Guidelines for Preventing Mosquito Breeding Sites Associated with Mining Sites

Medical Entomology
Centre for Disease Control
Department of Health and Families
Northern Territory Government
Darwin NT
November 2005
Guidelines for Preventing Mosquito Breeding Sites Associated with Mining Sites

Peter Whelan and Allan Warchot

General Comments

All mining operations need to include a section in an Environmental Management Plan for the monitoring and control of mosquitoes. This is necessary because of the potential of mine sites to provide extensive breeding sites for mosquitoes of pest and disease significance. Mine sites also provide the potential for the introduction of mosquito species and mosquito borne diseases into the NT that are either exotic to the NT or have previously been eliminated.

The monitoring of adult mosquitoes in any new mine should include trapping of adult mosquitoes once a month at a number of sites for the initial 12 months baseline mosquito monitoring program. The baseline mosquito-monitoring program provides an indication of the seasonal distribution of the mosquito species present and the relative potential impact of mosquito borne disease to mine personnel.

The monitoring and control of mosquito larvae should be an ongoing operation for the life of the mine. Mosquito larvae must be controlled with an approved mosquito larvicide (Bacillus thuringiensis var. israelensis or methoprene) as part of an organised monitoring and control program. Any mosquito control program should be discussed with the Medical Entomology Branch of the Department of Health and Community Services with regard to methods and insecticides.

Accommodation for personnel should be sited as far as possible from the most important biting insect breeding sites and be adequately insect screened or otherwise protected to reduce the impact of mosquitoes.

The potential for artificially created mosquito breeding sites can be minimised with the appropriate design of water holding facilities and water management procedures.
1. Water Dams

- All water storage dams should be constructed with relatively steep sides (45° slope minimum) to discourage the establishment of semi-aquatic vegetation (e.g. Typha and Eleocharis reeds) that will provide suitable habitats for mosquito breeding.

- Dam margins should be as straight as possible to minimise the linear area available for the establishment of semi-aquatic vegetation.

- Where possible, any closely grouped dams should be joined together to minimise the linear margin of vegetation.

- The bottom of any dam should be graded as level as possible, with a slight slope to one end to form a deeper section for periods of low water. This will remove the potential for the formation of isolated pools as the water level recedes in the dry season.

- Areas surrounding any dam that will be flooded during the wet season should be graded to enable water to drain freely into the dam as the water level recedes, without the formation of isolated pools that are capable of retaining water for a period greater than 5 days.

- There must be no islands formed within any dam. All areas of impounded water should have a relatively deep (2 m) wet season stabilised water level to prevent the emergence of semi-aquatic vegetation.

- Any drainage line directed into a dam must be fitted with a sediment trap or erosion prevention structures just upstream from the dam. This is necessary to prevent the formation of “alluvial fans” that will promote the establishment of semi-aquatic vegetation in the area of the fan where silt will be progressively deposited.

- Any overflow areas from dams should have erosion protection measures to prevent the creation of plunge pools.

- Local native fish should be introduced or have access into any dams where the water quality is suitable for their survival, to provide natural predators for the control of mosquito larvae.

- The margins of any water dam should be inspected annually for vegetation growth such as semi-aquatic vegetation and grass. Any dense marginal vegetation should be herbicided or physically removed, to prevent the vegetation from creation suitable mosquito breeding sites.
2. Wetland filters

- Wetland filters have the potential to provide prolific breeding sites for mosquito species of pest and disease significance. If no other alternative is available for the treatment and disposal of waste water, a wetland filter should incorporate the ability to annually reduce the build up of any dead vegetation. Plans for wetland filter design and siting should be forwarded to the Department of Health and Community Services (Medical Entomology Branch) at the planning stage to ensure that their potential impact on the health of mine site personnel is minimised.

- Annual maintenance could be achieved by dividing a wetland filter into separate sections. A dual system will enable water to be directed into one section of the filter while vegetation is burnt or otherwise reduced in the other section. An ability to manipulate the water level in the filter to strand or drown vegetation would be beneficial for the management of vegetation and mosquito numbers.

- Stocking the wetland filter with local native fish will provide a significant measure for controlling mosquito larvae. The provision of fish however will not remove the need for annual maintenance of the wetland filter.

- Where appropriate, consideration should be given to the provision of a fish ladder on any overflow facility to enable the dispersal of fish into and upstream of the filter.

- Wetland filters may need to be removed after mining operations are completed to enable the future development of adjacent land.

3. Weirs

- Any spillways must be fitted with erosion prevention structures to prevent scouring and siltation of creek lines during periods of overflow.

- Fish ladders should be constructed where appropriate to enable the upstream dispersal of fish following periods of dam overflow.

4. Mine Waste Dumps

- The final surface of mine waste dumps should be contoured so that the surface area is free draining and has no surface depressions.

- Any runoff from a waste dump should be directed to a silt trap to prevent any siltation of natural creek lines. Siltation in creek lines can promote the formation of isolated pools or disrupt fish ecology and may lead to the subsequent establishment of mosquito breeding sites.

- Mine waste dumps should be located away from natural drainage lines, to prevent the upstream impoundment of natural surface water flows. If impractical to locate
mine waste dumps away from natural drainage lines, diversion drains will be required to direct surface water flows around the waste dump.

5. **Sediment Traps**

- Sediment traps need to be designed where possible to be free draining within a period of 5 days after flooding.

- Sediment traps that can not be free draining within 5 days must be steep sided and have a sloping bottom base to one end, with erosion protection (e.g. reno mattress) at the inflow and overflow facility.

- Sediment traps should be maintained by silt and vegetation removal on an annual basis. There should be a designated and designed access path for silt removal.

- Sediment traps with dry season low flows should be sampled for mosquito larvae monthly in the dry season and appropriate mosquito control programs arranged with the appropriate authority.

6. **Borrow Pits**

- Borrow pits, costeans or scrapes must be rehabilitated, where possible, such that they do not hold water for a period greater than 5 days. These sites within 5km of urban residential areas must be rehabilitated either by filling or rendering them to be free draining.

- Borrow pits that cannot be rehabilitated must be steep sided, have a sloping floor to one end and have surrounding stormwater catchments directed to the upper end, so that they will fill with silt over time.

- There should be no dry season low flows from storm water drainage directed into borrow pits.

7. **Drainage Paths**

- Natural drainage patterns should be maintained where possible. Access roads across drainage lines may need to be fitted with culverts of sufficient size to prevent upstream flooding for periods that will enable mosquito breeding. Culverts should be installed flush with the upstream surface level. Erosion prevention structures will need to be constructed on the downstream side of any culvert, and erosion prevention structures may also be required at the headwalls of any culvert.

- Any disruption to surface drainage should be removed at the end of the mining operations.
8. Pit Dewatering

- Pit water discharge should be free of silt. Dry season pit water discharge should be directed into a water dam, and not into natural drainage lines or creek lines unless there is provision to prevent the growth of semi-aquatic reeds in the discharge area.

9. Waste Water Disposal

- Septic tanks must be installed to DHCS guidelines and should be inspected on an annual basis by the Environmental Officer to ensure that tanks and their effluents do not breed mosquitoes.

- Discharge, overflow or excess effluent from sewage treatment systems must be disposed of in a manner approved by DHCS. A sprinkler disposal system is suitable under most situations. Infiltration systems are acceptable if soil conditions are favourable. The discharge of excess effluent into ephemeral creek lines is not acceptable.

- Sewage ponds should be constructed with steep sides with an impervious lining and be regularly maintained to prevent vegetative growth at the margins (see “The prevention of mosquito breeding in sewage treatment facilities”, available from the Medical Entomology Branch). Surface debris and algal scum should be removed on a regular basis. Monitoring of mosquito larvae should be conducted in sewage ponds on a regular basis and control treatments conducted when necessary.

- Disposal of water into “Application areas” must ensure that water does not pool for a period greater than 5 days.

10. Artificial Containers

- Rainwater tanks must be adequately screened to prevent the entry of mosquitoes.

- Any container capable of holding water, eg. Machinery tyres, drums, disused tyres, tanks, pots, etc. should be stored under cover, be provided with drainage holes, emptied on a weekly basis, treated with an appropriate insecticide on an appropriate schedule, or disposed of in an appropriate dump site to prevent the formation of mosquito breeding sites.

- No used tyres, machinery or other containers that have previously held rain water should be brought to the NT from Queensland unless the containers or machinery has been thoroughly treated with chlorine or an appropriate insecticide to remove the possibility of the introduction of drought resistant eggs of exotic *Aedes* mosquito species.
11. Rubbish and Garbage Dumps

- Rubbish and garbage dumps must be operated in such a matter that there is no ground surface or water filled receptacle pooling of water for a period greater than 5 days, to prevent the formation of mosquito breeding sites.

- Rubbish and garbage dumps must be rehabilitated by filling and surface contouring to ensure they are free draining and have no surface depressions.

12. Decommissioning and Rehabilitation

- A decommissioning and rehabilitation plan should be in place for all mining operations to ensure no actual or potential mosquito breeding sites remain after cessation of mining operations. All disturbed areas should be rehabilitated to be free draining where practical. The proponent should consult the Medical Entomology Branch for input when preparing this document.

- Aspects to consider when decommissioning and rehabilitating a mine site include removing and appropriately grading all sediment ponds, removing all bund walls created for the development, removing infrastructure and artificial receptacles that could pond water, removing water dams and reinstating existing flowpaths where practical, rehabilitating borrow pits, removing wetland filters, sediment traps, and other facilities that could pond water and breed mosquitoes.

- Facilities such as open pit voids and water dams can be left as water holding pits if they are constructed with steep sides (at least 1:2 slope), and stocked with fish during the rehabilitation process.

13. Notes

- These guidelines replace former guidelines ‘Guidelines for preventing mosquito breeding sites associated with mining sites’, by Brian Montgomery and Peter Whelan May 1997.