They will indicate liming rates for spoil and drain water

They will detail drain maintenance programs on individual properties. They will be reviewed and revised periodically to ensure they remain current.

Any disturbance of soil below 300mm in ASS areas should be consistent with a drainage management plan.

It is important to note that whilst drainage management is the primary tool to manage acid from cane farms there are a number of other farm activities, which may cause acid formation, and discharge, which are to be managed under the requirements of the LEP exemptions.

**Appendix 1 provides a summary of the best practice guidance for drain assessment and maintenance, and floodgate management.**

## **Drain cleaning**

Tidal salt water is the preferred method of drain cleaning though it is acknowledged that this option is not available for all drains.

When conditions are suitable, floodgates should be opened to allow flushing with saline tidal waters within the confines of the drain. Gates should be opened when drains are relatively dry to prevent the discharge of acid water.

Herbicides control of weeds without soil disturbance is the preferred option in ASS. The rate and direction of the spray should be managed to avoid complete destruction of vegetation that may result in collapse of the drain side or erosion of the drain bank. Ensure that herbicides are registered for use in drains.

The extent and means of drain cleaning should be identified in the drain management plan. Drains that have an acid hazard and are mechanically cleaned should be limed so as to neutralise any acidity that might be created by the operation.

Any mechanical clearing should not increase the depth of the drain.

Mechanical weed removal should be by excavators equipped with slotted and raked buckets that minimise soil disturbance.

Mechanical maintenance in ASS areas creates an acid hazard in the freshly exposed sides and base of the drain and in the spoil from the drains. Lime should be applied to neutralise the acidity in both instances. The lime should be applied before or as soon as possible after drain maintenance. The rate will be determined by the degree of hazard indicated in the drainage management plan.

Spoil should be placed so that any drainage will not carry acid into the drain. It should be neutralised by application and incorporation of lime, or it can be spread in fields and neutralised there. A band of lime between the spoil and the drain will provide some protection until spoil can be neutralised or removed.

LIMING RATES ARE SPECIFIED IN EACH FARM'S DRAIN MANAGEMENT PLAN.

### **Redesign of drains on existing PAEs**

The depth and intensity of the acid sulfate layers has been assessed in key areas of each farm and is shown on a drain management plan.

When farm drainage systems are being redesigned new drains or remodelled drains will need to be clearly outlined in the drainage management plan. Construction details and timing are critical. Drain design should be properly engineered and the alignment and depth should be as per the plan.

Any disturbance of acid sulfate soils or lowering of the water table will require an assessment of the hazard produced, and the application of lime to neutralise the acid that may be generated. In some instances, it may not be possible to construct any drains due to the acidity hazard.

### **Land grading**

Appropriate land grading will result in a landform that can prevent excess surface water displacing acidic groundwater into the drainage system.

Land grading has the potential to reduce the export of acid by reducing the number of drains in fields. However, deep cuts may expose larger areas of acid sulfate soils where they occur close to the surface.

Fields in which acid sulfate soils occur within 500mm of the soil surface should not be graded without first assessing and then treating the acid hazard that may be created. In areas where the sulfidic layer is within 500mm of the soil surface Drain Management Plans specify the lime requirement for the cut areas in the laser graded block.

### **Monitoring acid management**

Farmers are required to keep records of land forming (laser grading), earthworks including drain construction and maintenance and any applications of lime to their farms. These records will be available for inspection by sugar industry or local government personnel.

By 30th June each year farmers shall record

1. length of drains that have been modified in the previous 12 months to a shallower design
2. area laser graded in the past 12 months
3. total area limed and amount of lime applied
4. details of drain maintenance during the previous 12 months including:
  - a) location and length of drains cleaned
  - b) date last cleaned
  - c) method of cleaning e.g. weed bucket; laser bucket; herbicides
  - d) amount of lime applied to works
5. observations of any fish kill incidents in the drains during the previous 12 months
6. how any property floodgates have been managed during the previous 12 months including any changes in practices.
7. any other works which potentially result in acid discharge

### **Auditing of the Sugar Cane Industry Performance**

The above farm monitoring records are essential to maintain the self regulation by the Sugar Industry for the management of acid sulfate soils and will enable progress on improving acid sulfate soils and drainage management practices.

Council LEP sugar industry exemption clauses for the management of acid sulfate soils require that an annual review of drainage management plans and works is to be carried out to a standard satisfactory to the Council and to the NSW Sugar Milling Co-operative. Council is to be issued with a copy of the results immediately after it has been carried out. Council may reserve the right to issue a notice relating to any one or more of the works if either of those requirements are not complied with.

To ensure transparency of the process and as a review of the compliance with self regulation ten Production Area Entitlements (PAE's) from each of the three NSW milling areas will be selected by the relevant Council (s) for an audit of acid management practices each year (30 in total). The PAE's will be selected from high, medium and low risk areas.

The Audit Committee will make an assessment of compliance with these best practice guidelines. The audit committee shall as a minimum consist of a member of the NSW Sugar Milling Co-operative with suitable expertise, a representative from the local Council, the regional ASS Extension Officer from NSW Agriculture and the local Extension Officer from BSES Limited.

The results will be sent to each relevant Local Government Area and to the Acid Sulfate Soils Management Advisory Committee (ASSMAC).

## **Breaches of the agreement and audit follow up**

In the event of a breach of these Guidelines and the Agreement being observed during the annual audit the Co-operative must inform the Local Council of the procedures taken in remediating the works. Works carried out without a management plan or not covered by the existing drainage plan will be notified to Council. Actions recommended to redress issues raised by the audit will be detailed as well as the timeframe for compliance.

The circumstances of any breach and actions proposed will be fully reported in the audit report.

In addition to any monitoring by the audit team of actions taken to remediate the breach, the farm involved should be inspected again the following year as part of the annual audit (in addition to the requisite 30 random inspections). Additional audit inspections of farms will be carried out at the discretion of the local Council.

## **Additional information**

Staff of the Co-operative, Bureau of Sugar Experiment Stations (BSES) and Cane Protection & Productivity Boards at each of the three mill sites will provide farmers with further information on request. The contact numbers are:

Condong Mill	(02)	6670 1700
Broadwater Mill	(02)	6620 8256
Harwood Mill	(02)	6640 0400

Information is also available through Government agencies including:

### **NSW Agriculture**

Acid Sulfate Soils Information Officer  
Acid Sulfate Soils Management Advisory Committee  
Wollongbar Agricultural Institute  
Telephone (02) 6626 1344

### **Department of Land & Water Conservation**

Regional Managers at  
Grafton (02) 66402000  
Alstonville (02) 6628 6009  
Murwillumbah (02) 6672 5488

### **Environment Protection Authority**

Grafton (02) 6642 0535

### **NSW Fisheries**

Maclean (02) 6645 2147  
Ballina (02) 6686 2018

## References

Collins, C. (2001). ASS case study. Robert Quirk. NSW Agriculture, WA1.

Collins, C. (2001). ASS case study. Wayne Gollan. NSW Agriculture, WA1

Woodhead, A., Jenkins, A., and Wood, M. (2000). Acid sulfate soils, keys to success. ASSMAC and NSW Agriculture.



# Appendix 1 Drain and Floodgate Maintenance Procedures

(adapted from work by the Clarence River County Council et al,1999)

TEM	RECOMMENDED PROCEDURES	EXPLANATION
<b>Timing of Works</b>	<ul style="list-style-type: none"> <li>Drain cleaning works should not be carried out during runoff events</li> <li>Drain cleaning in the lower estuary should be scheduled for late winter/early spring period</li> </ul>	<ul style="list-style-type: none"> <li>There is a high risk of discharges of acid products and silt when drains are flowing</li> <li>Cooler months (July-September) are when flowering/fruiting cycle of marine plants is least and there is minimal fish migration</li> </ul>
<b>Deepening or Widening Drains</b>	<ul style="list-style-type: none"> <li>Original drain profiles should not be enlarged</li> <li>Where drain design is inadequate, seek an engineering assessment prior to redesign</li> <li>Maintain drains no deeper than the pipe or culvert</li> <li>Dish drains should be installed in laser levelled fields rather than deep drains</li> </ul>	<ul style="list-style-type: none"> <li>Deep drainage lowers groundwater levels and increases the export of acid products</li> <li>Some drains which are in need of redesign may require Development Approval</li> <li>Laser levelling removes the need for the maintenance of deep drainage</li> </ul>
<b>Excavator Operators</b>	<ul style="list-style-type: none"> <li>Operators must be provided with information on acid risk as described in the 'Drain Management Plan' specific to each farm</li> <li>Operators must have received approved training in recognising and handling ASS material</li> <li>Laser guided bucket is a good way to ensure constant depth</li> </ul>	<ul style="list-style-type: none"> <li>Written instruction are an important means of risk management as well as assisting in improving operators' understanding of the issues</li> <li>On-the-ground training is also essential so operators can recognise ASS and understand why particular practices are important.</li> </ul>
<b>Liming Drain</b>	<ul style="list-style-type: none"> <li>Apply required rate of lime to drain spoil and incorporate or apply half the required lime to the drain before use of the weed bucket then apply the remainder as a bed of lime for the spoil to be placed upon.</li> <li>All exposed surfaces (Batters) must be limed to ensure neutral drain water after cleaning</li> <li>Mix the lime into spoil as soon as the material is dry enough to be cultivated</li> <li>Where spoil heaps have not naturally revegetated within a few months, rehabilitation (cultivation, liming, seeding) must be carried out</li> </ul>	<ul style="list-style-type: none"> <li>Liming drains prior to cleaning assists in mixing lime and sludge giving better neutralisation and stabilisation of acid products</li> <li>Intercepts and neutralises acid seepage from drain sides</li> <li>Thorough mixing of lime is required to ensure efficient neutralisation</li> <li>Bare spoil heaps can continue to leach acid products as well as being a source of erodable material</li> <li>If regrowth is not occurring within a "normal" period after seeding, then additional lime should be cultivated into bare areas and subsequently reseeded.</li> </ul>
<b>Shaping Spoil Heaps</b>	<ul style="list-style-type: none"> <li>Where possible, shape spoil heaps to improve farm access during wet weather</li> <li>Do not allow spoil heaps to form levee banks around drains as they impede surface drainage</li> </ul>	<ul style="list-style-type: none"> <li>Using spoil for access to a low paddock is better than over-draining the area</li> </ul>
<b>Handling Iron Monosulfides (Black drain sludge)</b>	<ul style="list-style-type: none"> <li>Spread drain sludge as a thin layer in cultivation paddocks, lime and incorporate into top soil when dry enough at an appropriate rate to neutralise acidity</li> <li>In pasture areas, if black drain sludge is not being spread, ensure that the sludge is placed so as not to be flushed back into drains; bunding and liming may be necessary</li> </ul>	<ul style="list-style-type: none"> <li>Concentrated iron monosulfides in drain sediments need to be handled very carefully as they can begin to oxidise and generate acidic products within minutes of exposure to air</li> <li>Drain sludge is easily washed back into drains</li> </ul>

ITEM	RECOMMENDED PROCEDURES	EXPLANATION
<b>Controlling Discharge of Polluted Water</b>	<ul style="list-style-type: none"> <li>• Clean drains in stages beginning furthest from the floodgates to minimise the risk of sediment transport to the estuary</li> <li>• Install where necessary a temporary weir or silt curtain in drains to contain water/sediment prior to commencing works</li> <li>• Treat drain with lime to raise pH of drain water</li> </ul>	<ul style="list-style-type: none"> <li>• Drain cleaning can disturb toxic sediments (monosulfides) which can impact adversely on the estuary</li> <li>• Reliance on sea water to buffer acid caused by drain cleaning strips the water of carbonate which is deleterious to aquatic life</li> </ul>
<b>Weed Removal</b>	<ul style="list-style-type: none"> <li>• Where practical, salt water flushing should have been practiced prior to chemical or mechanical weed removal</li> <li>• Reed bucket should be used wherever possible in preference to silt bucket</li> <li>• Once removed, plant material and spoil should be placed as far away as practicable from the drain</li> </ul>	<ul style="list-style-type: none"> <li>• Weed control with salt water is less environmentally damaging</li> <li>• Reed bucket removes minimal sediments from drain</li> <li>• Vegetation will release phosphate and nitrogen which is best absorbed in the paddock, rather than running back into the drain to promote further weed growth</li> </ul>
<b>Spraying Aquatic Weeds</b>	<ul style="list-style-type: none"> <li>• Ensure that the proposed use of a pesticide is fully compliant with label directions</li> <li>• Apply herbicides only in dry periods to avoid adverse impacts from both the pesticide and the export of decaying organic material</li> <li>• Timely spot spraying is preferred to blanket spraying of drains</li> <li>• Only spray the bottom of the drains, not the batters</li> </ul>	<ul style="list-style-type: none"> <li>• Pesticide use in aquatic situations is strictly controlled because of the risk of environmental damage</li> <li>• Pesticide use can lead to low dissolved oxygen levels through vegetation rotting in drains</li> <li>• Spot spraying can effectively control invasive water weeds</li> <li>• Erosion of batters is minimised if they are well vegetated</li> </ul>
<b>Salt Water Flushing</b>	<ul style="list-style-type: none"> <li>• Accept minor leakage of floodgates as an alternative method of weed control; Repair minor leaking floodgates only if they are causing damage to agricultural production or are in danger of structural failure. (Note: Repair of long term leaky gates requires NSW Fisheries approval)</li> <li>• Accept partial opening of floodgates as an alternative method of weed control</li> <li>• Investigate whether floodgates could be seasonally opened</li> <li>• Investigate whether floodgate redesign is required (e.g. mini-slucigate, sluicigate)</li> </ul> <p>Note: Introduce salt water gradually to drains to minimise damage;</p>	<ul style="list-style-type: none"> <li>• Leaking floodgates can have environmental benefits by flushing drains thus improving water quality, controlling water weeds, maintaining elevated groundwater and allowing fish passage</li> <li>• Gradual opening avoids fish kills, rapid death of plants and deoxygenation of water and rapid sediment removal by tidal flushing</li> <li>• Gradual opening allows the extent of salt water intrusion to be gauged</li> <li>• Salt damage to crops and pasture can occur from surface inundation and through lateral intrusion in sandy soils and through mole drains</li> <li>• Expert advice will be necessary to assess these risks in some situations</li> </ul>

ITEM	RECOMMENDED PROCEDURES	EXPLANATION
<b>Native Vegetation</b>	<ul style="list-style-type: none"> <li>• DLWC approval is required to trim, lop or destroy any native vegetation on protected lands including slopes over 18 degrees and riverbanks</li> <li>• Place spoil on previously disturbed areas rather than in areas of native vegetation</li> <li>• Where possible examine the use of shade trees along particular weed infested drains as a means of control;</li> <li>• Encourage permanent vegetation on at least one drain batter which may be alternated in different parts of the drain; Where continuous trees cannot be tolerated, encourage isolated trees with grass understorey;</li> <li>• Vegetation and drain clearing to allow for floodgate operation and maintenance in front of floodgates should be limited to a radius no more than the width of the floodgate headworks structure; Additional vegetation clearing should be limited to one side of the drain as it passes into the estuary, by agreement with NSW Fisheries as required</li> </ul>	<ul style="list-style-type: none"> <li>• Vegetation growing on drain banks helps prevent soil erosion</li> <li>• Shade is also important in maintaining high dissolved oxygen levels in drains</li> <li>• Permanent vegetation along drain banks encourages diverse aquatic ecology to establish.</li> <li>• Only one side of drains should be allowed to revegetate with permanent vegetation where machinery access is required for drain clearing</li> </ul>
<b>Aquatic Fauna</b>	<ul style="list-style-type: none"> <li>• Where eels are observed in drain spoil, defer spreading of spoil heaps for 24 hours</li> <li>• Removal of marine vegetation (eg mangroves or seagrass) requires written authority from NSW Fisheries</li> <li>• Encourage permanent aquatic habitat along the edge of major drains, including overhanging trees;</li> </ul>	<ul style="list-style-type: none"> <li>• Drain cleaning can result in substantial number of eels being placed on land. The fate of these eels is not known but it is likely that they will find their way back into the drain if they are in good physical condition</li> <li>• Continuous vegetation provides important sheltered habitat for juvenile migrating fish</li> </ul>
<b>Monitoring results of drain maintenance</b>	<ul style="list-style-type: none"> <li>• Keep a record of the timing of drain works and methods used</li> <li>• Record the outcomes (quarterly/annually as relevant) regarding issues such as regrowth of weeds, water quality and sedimentation issues, flooding related issues, and any aquatic life in the drains</li> <li>• Record any fish kills in the drains</li> <li>• Follow trends in water quality in the drain and record any significant changes</li> </ul>	<ul style="list-style-type: none"> <li>• Keeping a record of what was done and the outcome can lead to improved environmental outcomes and more effective and cheaper methods of drain management.</li> </ul>

## Appendix 2 Assessment of acid hazard on proposed new PAE

The NSW Sugar Milling Co operative in conjunction with Industry research partners has undertaken an industry wide farm sampling program for acid sulfate soils and has developed management plans for all NSW cane farms. These assessment procedures for proposed new PAE's only deal with acid sulfate soils. Other aspects of new land development will need to be dealt with through Council planning regulations.

The first step in a new cane development will be a soil survey along the same principles as the farm sampling project. This will indicate where the acid sulfate soils are, their depths and concentrations. Soil sampling locations will be determined by consulting the grower and soil cores will be sited in the lowest part of the proposed area. The industry will endeavour to have the grower present at the time of sampling to provide an immediate awareness of the presence of ASS on the farm.

Detailed description of the soil profile, field test measurements such as field pH, reaction to hydrogen peroxide and oxidised pH will be recorded and included in the Acid Hazard and Drain Management Plan. If the rapid field test indicates a significant acid hazard selected samples will be retained for a full laboratory analysis. Lime requirements will be calculated using the "look-up " table developed as part of the industry farm sampling program or through the laboratory calculation.

The farm drainage plan will be developed with the knowledge of the acid risk and using the Drainage Guidelines in the ASS Manual. Areas will be avoided where practical management options are not available for controlling acidic runoff. Based on the farm sampling program the farm layout and drainage system will be developed to minimise impacts at the time of farm development.

The NSW Sugar Industry will do this by

- Developing an Acid Hazard and Drain management plan for all new and extensions to existing PAE's
- Avoiding highly acidic areas
- Utilising best practice for drainage design
- Ensuring cane blocks have good drainage by laser land grading
- Establishing drain maintenance procedures in the drain management plan
- Ensuring that the Farm Rating Committee informs new growers in the industry of the need to observe all details of the Drain Management Plan and the obligations of self regulation.
- Only approving new PAE's subject to an investigation of acid risk and the development of a suitable drain management plan
- Regular auditing of the industry performance for acid management practices.