

# APP204199 [*Diazinon, Fenamiphos, Methamidophos*] (*insecticide*)

## Māori Impact Assessment (MIA)

### for Notified Modified Reassessment Hazardous Substance Application

#### KEY DETAILS

Applicant	<i>Vegetable Research and Innovation Board</i>
Active ingredient(s)	<i>Diazinon, Fenamiphos, Methamidophos</i>
Purpose	<i>Insecticide</i>
End-user	<i>commercial operator, biosecurity operators</i>
Use method	<i>aerial, boom spray, ground spray, handheld spray, spot-spray</i>
Environment	<i>cropland, biosecurity facilities</i>

#### Hazard classifications

- Methamidophos: Acute Oral Toxicity Category 2, Acute Dermal Toxicity Category 2, Acute Inhalation Toxicity Category 2, Skin Corrosion Category 1C, Serious Eye Damage 1, Specific Target Organ toxicity – Repeated Exposure Category 1, Hazardous to the Aquatic Environment Acute Category 1, Hazardous to the Aquatic Environment Chronic Category 2
- Diazinon: Acute Oral Toxicity Category 3, Acute Dermal Toxicity Category 3, Acute Inhalation Toxicity Category 4, Reproductive Toxicity Category 2, Specific Target Organ toxicity – Repeated Exposure Category 1, Hazardous to the Aquatic Environment Acute Category 1, Hazardous to the Aquatic Environment Chronic Category 1
- Fenamiphos: Acute Oral Toxicity Category 2, Acute Dermal Toxicity Category 2, Acute Inhalation Toxicity Category 3, Eye irritation Category 2, Specific Target Organ toxicity – Repeated Exposure Category 1, Hazardous to the Aquatic Environment Acute 1, Hazardous to the Aquatic Environment Chronic Category 1, Hazardous to the Terrestrial environment.

This report is prepared by Kaupapa Kura Taiao under s 58(1)(a) of the Hazardous Substances and New Organisms Act 1996 (“the Act / HSNO”).

## Executive Summary

Kaupapa Kura Taiao (the EPA's Māori Policy and Operations team) has undertaken an assessment to consider potential impacts of Diazinon, Fenamiphos, Methamidophos on the economic, social, and cultural well-being of Māori, and the relationship of Māori with the environment, pursuant to sections 5(b), 6(d) and 8 of the HSNO Act.

Based on information provided for this reassessment application, there is no significant evidence to support an extension to the phase out periods indicated in the original 2013 reassessment process.

### 1. Purpose and scope of this MIA

The purpose of this MIA is to inform the decision maker on the potential impacts on the relationship of Māori and their culture and traditions with their environment and taonga, and any issues that arise under the principles of The Treaty of Waitangi (Te Tiriti o Waitangi) from this reassessment application for Diazinon, Fenamiphos, Methamidophos. The MIA also provides advice to the decision maker on any potential impact on the capacity of Māori to maintain and enhance economic, social and cultural wellbeing.

The MIA is an assessment under s 6(d) and 8 of the Act. Advice is also provided on any implications arising under s 5(b) of the Act. To provide context to the findings in this assessment, a description of the Māori world view and the relationship of Māori with their environment is included as Appendix A.

#### 2013 Reassessment

These three substances were reassessed in 2013 as part of a group of OPCs which had been supported by overseas regulators revoking approvals or restricting the use of many products due to human and environmental concerns. A decision had been made to phase out these three substances by 2023 (Fenamiphos & Methamidophos) and 2028 (Diazinon). Ngā Kaihautū Tikanga Taiao generally supported the initial reassessment process and the recommendation to phase-out 19 of the OPC's, as well as the extended timeframe for diazinon to allow time for finding alternatives.

#### 2021 Reassessment

The current application is made primarily to extend the phase out periods to allow time for alternative products to be developed. There is no change to the risks associated with each substance from the initial reassessment, therefore the information from that process will be used as basis for this MIA report, along with feedback from the current submission process.

The applicant points to a lack of suitable alternatives as one reason for wanting to extend the phasing out, to allow time for development of suitable replacements. However, several submissions make note to some possible alternatives currently available, also recommending a more holistic approach to pest management. It could be useful to find out what progress or attempts have been made on developing more sustainable alternatives in order to determine the scale of options available.

Both Fenamiphos and methamidophos ingredients are approved by Ministry for Primary Industries (MPI) within their Approved Biosecurity Treatments (ABTRT) list, however Diazinon is not permitted under this list. We note MPI supports the phasing out timeframe for Fenamiphos as it is seen as an important biosecurity tool in treating high risk commodities entering the country, and notes research into suitable alternatives is an active area. The use of methamidophos as a biosecurity tool by MPI is less significant given there are more alternative options available for bio-control.

The Kaupapa Kura Taiao team assisted the applicant in this current application by sending information on the application to members of Te Herenga network seeking feedback. An email was sent on 23 December 2020 advising members should send any feedback to the applicant by 12 February 2021. The applicant states that no feedback was received through this engagement process. It is not known what other engagement efforts have been made in addition to this.

The recent submission by Ngāi Tahu HSNO kōmiti makes a statement conveying their disappointment that the applicant did not follow up a request for consultation with Māori (p.g. 8). There is no further detail to this statement and would be worth seeking clarification, given engagement is a very important part of the reassessment process.

## 2. Ngā here ture (Statutory obligations)

Section 5(b) provides that to achieve the purpose of the Act, the decision maker must recognise and provide for the maintenance and enhancement of the capacity of people and communities to provide for their own economic, social, and cultural wellbeing and for the reasonably foreseeable needs of future generations.

Section 6(d) of the Act obliges all persons exercising functions, powers, and duties under the Act, to achieve the purpose of the Act, to take into account the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, valued flora and fauna, and other taonga.

In accordance with section 8, the decision maker is required to take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).

The Treaty principles most relevant to assessing and deciding this application are:

- The principle of active protection of Māori interests.
- The principle of partnership.

## 3. Assessment of impacts on cultural receptors

### 3.1. Impact on Papatūānuku (Land and soils)

Although the use of chemicals is widely used in many general household and commercial purpose products, in general the use of products which have potential to harm people and environment does not align with the concept of kaitiakitanga. As our communities becomes less tolerant to the impacts of toxic chemicals on the environment and climate, there is greater focus towards reducing the use of harmful products and a move toward more sustainable alternatives.

### 3.2. Impact on Ngā otaota (Plants)

Diazinon, Fenamiphos, Methamidophos are not likely to have a significant impact on culturally important species of otaota (plants). The current control requirements assigned to each substance should be sufficient for managing potential adverse effects on these receptors. See section 4 in Appendix A for more information regarding ngā otaota.

### 3.3. Impact on Ngā manu, me ngā ngārara (Birds and reptiles)

This is a particular area of interest for Māori given the potential impacts on New Zealand bird species, highlighted by several reports of bird poisoning. The Fish & Game New Zealand submission

(APP204199) raises concern for the impact of organophosphates on several avian species, including waterfowl. An application of diazinon to a property in 2020 resulted in the death of 202 waterfowl and noted receiving numerous reports of bird deaths following diazinon applications over the years.

Although the control measures currently assigned to these substances should be sufficient for managing potential adverse effects on these receptors, such reported cases show there is still potential for significant impacts to occur. Therefore, this will still be a cause for concern for many Māori which would support phase out of use at the earliest point in time. See section 5 in Appendix A for more information regarding manu and ngārara.

### **3.4. Impact on Te Aitanga Pepeke (Arthropods)**

Diazinon, Fenamiphos, Methamidophos are not likely to have a significant impact on culturally important species of pepeke (arthropods). The current control requirements assigned to each substance should be sufficient for managing potential adverse effects on these receptors. See section 6 in Appendix A for more information regarding Te Aitanga Pepeke.

### **3.5. Impact on Ngā wai koiora (Aquatic habitats)**

Diazinon, Fenamiphos, Methamidophos are not likely to have a significant impact on ngā wai koiora (aquatic habitats). The current control requirements assigned to each substance should be sufficient for managing potential adverse effects on these receptors. See section 7 in Appendix A for more information regarding ngā wai koiora.

### **3.6. Impact on Taha hauora (Human health and well-being)**

This would be a major area of concern for Māori, as there is a direct connection to possible impact to the health & wellbeing of whānau. The research cited by submitters which makes connection of diazinon being a suspected carcinogen will be of particular concern for Māori. Cancer is a major factor in deaths among Māori, often resulting in traumatic experiences for whānau. Particularly in terms of the nature and effects of the illness on individuals and the toll on the collective unit. Where there is potential to minimise or avoid harm and long-term trauma to whānau, all practicable steps should be taken to achieve that. This would include the reduction and /or phase out of harmful products including diazinon, fenamiphos and methamidophos.

MPI notes that Diazinon has low to high risk for operators and negligible to medium risks to bystanders and due to these health risks, it is unlikely these two ingredients would be preferred by MPI in the control of BMSB.

Diazinon is likely to have a significant impact on taha hauora which would be increased by a possible carcinogenic link. The potential impacts that could have on individual health as well as impacts to the wider whānau and whakapapa are significant. Preserving life and protecting whakapapa will be a high priority for Māori and therefore any decisions around the ongoing use of these substances would be of great interest. See section 8 in Appendix A for more information regarding taha hauora.

### **3.7. Impact on kaitiakitanga and manaakitanga (environmental guardianship and due care)**

The use of these three substances can be considered by some to enable the responsibilities of kaitiakitanga and manaakitanga, by providing a tool for supporting their ability to protect native flora & fauna species. Also, through allowing them to provide financially and socially for their whānau aspirations, including hosting manuhiri, providing food and other cultural resources. However, if the

risks are not managed properly these can also have a negative impact on kaitiakitanga and manaakitanga. Particularly if any negative impacts associated with these substances prohibit whānau from accessing or utilising taonga resources for specific purposes e.g., gathering food or rongoa.

The three substances are not likely to have a significant impact on the ability of Māori to exercise kaitiakitanga and manaakitanga (environmental guardianship and due care) if proposed controls are followed. See section 9 in Appendix A for more information regarding kaitiakitanga and manaakitanga, as well as section 2 (Ngā taonga tuku iho / Cultural legacies) for further context.

## 4. Ngā hua (Benefits)

There are many Māori whānau involved or employed in the agricultural and horticultural industries that may be affected by the outcome of this application. Comments from the initial submissions noted that for some Māori the use of certain OPC's was important to the financial stability for their whānau. They supported the continued use, at least until more sustainable alternatives could be found. This view still shows that use is out of necessity rather than preference and therefore shows there is agreement these are not good for the environment overall. The benefits of some substances in the protection of some native species of flora & fauna was also noted as being necessary in some situations to help maintain balance.

Many Māori would appreciate a need in some cases to utilise these substances to achieve particular outcomes, but also understand the importance of balancing the benefits against the potential risks. As a result, it is also very important to apply appropriate control measures to manage risk where possible but phasing out and replacement with more sustainable alternatives would be the ultimately aspiration.

## 5. Analysis of impact

The benefits to Māori associated with this application are unlikely to outweigh any detrimental impacts to Māori, given the known negative impacts of all three substances.

The controls proposed to be assigned to Diazinon, Fenamiphos, Methamidophos should be sufficient for managing impacts on Māori under current permits. However, there are no additional new information to support an extension to the phase out periods.

## 6. Te Tiriti o Waitangi (Treaty of Waitangi)

The Principles of the Treaty of Waitangi have been considered in relation to this application and no concerns arise under the Treaty Principles, as summarised below.

Māori interests are being actively protected in relation to this application.

The decision makers on this application are making a decision informed by a Māori perspective.

The EPA considers it is acting in good faith, and is acting reasonably and fairly, in respect of this application. Mātauranga Māori and tikanga Māori are being respected.

## 7. Kupu whakatepe (Conclusion)

During the original 2013 reassessment process Ngā Kaihautū Tikanga Taiao provided input which supported the phase out recommendations for each of the three substances. That likely recognised a general position to move away from such harmful substances, while allowing time for alternative products to be found. In making its decision across all Organophosphates and carbamates (OPCs) during this process, the panel also aimed to find the right balance between allowing the continued use of OPCs for commercial plant protection purposes whilst ensuring that the most serious effects are appropriately avoided or managed. This would have taken into account appropriate time to explore alternative options. Therefore, in relation to this current proposal to extend the phase out periods for the three products, there hasn't been any further information provided that would change the initial decision made.

Dated: 16 March 2022

# Appendix A

## 1) Ngā here whakapapa (Genealogical obligations)

Māori have a holistic and intergenerational view of the environment based around whakapapa (genealogies) and whanaungatanga (relationships) connecting people and all things in the world, living and non-living, animate and inanimate. Māori cultural beliefs and environmental frameworks use kinship, personification and metaphor to explain the origins of, and interrelationships between, all things. These beliefs and frameworks are maintained and transmitted to successive generations through kōrero o mua (traditional narratives), mātauranga (knowledge systems) and tikanga (customary values and practices).

According to Māori creation traditions, Tāne-mahuta (deity of humans, forests and forest-dwelling species) procreated birds, insects, trees, plants and humans. As progeny of Tāne, all of these organisms share whakapapa (genealogy) with one another and are closely related. Since birds, insects, trees and plants were created before humans, the former have tuākana (senior sibling) status in relation to humans who are teina (junior siblings). This tuākana – teina relationship dictates that careful consideration be given to potential risks and impacts on plants and animals and places a responsibility on people to exercise tiakitanga (guardianship, due care and diligence).

Fish and other aquatic species are descendants of Tangaroa (deity of the sea and water-dwelling species). Many of Tangaroa's descendants live in the domain of Maru (tutelary guardian of fresh water). Again, whakapapa obliges us to ensure that the best interests of these related and interconnected elements are taken care of.

Any use of, or effects on, organisms and natural resources need to be contemplated within this fundamental construct. Compelling justification is required for any detrimental impacts.

## 2) Ngā tikanga tuku iho (Cultural legacies)

Any substance that poses risk to the web of life, and the plants and creatures within it, is an issue for Māori. The importance to Māori of ensuring that valued species flourish cannot be overstated historically or contemporarily. In former times, mahinga kai (food resources), rongoā (medicine) and pūeru (textiles) were critical for sustaining Māori communities and whānau. Wild plants and animals formed a critical part of the food supply. Valued native and introduced species are essential for continuing customary practices and meeting cultural obligations, especially in respect of showing manaaki (hospitality) to guests on the marae, providing whānau with traditional kai, healing people using age-old remedies, and performing rituals in accordance with proper method and material.

Hazardous substances that may potentially harm or adversely interfere with culturally significant receptors are not favoured by Māori. Any level of contamination of cultural receptors by hazardous substances is undesirable – irrespective of the quantity of contaminants coming into contact with the receptors, period of exposure, and the nature, scale and intensity of adverse effects.

Hazardous substances can engender both direct and indirect impacts on Māori interests. Direct impacts are the positive or adverse effects on culturally significant receptors such as taonga species. Indirect impacts are the consequential effects, that is, how such impacts affect the ability of Māori to express their culture, in particular customary practices and usages associated with the affected culturally significant species.

## 3) Papatūānuku (Land and soils)

Hazardous substances have potential to adversely affect soils, minerals and lifeforms in the earth's lithosphere, which is personified in Papatūānuku (earth mother), the wife of Ranginui (sky father), from whom all living things originate. This is concerning to Māori due the potential for directly poisoning or defiling Papatūānuku. Affected lifeforms could include culturally significant earth-dwelling creatures belonging to a realm known as Te Aitanga a Punga (the progeny of Punga) e.g., noke / toke (earthworms), iroiro (nematodes), ngūharu (greasy cutworm), tūtaeruru (grass grub), pihareinga (crickets), and huakita (bacteria).

Papatūānuku is central to Māori creation stories and represents many things to Māori. Whenua (land) and soils (one), which provide a basis for life, are personified in Papatūānuku and are fundamentally important to Māori identity. The inextricable link between Māori and whenua is reflected in the term 'tangata whenua' meaning people of the land. Whenua provides a tūrangawaewae – a place where a person can stand and feel they belong. Whenua also means placenta. Humans are born of Papatūānuku, are sustained by her placenta (the land) and return to her upon death. Similarly, it is Māori tradition following childbirth to return the placenta to Papatūānuku by burying it in a significant place. Māori are concerned to protect these cultural associations in relation to hazardous substances.

Any adverse impacts on soil environments, including potential effects on life forms such as worms and naturally occurring bacteria, would be regarded as culturally undesirable. This is particularly the case in respect of noke / toke (earthworms) which are taonga species. Noke / toke are important to Māori because they:

- Are a source of food for culturally significant species e.g., tarāponga (red billed gull), kōtare (kingfisher) and pūtangitangi (paradise shelduck)
- Are used in traditional fishing methods e.g., toitoi tuna (eel bobbing)
- Are a part of the Māori cosmogeny e.g., stories concerning Māui and the mortality of humans
- Have geographical significance through incorporation into place names e.g., Te Tai Tokerau (Northland)

#### 4) Ngā otaota (Plants)

Māori value plants in a multifaceted way that recognises their tangible and intangible uses as well as historical and contemporary importance. Some plants retain special significance even when their uses change, or they are no longer used but have 'remembered' cultural value. This worldview respects past and evolving relationships between people and plants and connects Māori with their culture and history. There is hardly a facet of classical Māori culture that did not somehow connect with plants.

With respect to Te Marae o Tāne (terrestrial ecosystems), hazardous substances may potentially harm culturally significant plants used for food, medicine, weaving, building materials and other end-uses, for example, pūhā (sow thistle), kawakawa (pepper tree), harakeke (flax), toetoe (toetoe grass), poroporo (kangaroo apple), koromiko (NZ willow), kohukohu (chickweed), kopakopa (NZ plantain) and paewhenua (common dock).

The importance of harakeke to Māori contemporarily and historically in terms of textiles, equipment, art, ornamentation, medicine, symbolic value and other associations cannot be overstated. Pūhā is an iconic Māori vegetable and has a variety of medicinal uses.

The multifaceted value of plants is exemplified in rarauhe (bracken fern). In pre-contact times, rarauhe was the most important wild vegetable – its starchy underground stems and tender young shoots were a staple food. Survival of Māori in Aotearoa depended on rarauhe when cultivated crops of kūmara (sweet potato), taro (arum) and uwhi (yam) failed, so remains respected today.

Rarauhe is tied into bundles for catching kōura / kēwai (freshwater crayfish) and is used to line and insulate crop storage facilities to keep kūmara and other root crops dry. It is also used to treat a range of medical complaints including burns, headache, colds, influenza, diarrhoea, constipation and seasickness. In former times, it was used as a soil binder in the construction of ramparts for defensive fortifications.

Rarauhe is also very symbolic. Along with other fern species it is used as a metaphor for leadership, succession, natural life cycles and intergenerational sustainability. For example, the whakataukī or proverbial saying 'Mate atu he tētēkura, ara mai he tētēkura' (As one fern frond dies another rises to take its place) encompasses these notions. Similarly, the young curled shoots of rarauhe emerging from the ground are sometimes generically referred to as 'pikopiko' (not to confuse with pikopiko the shield fern), a term commonly used as a metaphor for the younger or next generation of people. Such idioms are often used to embellish whaikōrero (speeches) and literature.



## 5) Ngā manu me ngā ngārara (Birds and reptiles)

Manu (birds) have always had a prominent place in Te Ao Māori as a food resource, skins and feathers for clothing and personal ornamentation, environmental and seasonal indicators, spiritual guardians and many other tangible and intangible uses.

Hazardous substances have potential to harm culturally significant manu (birds) that might come into contact with the substance either directly or indirectly. At-risk species may include pīwakawaka (fantail), tauhou (waxeye), pīhoihoi (pipit), kotare (kingfisher), karoro (black-backed gull), tarāpunga (red-billed gull), weka (woodhen), ruru (morepork), kererū (NZ pigeon), tūī (parson bird), korimako (bellbird), pūkeko (swamp hen), pūtangitangi (paradise shelduck), pērera (grey duck) and rakiraki (mallard duck) feeding on foliage, seeds, buds, flowers, insects, spiders and other prey exposed to the substance. The last five listed above are currently game birds, while the kererū was formerly an iconic food species and highly valued for its attractive plumage.

Pīwakawaka have deep symbolic meaning in kōrero o mua (traditional narratives) and Māori lore. Pīwakawaka are associated with death; Māori regard them as a harbinger of death when seen inside a house. According to some traditions it was the fantail that caused Maui's death which resulted in the mortality of humans.

Kererū was the most important food bird for Māori and its feathers were used to beautify cloaks. It was highly valued as a seed distributor and forest regenerator because it was the only bird big enough to swallow and disperse the largest seeds of native species e.g., taraire and karaka trees.

Great orators and singers are compared with the melodious tūī, as in the kīwaha (saying) 'me he korokoro tūī' (just like the throat of a tūī). Tūī are also highly regarded for their ability to mimic the sounds of other creatures and humans.

Māori admire the kōtare for being an alert sharp-sighted sentry. This bird perches motionless, then attacks its prey in a sudden blur. The word kōtare sometimes referred to elevated platforms in pā from which sentries watched out for enemies.

The kawau is a metaphor for imminent action and people who are primed for action or ready to implement a plan. This is evident in the saying 'Kua mārō te kakī o te kawau' (The shag's neck has stiffened), referring to the rigid out-stretched neck of the kawau prior to launching into flight. Its alternative name 'koau' (a word play on 'ko au', literally 'it is me') is used in the proverb 'ko te koau anake e whakahua i tana ingoa, ko au, ko au, ko au' (Only the black shag proclaims its own name, it's me, it's me, it's me) in reference to conceited or egotistic people. Kupe, one of the first explorers of New Zealand, had a pet shag that was said to be the 'eye of the ancestor', a special bird with insights into ancient knowledge.

Māori sometimes kept karoro (black-backed gulls) as pets – they trained them to eat the caterpillars that infested kumara crops. Some birds became tame enough to follow people around, while others had their wings clipped to stop them flying away. Tarāpunga (red-billed gulls) around Lake Rotorua are considered tapu by the Te Arawa people as the shrieking of gull colonies warned them of a pending attack by northern Ngāpuhi marauders led by Hongi Hika in 1823.

Māori associate matuku with nobility and grace. The kōtuku (white heron) in particular has mythical status for Māori because of their rarity and beauty. The epithet 'te kōtuku rerenga tahi' (the white heron of a single flight) is given to distinguished guests who seldom visit and people of rare ability or achievement. While the elegant matuku-moana (white-faced heron) is reasonably abundant, other herons are much less common as befits their status as special beings.

Even though pīhoihoi are small, they were sometimes used as food by Māori in former times. According to Te Ara: The Encyclopedia of New Zealand (2015), Māori warriors sometimes used a tactic known as manu kāwhaki (decoy bird) which mimicked the pīhoihoi's movement whereby they would pretend to retreat and lure the enemy into an ambush.

Pūkeko were admired for their bold scheming and determination. In former times the tenacious and mischievous pūkeko raided gardens for kumara and taro. Stubborn, annoying people are compared to

the bird and said to have 'taringa pākura' or pūkeko ears (pākura is another name for pūkeko) i.e., headstrong people who ignore or don't listen to advice. Pūkeko feature in stories of how the kiwi lost its wings in which all forest birds refuse to come down from the trees to eat the bugs on the ground and save the forest, except the kiwi which was willing to give up its colours and the ability to fly. The pūkeko's excuse was that the forest floor was too damp, and it didn't want to get wet feet, so was punished by having to live in swamps.

Hazardous substances can also pose risks to ngārara (reptiles), in particular moko (lizards) such as moko tāpiri (common gecko) and mokomoko (common skink). Moko are important in kōrero o mua (traditional narratives) and Māori lore. Moko are considered by Māori to be harbingers of bad luck and symbolise death. They are associated with Whiro - the deity of darkness, disease, evil and death. Māori generally feared moko and placed these in burial caves as guardians to watch over the dead.

## 6) Te Aitanga Pepeke (Arthropods)

Hazardous substances have the potential to harm culturally significant arthropods belonging to a domain within Te Marae o Tāne (terrestrial ecosystems) known to Māori as Te Aitanga Pepeke (insect world) and 'Te Tini o Hakuturi' (the multitude of bow-legged ones). These vulnerable species include wētā, rō (stick insects), pūngāwerewere (spiders), kēkerengū (cockroaches), pōpokorua (ants), hiore kakati (earwigs), ngaro iro (blowflies, houseflies), tūpanapana (click beetles), kurikuri (ground beetles), pāpaka nguturoa (weevils), mūmūtawa (ladybirds), mōwhitiwhiti (grasshoppers) and pepe (moths and butterflies).

Te Aitanga Pepeke, including ngarongaro (flies), pāpapa (beetles), pepe (moths and butterflies), pūngāwerewere (spiders) and wakapīhau (centipedes), are culturally significant due to the part they play in Māori cosmogeny and environmental lore. This is evident in kōrero o mua (traditional narratives) involving pepeke which contain lessons or, as Pākehā would have it, the 'moral of a story'. For example, according to kōrero o mua, the insects and birds saw a man named Rātā fell a large tree to make a waka without appropriate ritual or authority to do so. They were angry about this and twice re-erected the tree after he had felled it, resulting in great shame for Rātā. However, upon realising and making good his mistake, Rātā was assisted by the insects and birds to build his waka. This cautionary tale is a reminder that natural resources should be used wisely and with due care and diligence. It also signals that mistakes are acceptable if they are corrected and lessons are learnt from them.

Māori recognise the important role that pepeke play in the web of life as predators, scavengers and as a food source for other creatures. Several culturally significant pepeke are beneficial for humans. These include mūmūtawa (ladybirds), pūngāwerewere (spiders) and ngaro wīwī (hunting wasps) prey on a range of pest insects and mites, while ngaro huruhuru (native bees) and ngaro tamumu (hoverflies) are pollinators.

Additionally, pī rāwaho (introduced bees) including pī honi (honey bees) and pī rorohū (bumble bees) are economically important as pollinators and, in the case of honey bees, producers of honey. A significant number of Māori work with agricultural systems or ecosystems where pollination is essential to the healthy functioning of those systems. Also, an increasing number of apiarists are Māori. It is noted that some substances pose risks to bees and may have the potential to impact on Māori bee keeping activities.

This is important because beekeeping enables natural resources to be harvested without damaging ecosystems or needing to own the resources on which bees forage. It provides a source of employment and income that can support Māori wishing to live in their hau kāinga (traditional home communities) particularly in remote areas.

As indicated by the Māori term 'Te Tini o Hakuturi' (the multitude of bow-legged ones) – the word 'tini' meaning numerous, countless and prolific – the use of hazardous substance in some circumstances is not likely to compromise overall populations of impacted culturally significant arthropods, and locally affected numbers of pepeke can be expected to recover reasonably quickly.

## 7) Ngā wai koiora (Aquatic habitats)

Waterways and wetlands are extremely important to Māori as they provide food, medicine and raw materials for a wide range of uses and were stewarded carefully in former times to ensure they remained productive and sustainable. Aquatic species formed a staple element of Māori diets and these remain highly valued today. Māori developed sophisticated technologies for managing, harvesting and processing the bounty of aquatic systems. They also observe that otaota wai (aquatic plants) and pūkohu wai (algae) are valuable to waterways as they help to purify water by absorbing nutrients, and stabilising sediment from streams and rivers, and stabilising sediment – which is important for maintaining balance within and between Te Marae o Maru (freshwater ecosystems) and Te Marae o Tāne (terrestrial ecosystems). The relationship of Māori with, and dependence on, waterways and the resources within is encapsulated by the saying ‘Ko au te awa, ko te awa ko au’ (I am the river and the river is me).

In respect of Te Marae o Maru, hazardous substances entering waterways may have potential to adversely affect culturally significant ika (fish), mawhiti (crustaceans), kaiwhao (molluscs) and otaota wai (aquatic plants). This includes food species such as tuna (freshwater eels), inanga (whitebait), kōura / kēwai (freshwater crayfish), kākahi (freshwater mussels) and kowhitwhiti (watercress), and prey species that spend all or part of their lifecycle in waterbodies, for example kōuraura (shrimp), pūpū wai māori (water snails), piriwai (mayflies) kapowai (dragonflies), hoehoe (water boatman) and hoe tuarā (backswimmer). The importance of tuna (freshwater eels) to Māori is widely known and extends well beyond being a key traditional food source. Kowhitwhiti (watercress) is an iconic Māori vegetable.

Further in respect of Te Marae o Maru, some hazardous substances may adversely affect kekakeka (duckweed) and other aquatic plants including pūkohu wai (algae), which are a food source for culturally significant species and offer a habitat and protection for small fish and invertebrates in addition to other ecological functions.

## 8) Taha hauora (Human health and well-being)

Hazardous substances may adversely affect taha hauora (human health and well-being), including the dimensions of: *Taha tinana* – physical health and well-being; *Taha hinengaro* – mental and emotional well-being; *Taha wairua* – spiritual health and well-being obtained through the maintenance of a balance with nature and the protection of mauri, and; *Taha whānaunga* – the responsibility to care for and share in the collective, including relationships, co-workers and social cohesion, and be connected to, people and things that foster a sense of belonging, enjoyment, well-being and safety.

Hazardous substance may compromise the ability of people to protect themselves or others where it is used. Ensuring the collective welfare and fostering a sense of well-being and safety amongst all involved is important for maintaining taha hauora.

Māori are interested to know about how hazardous substances may potentially effect vulnerable or disadvantaged groups such as kaumātua (older persons), tamariki (children) in particular ngā kōhungahunga (toddlers), ngā tūroro (the sick and infirm), ngā kūware (the unknowing or innocent), me ngā ūmanga (particular occupations).

Hazardous substances may potentially raise concerns in relation to the following issues:

- Oranga pai me te toiora - quality of life and enjoyment of healthy lifestyles.
- Reduction of mauri (vital essence) and manawaroa (resilience) of individuals.
- Hauātanga - impairment of functions and potential to participate fully at work, home or in society.
- Mate ā ira (genetically linked diseases), or interference with ira tangata (human genes) and ira atua (divine elements) of which human beings are comprised.
- Interference with whakapapa (genealogy) and whanaungatanga (family relationships).
- Mate pukupuku - cancer related conditions.
- Te whānau tamariki - issues concerning fertility, pregnancy, birth and developmental defects.
- Ngā whakakino ki ngā pūnaha ā tinana - adverse effects on body organs and/or systems.

Māori may have higher registration rates than non-Māori for medical conditions associated with particular hazardous substances and may be more likely to be hospitalised than non-Māori for these

afflictions. Furthermore, Māori may be increasingly or highly represented in occupations or activities where they may be potentially exposed to particular hazardous substances. As such, Māori may be disproportionately affected by a hazardous substance as a demographic group.

## 9) Kaitiakitanga and manaakitanga (environmental guardianship and due care)

Kaitiakitanga can be interpreted roughly as the environmental and cultural guardianship exercised by mana whenua enabling protection of resources for the current and future welfare of people and the environment. Kaitiakitanga seeks to maintain balance and harmony within the environment from a perspective of intergenerational sustainability. Manaakitanga is about valuing people, acting with goodwill and beneficial purpose, showing respect, caring for and protecting the well-being of people and the environment. Manaakitanga extends to physical, spiritual, social and economic well-being – which can manifest in dimensions of taha hauora (human health).

Keeping people safe and minimising environmental impacts is consistent with the practice of kaitiakitanga and manaakitanga. Protecting the economic well-being, social well-being and lifestyles of those who may potentially be affected by a hazardous substance aligns with the practice of manaakitanga.