SWAN CANNING RESEARCH AND INNOVATION PROGRAM

Optimising the development and use of persuasive communication to influence behaviour in the Swan-Canning river system

FINAL REPORT

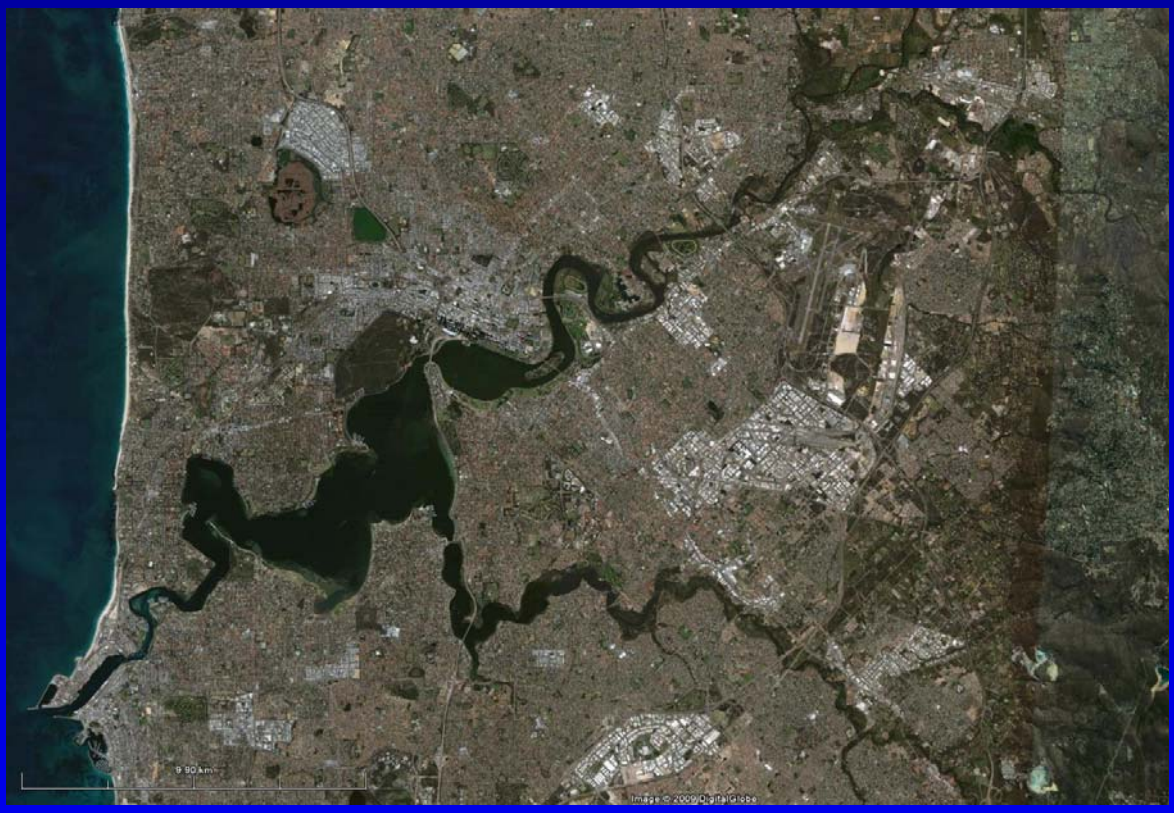

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Table of Contents

List of Tables

List of Figures

Executive Summary

Background

Natural resource managers are regularly faced with the challenge of trying to influence people to behave in certain ways in order to meet certain conservation objectives. While approaches such as regulations and law enforcement can be quite successful, they are not always the most desirable, effective and efficient means of influencing behaviour. For this reason, managers are supplementing more restrictive and authoritative approaches with less intrusive behavioural influence tools that aim to influence people's decision-making processes.

A persuasive communication intervention informed by the social sciences is one such tool. Instead of relying on intuition or other arbitrary sources of information, persuasive communication relies on theoretical frameworks grounded in social psychology to identify and understand the underlying reasons why people decide to do certain behaviours. Understanding these reasons means it is more likely that a persuasive communication intervention will be successful in bringing about a desired behaviour change. However, natural resource managers often have a lack of exposure to these theoretical frameworks for analysing behaviour, making decisions with respect to communication efforts more challenging.

Project Objectives

This project aimed to apply behaviour change principles from the social sciences to designed an intervention to influence human behaviour impacting on the health of the river system based on the following :

1. Collaborate with a range of local stakeholders to identify the most problematic behaviours associated with the Swan-Canning river system and produce a reliable classification system of these behaviours as a guide to conducting targeted behaviour modification research.
2. Select one target behaviour and user group, and based on behaviour change principles from the social sciences, undertake a trial that identifies and measures the beliefs that underpin that behaviour.
3. Develop an intervention based on these beliefs and experimentally evaluate its effectiveness at influencing the behaviour.

Method

The project involved four phases of research based on Ajzen's (1991) theory of planned behaviour, These were as follows:

1. **Problem identification workshop** held with key stakeholders to identify the range of priority problems impacting on a place of interest. From this workshop, a target behaviour and population was chosen for the project.
2. **Belief elicitation** survey of the target user group to identify a pool of key beliefs underlying their decisions to purchase or not purchase environmentally sensitive fertiliser.
3. **Belief measurement,** a fixed-item questionnaire measured the relative strength and importance of the key beliefs. This identifies beliefs that discriminate between customers who bought environmentally sensitive fertiliser and those who did not.
4. **Intervention and evaluation** experimentally applies the findings from the previous phases with the aim of influencing the behaviour of the target group through addressing the key beliefs identified in the previous phases.

Findings

Problem Identification Workshop

- Included a range of experts, primarily from the Swan River Trust as well as other organisations.
- A range of problems, behaviours and target groups were identified
- The most pressing problem was considered to be excess nutrients entering ground and surface waterways from home gardens
- Further discussion with the group identified the specific behaviour and target group of customers purchasing environmentally sensitive fertiliser at Canning's Trademart.

Belief Elicitation

The primary beliefs associated with purchasing environmentally sensitive fertiliser included:

- The lack of ability to easily identify and purchase environmentally sensitive fertiliser in the store
- Awareness of the link between fertilizer use and health of river systems; ground water, people and animals
- The possibility that environmentally sensitive fertilizer may not work as well; and
- Lack of peer group pressure relating to fertiliser purchasing behaviour.

Belief measurement

- customers generally held favourable attitudes towards purchasing environmentally sensitive fertiliser
- Customers did not have strong intentions either way regarding purchase of environmentally sensitive fertiliser on arrival at the store
- the key beliefs influencing purchasing behaviour related to an inability to easily find environmentally sensitive fertilisers in-store amongst the other products, combined with a lack of information, hindering the behaviour.

Intervention and evaluation

- Focused on making environmentally sensitive fertiliser products easier to find at Canning's Trademart, as well as providing more information to customers.
- Customers exposed to the intervention believed that they had greater control over purchasing these products compared to customers who were not exposed to the intervention.
- There was a 37% increase in purchased fertiliser products that *respondents believed* were environmentally sensitive
- Many of these purchased fertilisers, such as manure and other products promoted as "organic," contribute to the high nutrient loads entering the Swan-Canning river system from domestic gardens
- This reinforced a debate occurring throughout the project about what an environmentally sensitive fertiliser is. as there was a disparity in the views within the group of experts and between experts and customers at Canning's Trademart.

Implications

Education seems to have successfully disseminated the 'right information' as customers generally had an awareness of the impacts of fertilisers on ground water and rivers. However, more education may not adequately influence fertiliser purchasing behaviour.

The main determinant to buying environmentally sensitive fertiliser was the customer's sense of ability to identify such products easily in the store. This suggests the need for actions to make it physically easier for people to buy environmentally sensitive fertiliser products while in the store.

There is confusion in the community about what exactly an environmentally sensitive fertiliser is. This includes the misconception that products labelled "natural" or "organic" (such as manure) are environmentally sensitive. If this confusion remains, people wanting to do the right thing may continue to purchase products that are not environmentally sensitive.

Introduction

The Swan-Canning river system is an integral and valued natural resource of the Perth city region and the state of Western Australia. Made up of a network of rivers, watercourses and tidally affected waterways on the coastal plain around Perth, the system possesses a range of economic, social, environmental, recreational and historical values that have contributed to its status as an iconic natural feature of the state (Swan River Trust, 2005a; Western Australian Planning Commission, 2006). However, underlying its aesthetic appeal, the system is under stress from a variety of sources. These include excess nutrients and other contaminants entering the system from backyards, drains and industrial and rural lands; erosion and sedimentation that has been accentuated by the loss of foreshore vegetation; climate change impacts resulting in variability in the system's water flow regime; and a growing population with demands for increased urban development and greater opportunities for water-based recreational pursuits such as fishing and boating (Swan River Trust, 2008).

In 1989, the Swan River Trust was established with the mission to "work with local, State and Commonwealth governments and the community to protect the Swan and Canning rivers and associated land to ensure ecological health and community benefits are enhanced" (Swan River Trust, 2008, p. 4). To achieve this, the Swan River Trust has a range of action areas designed to enhance water quality. These include addressing sources of nutrients and contaminants, setting water quality targets, improving land use planning and development processes, achieving behaviour change through community involvement, applying intervention techniques, and monitoring and reporting on river health.

In order to ensure effective planning and management, the Swan River Trust provides research funding through the *Swan Canning Research and Innovation Program* (SCRIP). The program aims to support collaborative research between the Trust, universities and other research organisations to enable the development and application of innovative solutions to environmental challenges in the Swan-Canning river system. For the 2007-08 financial year, SCRIP priority research areas included:

- Fish and aquatic fauna
- Aquatic flora
- Catchment and estuary issues
- Climate change
- Decision support systems
- Community behaviour change

In 2008, researchers from Curtin University and Monash University submitted a proposal addressing the SCRIP priority area of "community behaviour change." The proposal focused on the use of behaviour change principles from the social sciences with the aim of influencing human behaviour impacting on the health of the Swan-Canning river system. This approach was based on methods and theoretical frameworks the researchers developed and applied in a previous project for the Sustainable Tourism Cooperative Research Centre (Ham, et al., 2009; Ham, Weiler, et al., 2007). To achieve its aim, the project adopted the following objectives:

1. Collaborate with a range of local stakeholders to identify the most problematic behaviours associated with the Swan-Canning river system and produce a reliable classification system of these behaviours as a guide to conducting targeted behaviour modification research.
2. Select one target behaviour and user group, and based on behaviour change principles from the social sciences, undertake a trial that identifies and measures the beliefs that underpin that behaviour.
3. Develop an intervention based on these beliefs and experimentally evaluate its effectiveness at influencing the behaviour.

The project was granted SCRIP funding based on its potential to enhance the understanding of human behaviour and inform further efforts to employ the social sciences to influence behaviour and improve the health and water quality of the Swan-Canning river system.

This report details the findings of this project. After describing the underlying theory and methods, the report details four phases of research undertaken to evaluate the effectiveness of an intervention based on behaviour change principles from the social sciences. The report concludes with a discussion of the implications of the study in terms of the value of applying the social sciences to inform interventions designed to influence behaviour and assist with improving the water quality of the Swan-Canning river system.

Theory and Methods

Background

Managers of natural resources such as national parks, coastal zones, water catchments and other areas of high intrinsic natural value are regularly faced with the challenge of trying to influence people to behave in certain ways. For example, encouraging national park visitors to stay on a walking track or pick up rubbish during their visit, or encouraging boat owners to travel at no-wake speeds to reduce erosion events along river embankments. Although managers have a range of behavioural influence tools that can be used to address such issues, some of these tools are inappropriate for certain types of behaviour, while others may be incompatible with the settings where the behaviour occurs.

Tools of behavioural influence can generally be classified into two categories; direct approaches and indirect approaches. Direct approaches aim to regulate or control behaviour through measures such as legislation, law enforcement, site hardening, barriers and other forms of activity restraint. They are often viewed as authoritive measures, where consumers, visitors, manufacturers and the general public have little choice but to engage in the prescribed behaviour. In the context of water catchment management, such measures may include government policies prohibiting the manufacture and sale of products containing certain chemicals and establishing buffer zones around particular water resources. Such measures can be used quite successfully. However, they may not always be the most desirable way of influencing behaviour given that they often seek to control behaviour through what can sometimes be viewed as intrusive measures. This can raise problems in relation to political acceptability, community support, social justice, costly enforcement and mitigation measures, and unpopular impacts on people's everyday lives and experiences.

It is for these reasons that natural resource managers often supplement direct management programs with less intrusive indirect measures. These aim to influence people's decision-making processes based on voluntary compliance, thereby allowing greater volitional control over their own behaviour. Typical examples of such indirect measures include incentives, rewards and persuasive communication strategies. The intent of these measures is to provide a particular target audience with the cognitive foundations to engage in a target behaviour. According to a number of authors investigating the merits of using direct and indirect

measures in outdoor recreational settings (e.g., Beeton, Weiler, & Ham, 2005; Cullinane, 1997; Holding & Kreutner, 1998; Manning, 2003; Marion & Reid, 2007; McCool & Christensen, 1996; Steiner & Bristow, 2000; Vander Stoep & Roggenbuck, 1996), volitional control is a key advantage of persuasive communication and other forms of soft or indirect management, as allowing people greater experiential freedom is more compatible with the notion of leisure typically associated with outdoor settings. Furthermore, persuasive communication can provide political and public relations advantages in terms of paving the way for the later introduction of more restrictive measures by initially raising awareness and acceptance that a problem needs to be addressed (Jones & Sloman, 2002). In contrast to other forms of behavioural influence, persuasive communication can also be a more effective long-term and wide-scale approach to achieving behavioural influence, as the messages used to provide individuals with a new or different set of beliefs about the target behaviour may later foster similar behavioural outcomes in other timeframes and contexts.

The value of using communication as a behavioural influence strategy in the context of the Swan-Canning river system has been recognised in policies and plans such as the Swan Canning Cleanup Program (SCCP) Action Plan. Launched in 1999, the plan represented a large-scale, multi-disciplinary program designed to tackle the increasing incidence of algal blooms caused by excessive nutrients entering the Swan and Canning rivers (Swan River Trust, 2005a). One of the plan's action areas involves supporting integrated catchment management to reduce nutrient inputs, and using education to raise community awareness regarding catchment and river management issues. Indeed, an evaluation of the action plan released in 2005 states that, "the overall success of the SCCP Action Plan will ultimately depend on changes in people's attitudes and behaviour: this is why the Action Plan has a strong emphasis on the involvement and education of the community" (Swan River Trust, 2005b, p. 173).

However, as part of this evaluation of the SCCP, a review was undertaken of the education and communication components of the plan. The review highlighted the absence of any preliminary research with target audiences concerning the "barriers and benefits" related to performing certain desired behaviours. This is an essential first step in developing an effective communication campaign. In the absence of such formative research, program and message designers often intuit what to communicate to the target audience and mistakenly rely on the

assumption that changes in awareness and attitudes will lead to changes in behaviour (McKenzie-Mohr & Smith, 1999).

Such comments are certainly not unique to the communication and education efforts associated with the Swan-Canning river system. Similar concerns have been voiced in the development and evaluation of communication efforts concerning other waterways (e.g., Fogarty, Huston, Maskin, Van Belleghem, & Vang, 2007; Howard & McGregor, 2002) and in tourism, national park and other recreational settings (e.g., Ballantyne & Hughes, 2006; Beeton, et al., 2005; Ham & Krumpe, 1996). Such communication efforts often underestimate the complexity of human behaviour. This is why theoretical frameworks grounded in social psychology are becoming an increasingly valuable tool for understanding and influencing behaviour. These theoretical frameworks can assist in objectively identifying the underlying determinants of people's decision-making processes that can then be targeted in a persuasive communication intervention. However, one of the challenges commonly faced by natural resource managers is a lack of exposure to these approaches for analysing behaviour and making decisions with respect to communication efforts.

Applying the Social Sciences to Understand and Influence Behaviour

Designing a persuasive communication intervention requires an understanding of the underlying determinants affecting the target audience's decision-making processes. The more that is understood about these determinants, the more likely that an effective communication intervention can be developed. Instead of relying on intuition or other arbitrary sources of information, theoretical frameworks from the social sciences provide a means of identifying these underlying determinants and for designing and evaluating communication interventions aimed at influencing behaviour. As Marion and Reid (2007) concluded in their review of the efficacy of educational programs in US national parks, an improved theoretical basis for communication efforts is important for developing message content that is more effective and persuasive on behaviour. While intuition or hunches may at times be accurate, Vander Stoep and Roggenbuck (1996) point out that:

> … a danger exists because hunches evolve from personal experiences, value structures, and views of the world. Social science allows us to step back from personal assumptions and world

> views to observe how other people act, react, and interact with each other and their environment. (p. 87)

One of the most influential and widely applied theoretical frameworks of human behaviour is Ajzen's (1991) theory of planned behaviour (TPB), which attempts to capture the complexity of human behaviour within a parsimonious framework of variables and constructs (see Figure 1). According to the theory, the primary determinants of any behaviour are the following three categories of beliefs, which are shown on the left-hand side of the model:

1. *Behavioural beliefs:* A person's sense of how likely certain outcomes will result from engaging in the behaviour and his/her positive or negative judgement about each outcome. Taken together, a person's salient ("top of mind") behavioural beliefs give rise to their *attitude* towards the behaviour (whether it is a good or bad thing to do).

2. *Normative beliefs:* A person's sense of the opinions of important social referents (e.g., partners, friends, specific organisations) about the behaviour and how much he/she is motivated to comply with these opinions. Taken together, a person's salient normative beliefs give rise to a sense of social pressure (referred to in the model as *subjective* norm).

3. *Control beliefs:* a person's sense about the presence of situational or internal factors that make the behaviour easy or difficult to do, and how much each factor facilitates or inhibits the performance of the behaviour. Taken together, a person's salient control beliefs determine how much control over the behaviour he/she feels (referred to in the model as *perceived behavioural control*).

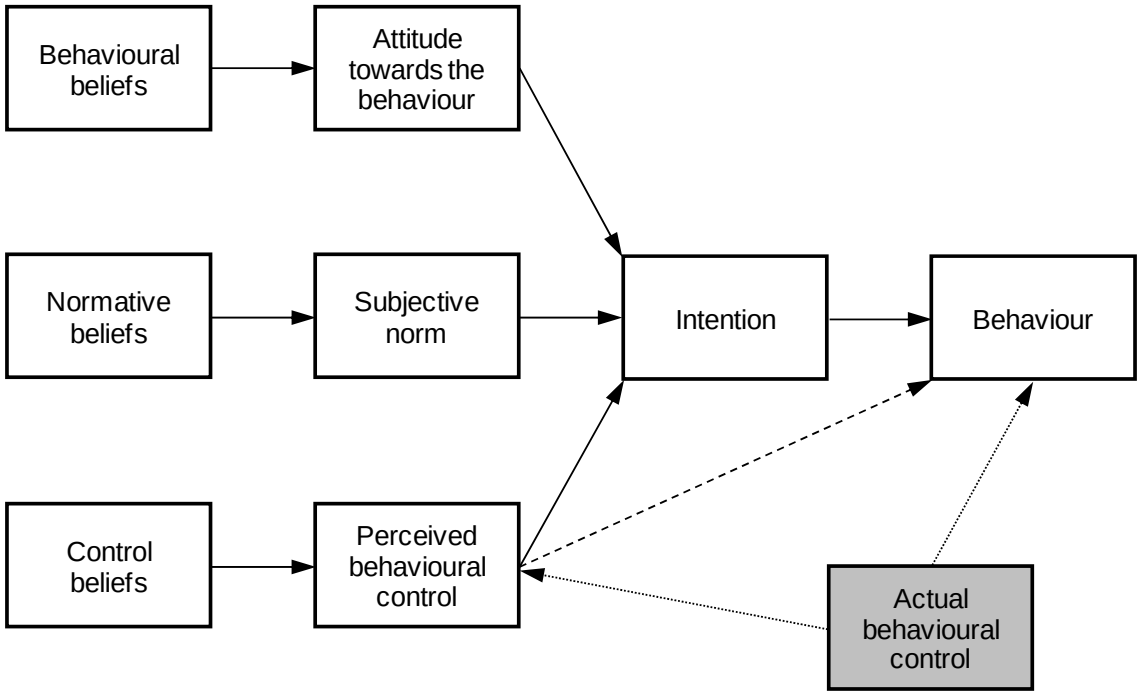

Figure 1: The Theory of Planned Behaviour (TPB)

On the right-hand side of the model are *behavioural intention* and *behaviour*. As the diagram shows, the combination of a person's attitude toward the behaviour, his/her sense of social pressure to perform the behaviour (subjective norm), and whether the person feels a sufficient level of control over performing the behaviour (perceived behavioural control) will lead to an intention to perform it. As a general rule, the more favourable the attitude and subjective norm, and the greater perceived behavioural control, the stronger the person's intention should be to perform the behaviour. Finally, given a sufficient degree of actual control over the behaviour, a person is expected to carry out their intentions when the opportunity arises to engage in the behaviour. Intention is therefore assumed to be the immediate precursor of behaviour. However, because many behaviours pose difficulties in their execution that may limit volitional control, it is useful to consider perceived behavioural control (PBC) in addition to intentions as the immediate antecedents of behaviour. To the extent that people are realistic in their judgments of a behaviour's difficulty, a measure of PBC can serve as a proxy for actual control (Ajzen, 2008).

As a general theory of human behaviour, the TPB has received considerable attention in the literature. This typically involves three broad areas of research. First, a large number of studies have focused on *testing* the predictive utility of the TPB across a variety of behaviours and populations to examine whether it is truly a general theory of human behaviour. Some of the contexts for such studies involve health, medicine, nutrition, safe sexual practices, occupational safety, environmental restoration, transportation choice, energy use, household recycling, consumer purchasing, voting, jury decision making etc. Such studies have typically provided strong support for the predictive utility of the model (Ajzen, 1991; Ajzen & Fishbein, 2005; Albarracin, Johnson, Fishbein, & Muellerleile, 2001; Armitage & Conner, 2001; Hagger, Chatzisarantis, & Biddle, 2002; Hausenblas, Carron, & Mack, 1997; Sheeran & Orbell, 1998; Sheeran & Taylor, 1999; Sutton, 1998).

The second type of study involves researchers *extending* the TPB with additional constructs in an attempt to improve its predictive utility. Examples of such constructs include "personal norm" (an individual's internalise moral values concerning whether performing the behaviour is the "right thing to do"), "self-identity" (which captures the influence of the wider social context on individuals by linking a particular behaviour to some identifiable social characteristic or category of person) and "habit" (the influence of past behaviour on the decision-making processes of future behaviour). Reviews of some of these extensions can be found in Ajzen (1991), Bamberg, Ajzen, and Schmidt (2003), and Conner and Armitage (1998).

The final and most recent type of study, which is also of greatest relevance to this report, involves *applications* of the TPB to inform and evaluate behavioural change interventions. Such studies assume that the TPB depicts a causal process. In the context of a persuasive communication intervention based on the TPB, Fishbein and Ajzen (2005) explain that the intervention must contain messages that target "behavioural, normative, and/or control beliefs in an effort to produce positive intentions among participants who, prior to the intervention, either did not contemplate performing the behaviour or were disinclined to do so" (p. 28). Examples of such studies have involved using the TPB as a behaviour change framework to develop interventions to increase physical activity participation (Chatzisarantis & Hagger, 2005), reduce speeding among car drivers (Stead, Tagg, MacKintosh, & Eadie, 2005), encourage school-age cyclists to use helmets (Quine, Rutter, & Arnold, 2001), deter people

from bird feeding (Ballantyne & Hughes, 2006), reduce fat intake among a population of hospital workers (Armitage & Conner, 2002), as well as a host of national park behaviours such as staying on designated walking tracks (Beeton, et al., 2005), proper food storage (Lackey & Ham, 2003), using alternative transportation systems (Curtis, 2008), discouraging visitors from climbing Uluru (Brown, 1999), and picking up litter (Ham, Weiler, et al., 2007).

With such examples of academic endeavour and industry applications, the TPB was chosen as an appropriate theoretical framework to address this project's aim of using the social sciences to develop an intervention to influence a behaviour associated with the health of the Swan-Canning river system.

Overview of Methods

The process for developing and evaluating an intervention based on the TPB has been well documented by a number of authors (e.g., Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975; Fishbein & Manfredo, 1992; Fishbein & Yzer, 2003; Ham, Brown, et al., 2007; Ham & Weiler, 2005; Sutton, 2002; van den Putte & Dhondt, 2005). The first phase involves carefully defining the target behaviour and population. This is typically done through a problem identification workshop with key stakeholders to collect their opinions about the most pressing problems. Through this process, a rank-ordering of priority problems emerges, resulting in the selection of a target behaviour and population.

Phase 2 involves collecting data in the field from a sample of the target population to identify a pool of beliefs related to the target behaviour. Using a semi-structured interview procedure based on TPB principles, the underlying rationale for this belief elicitation phase is that the more that is understood about the factors underlying people's decision to engage in a desired behaviour, the more likely that an effective communication intervention can be designed to influence the behaviour. Such procedures remove any notion of "guesswork" related to the target audience's beliefs. If researchers identify beliefs that are not, in fact, salient to the behaviour they want to promote, then their messages will target erroneous beliefs and will have little persuasive influence.

Phase 3 is a belief measurement phase that involves measuring the strength and importance of the most frequently mentioned salient beliefs through a fixed-item questionnaire. The

"strength" and "importance" of each belief are measured using numerical ratings to produce a belief score. This instrument is administered in the field to a second sample of the target population. Analysis of the Phase 3 data typically involves statistical comparisons of belief scores between performers and non-performers of the target behaviour. The beliefs that appear most different between the two groups, and which seem most amenable to persuasive influence, are selected to be targeted in an intervention.

Finally, Phase 4 involves experimentally testing the effectiveness of persuasive message treatments that target this subset of amenable beliefs. Measures from the TPB are used to determine to what extent the beliefs targeted by the treatments are replaced, altered or maintained, in conjunction with evidence of actual behaviour change.

Phase 1: Problem Identification Workshop

Background

The first phase in any behavioural influence project involves identifying one or more problem behaviours that managers want to address with an intervention. However, in the context of using persuasive communication as the desired intervention strategy, not all behaviours are equal in terms of being amendable to persuasion. Specifically, only behaviours that are "unskilled" (i.e., inappropriate behaviours that occur when people know what they should do but lack the skills to do so) or "uninformed" or "misguided" (i.e., behaviours that result from people not having sufficient information to perform a particular behaviour) have the potential to be addressed through persuasive communication, as these are a consequence of people's own lack of knowledge or insufficient skill levels. In this context, a persuasive communication intervention will endeavour to provide people with a cognitive foundation and/or skill set to engage in appropriate behaviour. In contrast, "unavoidable" behaviours that occur regardless of people's prior knowledge and experience (e.g., trampling of ground cover vegetation at campsites) and "illegal" behaviours (i.e., deliberate acts that violate laws and regulations) are less likely to be influenced through persuasion communication (Hendee & Dawson, 2002; Manning, 2003; Marion & Reid, 2007; Roggenbuck, 1992).

When identifying problem behaviours, it is worth considering answers to the following questions:

1. *What specific problems need to be addressed?*

Using a national park context as an example, problems may involve issues such as site erosion, over flowing car parks, animals harassing visitors for food or litter pollution in waterways. They can be problems that have an impact on the environment, compromise people's safety and experiences, or are costly and time consuming for authorities to manage.

2. *What behaviours cause these problems?*

A range of behaviours may contribute to a specific problem. For example, site erosion in a national park may be a result of people walking off the designated track, inappropriate four-

wheel-driving activities, or the wash from a boat travelling too fast. Birds harassing visitors for food may be caused by people feeding animals or not storing their food properly. While a number of behaviours may contribute to the same problem, the behaviours themselves are quite different.

3. Where and when does the problem behaviour occur?

This involves considerations such as whether the behaviour is specific to a particular location, or is it prevalent across a much wider area? Is it specific to certain times of the year, and is it a one-off or a repeated behaviour? These are issues needing consideration in the context of both conducting research (e.g., is the behaviour easily observable), as well as implementing and evaluating an intervention. For example, behaviours that are subject to habitual decision-making can be more difficult to influence unless an intervention changes the decision-making conditions enough to re-evaluate a habitual choice.

4. Who is performing the problem behaviour?

Knowing who carries out the problem behaviour will essentially identify the target audience of any intervention. However, identifying the target audience is not always straightforward. For example, problems such as mountain bike riders using unauthorised trails can be linked to an obvious and specific group (i.e., mountain bike riders). In contrast, the target audience of an activity such as feeding wildlife may not be so clear. It might be done by visitors in general, be specific to picnickers, while other visitors such as bush walkers may not be part of the problem behaviour.

5. What behaviour do you want people to perform in order to address the problem?

Once the problem, the associated problem behaviour and the target audience have been identified, it is then time to identify the desired behaviour. This is referred to as the “target behaviour.” In other words, each problem behaviour has a corresponding target behaviour. For example, to address the issue of overflowing car parks at a particular national park (the problem) caused by too many people driving their cars (the problem behaviour), an intervention may need to target car driving visitors (the target audience) to use a voluntary shuttle bus service provided by the park (the target behaviour).

With these questions in mind, a problem identification workshop was held in Perth in April 2008 for the current project. The aim of the workshop was to reach a consensus among an invited group of key stakeholders on the priority problems that need to be addressed in the context of improving the water quality in the Swan-Canning river system. Using a modified nominal group technique—a group consensus approach that encourages equal participation among group members for the purpose of identifying and ranking issues—a "problem behaviour matrix" would subsequently be developed for the purpose of informing the selection of the target behaviour, audience and study site for the project.

Procedures

Sixteen key stakeholders from organisations including the Swan River Trust, the Department of Water, the South East Regional Centre of Urban Landcare, the Phosphorus Action Group and Ribbons of Blue/Waterwatch attended the workshop. Following an introduction by the project researchers, participants were asked to individually and silently generate a list of user-induced management problems in response to the following scenario:

> *The Swan River Trust is to conduct a new five-year education initiative to reduce user-induced management problems in the Swan-Canning River System. Prior to the application of the program, decisions have to be made about which problems to target in the program's FIRST YEAR. You've been asked to submit a list of the most pressing user-induced management problems that are the result of misinformation or lack of information. Remembering that the program will have a five-year lifespan and that you are only recommending the most pressing problems to be targeted in year one, please complete the following sentence with the details shown in the master table:*
>
> *"I think the first year of the new user education initiative should direct itself to reducing the following user-induced management problems: ...."*

After completing this process, participants took turns in sharing one problem at a time with the group. The problems were entered into a matrix on a whiteboard visible to all participants. Discussion and clarification followed the reporting of each problem to ensure that the

problems were captured completely and accurately. This included the location of where the problem occurs, who is responsible for causing it, and the associated problem behaviours. This procedure continued until the participants had reported all the problems they had identified (subject to the time limits of the workshop). Participants were invited to contact the facilitators later if further problems needed to be included.

Following the listing of the user-induced problems in the matrix, participants were asked to indicate their relative priority by each distributing a total of 100 points among the identified problems. Two rules determined points distribution: all 100 points had to be allocated, and no single problem could be allocated more than 50 points by an individual. Once each participant had allocated their points to the list of problems, the points allocated to each problem were summed.

Results

A total of 23 problems were identified by the group. These are listed in
Table 1, along with the initial total group point allocations. The problem that received the greatest allocation of points was “excessive nutrients from home gardens entering waterways” (233). This was followed by “sedimentation” (137). Other notable problems were damaged foreshore vegetation (95), rubbish in waterways (85), shoreline erosion (78) and livestock impacts (77).

Table 1: Results from the problem identification procedure and points allocation

Problem	Where?	Who?	Problem behaviours?	Points
Excessive nutrients from home gardens entering waterways (leading to, for example, high nutrient levels, toxic algal blooms, fish kills)	– Home gardens (catchment-wide) – New & old development areas	– Residents – Landscapers – Garden retailers	– Use water-soluble fertilisers – Do not follow the fertiliser bag instructions – Use too much fertiliser – Use fertiliser too frequently – Apply fertiliser at inappropriate times – Over-watering – Planting inappropriate garden species that require heavier fertiliser use – Retailers not providing the right information regarding fertilisers	233
Sedimentation	– Catchment-wide – From streams to the floodplains & then to the river	– Developers – Builders – Construction – Industry – Local government	– No sediment fencing/controls – Poor disposal of building material – Placement of sand/brick material near storm water drains – Street sweeping not occurring at appropriate times	137
Degradation of riparian vegetation, no delineation between public open space & riparian zone.	– Swan estuary (lower Swan- Canning) – Urban & regional parks	– Local government – Land managers – Local landholders – DEC/WAPC	– Mowing up to the edge of the river bank due to public safety concerns (e.g. minimising snake habitat) – Ignoring natural or logical barriers (such as footpaths – Inappropriate barriers	5
Birds getting sick or aggressive	– Local parks with wetlands	– Parents & grandparents – Bakeries	– Feeding bread to birds	28
Introduction of organic matter from deciduous trees into waterways	– All waterways – Near stormwater drains	– Local government – Developers – Landscapers – Urban Development Industry (UDI)	– Planting deciduous trees in the wrong locations – Failure to recognise health risks	32

Problem	Where?	Who?	Problem behaviours?	Points
Litter/rubbish in waterways	– Catchment-wide	– Recreational users – Residents – Local government	– Over-filling bins – Dropping rubbish – Not picking up rubbish – Not providing enough bins – Not emptying bins	85
Shoreline erosion	– Upper Swan – Lower Canning	– Recreational & commercial boat skippers	– Going too fast – Using boats with inappropriate hull designs	78
Rapid transfer of water	– Urban & industrial areas (catchment-wide)	– Building designers – Local government – Homeowners	– Poor uptake of water sensitive urban design	17
Lack of recognition of the impacts from certain actions (lack of "connection"/social responsibility)	– Catchment-wide	– Local community (specifically, the non-conservation minded) – People who don't care	– Not seeking knowledge regarding sustainable practices	39
Heavy metal contamination (boats)	– Boat slipping facilities at yacht clubs	– Yacht clubs – Boat owners	– The use of toxic anti-fouling coatings – Cleaning boats too frequently – Not using coatings that are better for the environment – Poor containment facilities – Lack of ownership of the problem (accompanied by a lack of evidence)	22
Damaged foreshore vegetation by watercraft & people	– Swan & Canning river foreshores – Boat mooring nodes	– Pedestrians – Boat owners (e.g., fishermen, kayakers, canoeists) – DPI	– Not avoiding areas that are being revegetated – Not using existing paths/designated areas – Lack of designated areas – 'Dinghy dumping' (using chains) – Fishermen digging up vegetation for worms	95
User conflicts (Conflicts between jet boat owners & other recreationists e.g. picnickers, unpowered boat users, fishers)	– Designated use areas – Deep Water Point – High use areas	– Jet boat owners	– Speeding – Going outside designated areas	35

Problem	Where?	Who?	Problem behaviours?	Points
Damage to riverbanks	– Belmont Park	– Wake boarders – Water skiers	– Not using boat ramps – Pulling boats up on riverbanks	5
Introduction of feral animals (including farm animals) & weeds (invasive species)	– Catchment-wide (although more apparent in the upper catchment)	– Residents – Hobby farmers	– Dumping garden refuse – Dumping waste from aquariums – Dumping pets – Lack of fencing	13
Injuries to wildlife (e.g., birds, reptiles)	– Recreational areas (fishing) – Major event areas	– Fishermen – General public	– Leaving behind fishing line – Dumping or dropping cans/general rubbish/plastic bags	2
Heavy metal contamination (industry)	– Swan-Canning rivers	– Industry	– Light-industrial discharge – Bacterial discharge – Industry not seeing the “big picture”	65
Disturbance of bird breeding areas	– Swan-Canning rivers	– Dog owners – Kayakers – Local government	– Walking dogs off lead – Kayakers entering sensitive bird breeding areas – Firework displays conducted at sensitive breeding times	37
Disturbance of fish breeding areas	– Mooring areas (lower Swan-Canning rivers)	– DPI	– Placement of moorings in sensitive areas – Lack of scientific knowledge of the entire ecology of the river (e.g., breeding cycles: when & where)	7
Perception & reality not connecting (e.g., the river looks healthy, but.....)	– Catchment-wide	– Local community	– Mixed messages (e.g., nutrients, tree types) – Lack of resources (political & monetary)	35
Livestock impacts (e.g., erosion, sedimentation, nutrients entering waterways)	– Farms – Swan river agricultural areas	– Farmers	– Livestock grazing in/close to river banks	77
Nutrients from horse manure	– Ascot (stable areas)	– Horse owners – Race course owners	– Washing down trailers – Inappropriate stable management – Lack of containment facilities	2
Untreated road run-off	– Road network	– Road authorities – Local government	– Lack of treatment facilities (e.g., not installing filter measures)	52
Reduced water flows in the river (often at critical times)	– Upper Canning	– Property owners by the edge of the river – Local government	– Water being pumped from the river – legally & illegally – at critical times – Lack of management of river water users	(added later)

After the initial allocation of points, individual participants were given a final opportunity to change their point allocations. These results are shown in Table 2, as well as the final rankings of the problems. After the reallocation of points, the top five problems were excessive nutrients from home gardens entering the waterways (223), sedimentation (137), damaged foreshore vegetation (120), rubbish in waterways (120) and livestock impacts (107).

Table 2: Final rankings of problems

Ranked problems	**Points**
1. Excessive nutrients from home gardens entering waterways (leading to high nutrient levels, toxic algal blooms, fish kills)	223
2. Sedimentation	137
3. Damaged foreshore vegetation by watercraft and people	120
4. Litter/rubbish in waterways	120
5. Livestock impacts (e.g., erosion, sedimentation, nutrients entering waterways)	107
6. Shoreline erosion	78
7. Heavy metal contamination (industry)	65
8. Lack of recognition of the impacts from certain actions (lack of "connection"/social responsibility)	39
9. Untreated road run-off	32
10. Introduction of organic matter from deciduous trees into waterways	32
11. Birds getting sick or aggressive	28
12. Perception and reality not connecting (e.g., the river looks healthy, but.....)	25
13. Heavy metal contamination (boats)	22
14. Rapid transfer of water	17
15. Introduction of feral animals (including farm animals) and weeds (invasive species)	13
16. Disturbance of bird breeding areas	12
17. User conflicts	10
18. Disturbance of fish breeding areas	7
19. "Lawns to the edge of the river"	5
20. Damage to riverbanks	5
21. Injuries to wildlife (e.g., birds, reptiles)	2
22. Nutrients from horse manure	2
23. Reduced water flows in the river (often at critical times)	-

Selecting the Target Behaviour

From the problem identification workshop, it was clear that the most pressing problem associated with the health of the Swan-Canning river system was considered to be "excessive nutrients from home gardens entering waterways." With Perth's sandy soils and long, hot, dry summers, home-owners' aspirations of having green lawns and healthy-looking gardens can be difficult to achieve. As a result, many home owners embark on a regime of excessive and improper fertiliser use. Specifically, the use of soluble fertilisers containing high

concentrations of phosphorus and other nutrients is one of the greatest threats to the river system. Through surface run-off, soil erosion, as well as leaching through the sandy soil into the groundwater, nutrients from fertilisers are readily transported into the waterways. This can lead to toxic algal blooms that kill aquatic animals and plants, have a negative impact on human health, and compromise aesthetic and recreational values (South East Regional Centre for Urban Landscape, 2008b; Swan River Trust, 2005a).

The following behaviours emerged from the workshop that contributed to this problem:

- Using/purchasing water-soluble fertilisers
- Not following the fertiliser bag instructions (including inappropriate instructions on bags)
- Using too much fertiliser
- Using fertiliser too frequently
- Applying fertiliser at inappropriate times
- Over watering
- Planting inappropriate garden species that require heavier fertiliser use
- Retailers not providing the right information

The research team discussed these behaviours in the context of three considerations: first, the practical issues involved with a one year research project; second, the appropriateness of the behaviours as a target for change in a persuasive communication intervention; and third, being able to demonstrate the influence of an intervention on the behaviour. Based on these considerations, the behaviours were classified as follows:

Feasible *for the project design and capacity for change*	***Not feasible*** *for the project design and capacity for change*
– Using/purchasing water soluble fertilisers – Using too much fertiliser – Over watering – Using fertiliser too frequently	– Inappropriate instructions on bags – Retailers not providing correct information – Planting inappropriate gardens – Applying fertiliser at inappropriate times

Behaviours deemed as being not feasible for the project were essentially those that occurred over a longer time period (i.e., planting inappropriate gardens, applying fertiliser at inappropriate times) or involved a target audience or a level of intervention that were beyond the time and budget of the project (i.e., getting manufacturers to change their product packaging; asking retailers to change the information they provide to customers).

To confirm what target (i.e., desired) behaviour to focus on for the project, a follow-up teleconference was held with a number of the attendees from the problem identification workshop. Participants in the teleconference were asked to think of a target behaviour based on the elements of target, action, context and time. For example, in a project that focused on influencing visitor use of alternative transportation systems in Australian national parks, the target behaviour was visitors catching (action) a shuttle bus (target) at Cradle Mountain (context) during their current visit (time).

From the teleconference, it was agreed that an appropriate target behaviour for the project would be customers (home gardeners) at a particular garden centre or nursery purchasing an alternative to water soluble fertilisers containing phosphorus. However, an issue that quickly emerged was the availability of such alternatives. In other words, what should people buy instead? While Western Australia's South East Regional Centre of Urban Landcare has a list of criteria for assessing suitable fertilisers (see Appendix D), no product at this stage of the project apparently fulfilled all the criteria. The project therefore had to focus on residents purchasing products that were the next best alternative.

The next challenge was deciding on the exact wording of the target behaviour. As previously mentioned, the behaviour needed to be defined in terms of target, action, context and time. While the action component involved purchasing, and the context and time components would involve the time spent at a specific retailer, the wording of the target (i.e., the desired type of fertiliser product) involved a number of incarnations. These included the following:

1. "Low water soluble fertiliser"
2. "Phosphorus-free fertiliser"
3. "Organic fertiliser"
4. "River-friendly fertiliser"
5. "Environmentally sensitive fertiliser"

Option 1 was dismissed because people may not be aware of what actually constitutes a low water soluble fertiliser. It also did not capture other components of a preferred fertiliser type. Similarly, phosphorus-free fertiliser (Option 2) may contain other chemicals, such as nitrogen, that can be just as harmful. Option 3 was then considered, as it was consistent with the wording contained in some Department of Water surveys related to fertiliser. However, concerns were expressed that people would associate the term "organic" with manure-type fertilisers, which are products that have contributed to high nutrient loads in certain parts of the Swan-Canning river system. "River-friendly fertiliser" was then suggested, but it was decided that it was too leading and may make respondents feel a sense of guilt for not purchasing such a "friendly" product. Furthermore, it established a link between fertiliser use and river quality—a link that we wanted respondents to make themselves. In the end, Option 5 was chosen. While "environmentally sensitive fertiliser" was still somewhat leading, this more generic terminology was agreed as being the best compromise, and would relate to a range of possible products sold at the selected garden centre. It is also the term used as part of the WA Government's Fertiliser Action Plan focussed on encouraging use of low impact fertilisers.

Site Selection

Canning's Trademart—a garden and nursery supply business selling wholesale and retail products—was selected as a case study site for the project. Located in Forrestdale in Perth's southern metropolitan region, it is about 30 km from the central business district. For the purposes of the project, the case study site fulfilled several factors that the researchers and key stakeholders from the workshop considered important. First, Canning's Trademart had a wide range and a large quantity of fertiliser products for customers to choose from. This provided a good experimental setting for people to make on-site decisions regarding the purchase of either an environmentally sensitive fertiliser or another fertiliser product. Second, Canning's Trademart is located in an area of metropolitan Perth with a varying but lower socio-economic profile. Other retail establishments considered were deemed to be in wealthier residential areas where people were more likely to be aware of fertiliser impacts and thus more likely to buy environmentally sensitive products. This would diminish the need for, and influence of, messages aimed at encouraging the purchase of such products. It was considered that there was likely to be a broader range of people purchasing fertiliser at Canning's Trademart who were less likely to be aware of water quality issues. Canning's Trademart was

therefore approached with a request to be involved with the project. After receiving permission to allow data collectors to interview their customers, Phase 2 of the research commenced. This involved identifying the salient beliefs underlying customers' fertiliser buying decisions at Canning's Trademart.

Figure 2: Canning's Trademart

Phase 2: Belief Elicitation

Background

According to Clayton (2007), there are a number of reasons why people spend a lot of time, money and effort in maintaining their gardens. First, there is an economic component, as a well-kept garden is likely to enhance their property's value, as well as neighbouring ones. Indeed, in some localities in the United States, there are laws enforcing certain gardening standards and failure to comply with these standards may lead to complaints, fines and other legal action. Second, there may be tangible and therapeutic benefits such as food production, exercise and stress relief. Finally, given that gardens are often a public demonstration of personal values, their maintenance can involve a range of psychological motives. These include social pressure to "fit in" with the local community, a display of social status, providing an avenue for social interaction, and offering a means for people to express their personal identity. While these motives highlight how gardens can have a positive effect on the individual, the impacts of certain gardening practices on the surrounding environment is not always so positive. Such practices include planting invasive non-native species, excessive water use, the spraying of pesticides and the application of fertilisers containing high concentrations of nutrients such as phosphorus and nitrogen. According to Robbins (2007), while many people who value their gardens also care about the environment, maintaining a presentable garden and lawn will often take precedence over reducing their impact on nature.

The impacts of domestic activities on nearby waterways, in particular the purchasing and use of certain types of fertiliser products, have already been documented by a number of researchers and organisations (e.g. Barth, 1995; Clayton, 2007; Fogarty, et al., 2007; Howard & McGregor, 2002; McDade, 2008; Robbins, 2007; South East Regional Centre for Urban Landscape, 2008a, 2008b; Swan River Trust, 2005a; Werner, 2003). In the context of the Swan-Canning river system, organisations such as the South East Regional Centre of Urban Landcare, in conjunction with the Swan River Trust, run and promote initiatives such as the Phosphorus Awareness Project and the Fertilise Wise campaign to raise awareness of the impacts of home garden fertiliser use in the Swan-Canning river catchment. As demonstrated by the outcomes from the current project's problem identification workshop, such fertiliser

practices remain a major concern for natural resource managers and community groups, resulting in the following target behaviour being selected:

Customers buying (action) environmentally sensitive fertiliser (target) at Canning's Trademart (context) during their visit at the store (time).

Given that the target behaviour is a form of "consumer behaviour," it is worth noting that while such behaviours inevitably result in the act of buying a particular product or service, there are often other factors and processes involved that are of equal interest to consumer psychologists. These are captured in the following example:

> Consider, for example, the act of buying a washing machine. Prior to the purchase, consumers may search for relevant information on the Web, consult friends and co-workers, read consumer magazines, and discuss the options with a spouse or partner. The information obtained may narrow the decision to a small number of manufacturers and brands. At this point, the consumer may well visit one or more local showrooms to view the different brands and consult sales representatives about prices, warranty, installation, delivery times, removal of the existing washing machine, and so forth. Finally, the consumer decides on a particular brand and places an order. (Ajzen, 2008, p. 525)

Thus, while the purchase of a product may be the end result, consumer psychology is interested in all aspects of the consumer purchase decision, such as brand loyalty, place of purchase, information sources, recommendations from others etc. However, given the breadth of factors and processes involved, investigations into consumer choice often have to limit their focus for practical reasons. This was also the case for the present study, which is reflected in the chosen target behaviour.

The TPB has been applied to predict and explain a range of consumer behaviours. These include purchasing genetically modified food (Cook, Kerr, & Moore, 2002), sustainably produced food (Robinson & Smith, 2002) and organic food (Arvola, et al., 2008), green purchasing behaviour in relation to environmentally-friendly products (Chan & Lau, 2001; Kalafatis, Pollard, East, & Tsogas, 1999), online purchases (Hansen, Møller Jensen, & Stubbe Solgaard, 2004), patronage at particular retail environments (Ogle, Hyllegard, & Dunbar, 2004) and buying familiar versus unfamiliar products (Arvola, Lähteenmäki, & Tuorila,

1999). Results from this research have shown that the TPB is a valuable conceptual and methodological framework for the study of consumer behaviour.

Following the problem identification workshop, the second phase in developing an intervention based on the TPB is referred to as the "belief elicitation" phase. The aim of this phase is to identify the target audience's salient (most commonly held) beliefs about the target behaviour using a free response, open-ended question format. This offers the added value of providing researchers and intervention designers with the terminology and wording in the language of the target population. Given that beliefs are assumed to be the basic determinants of behaviour, and that any attempt to influence a particular behaviour must target the underlying beliefs, the belief elicitation phase must be conducted rigorously and carefully, as the outcomes from this phase inform all subsequent phases of the research.

Procedures

Following the theoretical rationale and measurement procedures outlined in Ajzen (2002a), Beeton et al. (2005), Lackey and Ham (2003) and Middlestadt et al. (1996), elicitation research was undertaken at Canning's Trademart in August 2008. This involved semi-structured interviews with customers, who had bought fertiliser, as they exited the store. The research instrument contained the following open-ended questions based on the belief categories of the TPB:

Behavioural Belief Questions

1. What do you see as the *advantages* or *good things* that could occur if you buy an environmentally sensitive fertiliser from this store today for your home garden?
2. What do you see as the *disadvantages* or *bad things* that could occur if you buy an environmentally sensitive fertiliser from this store today for your home garden?

Normative Belief Questions

3. Who (individuals or groups whose opinions you consider personally influential) do you think would support or approve of you buying an environmentally sensitive fertiliser from this store today for your home garden?

4. Who (individuals or groups whose opinions you consider personally influential) do you think would object or disapprove of you buying an environmentally sensitive fertiliser this store today for your home garden?

Control Belief Questions

5. What factors or circumstances *enable* or make it *easy* for you to buy an environmentally sensitive fertiliser from this store today for your home garden?
6. What factors or circumstances make it *difficult* for you to buy an environmentally sensitive fertiliser from this store today for your home garden?

Consistent with the logic of the TPB, behavioural beliefs were elicited by asking respondents to associate both positive and negative outcomes (advantages and disadvantages) of performing the target behaviour. For normative beliefs, respondents were asked who they thought would approve or disapprove if they carry out the target behaviour. In the category of control beliefs, respondents were asked what they think makes performing the target behaviour easier or more difficult. In addition to these belief questions, a series of socio-demographic questions were asked of respondents, as well as what they thought constituted an "environmentally sensitive fertiliser." The type of fertiliser that respondents' purchased was also documented. A copy of the instrument is provided in Appendix A.

For the purpose of this phase of the research, a small convenience sample within the target population was appropriate, as long as it captured a comprehensive range of salient beliefs. Interviews continued until theoretical saturation was reached (i.e., the point where additional data collection provided little further information).

Following the data collection, the responses to the belief questions from each interview were transcribed into a table. The responses were reviewed to develop universal categories or "codes" that reliably collapsed the responses into fewer categories. Three coders then conducted a content analysis of the transcribed responses for the purpose of quantifying the frequency of the coded beliefs. This procedure required the coders to independently assign each response to one of the universal categories based on their prevailing meaning. Responses that were coded in the same category by at least two of the coders were retained in the pool of

beliefs elicited from this phase of the research. This procedure enhanced the reliability of the beliefs that were entered into the analysis.

Results

Respondent Profile

Forty customers completed the interview, and theoretical saturation was achieved. A summary of the socio-demographic characteristics of respondents is presented in Table 3. The majority of respondents were female, had completed secondary school and were Australian. The mean age of respondents was 49. Given the small sample, caution should be taken in viewing this profile as representative of gardener characteristics in suburban Perth. In terms of where else respondents purchased fertiliser for their home gardens, 65% said Bunnings.

Table 3: Socio-demographic profile of respondents during the belief elicitation phase (n = 40)

Characteristic	Percent	Characteristic	Percent
Gender		*Which suburb do you live in?*	
Male	41.0%	Canning Vale	13.9%
Female	59.0%	Oakford	11.1%
		Willetton	8.3%
Age		Armadale	5.6%
18-29	10.3%	Banjup	5.6%
30-39	10.3%	Byford	5.6%
40-49	23.1%	Mandurah	5.6%
50-59	35.9%	Southern River	5.6%
60-69	15.4%	Thornlie	5.6%
70+	5.1%	Wattleup	5.6%
		Bedfordale	2.8%
Education		Bertram	2.8%
Primary/Some Secondary	2.7%	Bibra Lake	2.8%
Completed Secondary	51.4%	Forrestdale	2.8%
Completed Tertiary	45.9%	Gosnells	2.8%
		Kelmscott	2.8%
Nationality		Mundijong	2.8%
Australian	84.6%	Safety Bay	2.8%
British	10.3%	Success	2.8%
Other	5.1%	Wandi	2.8%
Place of Birth		*Where else do you buy fertiliser for your garden?*	
Australia	69.2%		
UK	27.5%	Bunnings	65%
Other	2.5%		

Salient Beliefs

The coded beliefs of respondents are presented in Table 4. In terms of positive outcomes or advantages of using environmentally sensitive fertiliser, three beliefs emerged: “less impacts on the rivers and groundwater,” “safer for people and animals” and “healthier for the garden.” The most frequently mentioned belief for negative outcomes was “nothing” followed by “may not work so well on the garden.”

“Family and friends” were cited by 22.5% of respondents as a source of social influence that would approve of them buying an environmentally sensitive fertiliser (“nobody” was also mentioned by 22.5% of respondents). Other individuals or groups who were mentioned were often along the lines of “environmental organisations,” “the government” and “gardeners on TV.” However, these were not included in the coding process, and hence not in Table 4, as they are what Lackey and Ham (2003) refer to as “generalised others” and do not represent an operant social pressure consistent with normative beliefs. Instead, these generalised others are individuals or groups who would potentially “agree” with a person’s decision to buy an environmentally sensitive fertiliser rather than actually exerting any social pressure. In terms of who would disapprove, “nobody” was the dominant response.

When answering the question about what factors or circumstances enable or make it easy to buy an environmentally sensitive fertiliser, most people gave responses that were more aligned with the question about the impeding factors. For example, respondents replied “if it was cheaper” or “if it was easier to find in-store” would enable them to buy environmentally friendly fertiliser. However, these responses implied that such products were actually more expensive and hard to find, and were therefore included in the responses to the next question. Thus, there were few factors that made it easy for people to purchase environmentally sensitive fertiliser (apart from its availability and a small percentage mentioning helpful shop assistants). In contrast, “costs too much,” “hard to find in-store,” “not in stock,” “lack of information in-store” and “lack of knowledgeable shop staff” were all mentioned as making it difficult to buy environmentally sensitive fertiliser.

Table 4: Frequently mentioned beliefs from respondents during the belief elicitation phase

Beliefs	% respondents (n = 40)
Behavioural Beliefs *(personal belief about the results of the behaviour)*	
1. What do you see as the *advantages* or *good things* that could occur if you buy an environmentally sensitive fertiliser from this store today for your home garden?	
• Less impacts on the rivers and groundwater	55.0%
• Safer for people and animals	20.0%
• Healthier for the garden	12.5%
2. What do you see as the disadvantages or bad things that could occur if you buy an environmentally sensitive fertiliser from this store today for your home garden?	
• Nothing	37.5%
• May not work so well on the garden	25.0%
• Not sure	22.5%
Normative Beliefs *(Perception of influential peer approval or disapproval of the behaviour)*	
3. Who do you think would support or approve of you buying an environmentally sensitive fertiliser from this store today for your home garden?	
• Family and friends	22.5%
• Nobody	22.5%
4. Who do you think would object or disapprove of you buying an environmentally sensitive fertiliser from this store today for your home garden?	
• Nobody	77.5%
Control Beliefs *(Perception of factors that help or hinder the ability to carry out the behaviour)*	
5. What factors or circumstances *enable* or make it *easy* for you to buy an environmentally sensitive fertiliser from this store today for your home garden?	
• Nothing	22.5%
• Availability in-store	15.0%
• Assistance from shop assistant	7.5%
6. What factors or circumstances make it *difficult* for you to buy an environmentally sensitive fertiliser from this store today for your home garden?	
• Costs too much	55.0%
• Hard to find in-store	45.0%
• Nothing	27.5%
• Not in stock	22.5%
• Lack of information in-store	15.0%
• Lack of knowledgeable shop staff	10.0%

Type of Fertiliser Purchased

During each interview, the data collectors observed and recorded the type of fertiliser each respondent had bought (respondents were not asked directly in case they would feel uncomfortable about the product they had purchased given the nature of the questions). The products are summarised in Table 5 with a complete itemised list in Appendix C. Note that some of the information is incomplete, as the data collectors sometimes had difficulty in observing the product. Key experts who had attended the initial problem identification workshop were then asked to identify the products that could be classified as "environmentally sensitive." There was some debate amongst the group as to what constituted an environmentally sensitive fertiliser. No product at this stage of the project fulfilled all the considered criteria outline in Appendix D. Products that were deemed as the next best alternative were therefore classified as "environmentally sensitive." Based on these criteria, 36% of the observed purchased fertiliser products were environmentally sensitive.

Table 5: Fertilisers and products purchased by respondents during the belief elicitation phase

Product Purchased	n	%
Lawn Fertiliser / food	7	17.5%
NPK Blue	6	15.0%
Potting mix	4	10.0%
Blood and Bone	3	7.5%
Rose Food	3	7.5%
Mulch	2	5.0%
Manure (Sheep / Poultry)	2	5.0%
Macracote/plus	2	5.0%
Nutrafert God's Gift to Gardens Organic	2	5.0%
Soil Improver	1	2.5%
Seasol Rose Food (liquid)	1	2.5%
Weed 'n' Feed	1	2.5%
Rich gro premium azalea and camellia	1	2.5%
Rich gro extra green (low phosphate)	1	2.5%
(could not observe)	7	17.5%

What is Environmentally Sensitive Fertiliser?

Given that there was considerable debate prior to the belief elicitation phase about how to word the type of desired fertiliser (e.g., "organic fertiliser," "phosphorus-free fertiliser," "low water soluble fertiliser"), respondents were asked to describe what they actually considered to

be an “environmentally sensitive fertiliser.” These responses are summarised in Table 6 with a complete itemised listing in Appendix C. While 40% were unsure what constituted an environmentally sensitive fertiliser, 17.5% associated it with an organic type product, 10% with manure-based products, 7.5% with a lower chemical composition, and 10% with blood and bone products.

Table 6: Types of fertiliser described by respondents as "environmentally sensitive" during the belief elicitation phase

Product Type	**N**	**%**
Don’t know	16	40.0%
Organic/natural products	7	17.5%
Manure	4	10.0%
Blood and bone	4	10.0%
Animal products	3	7.5%
Phosphate free/low phosphate/low nitrgoen	3	7.5%
All types/most	2	5.0%
Quick release	1	2.5%
None	1	2.5%
High phosphates	1	2.5%
Fertilisers based on Australian Standards	1	2.5%
Dynamic Lifter	1	2.5%
Compost	1	2.5%
Believe what the writing on the packaging says	1	2.5%
Anything that does not leach through the soil and enter the river	1	2.5%

Discussion

A number of issues emerged during the belief elicitation phase of potential interest to managers of the Swan-Canning river system. First, respondents were aware of some of the benefits of using environmentally sensitive fertiliser. Specifically, they recognised the link between home garden fertiliser practices and impacts on the groundwater and rivers. Projects and initiatives such as the Phosphorus Action Program and the Fertilise Wise campaign therefore appear to be getting the message across that inappropriate fertiliser practices at home can have a detrimental impact on the Swan-Canning river system.

Second, there seemed to be some confusion among respondents as to what actually constitutes an "environmentally-sensitive" fertiliser. Suggestions from respondents relating to organic, chemical composition and manure-type products partially mirrored the debate among the problem identification workshop participants about the wording of the desired fertiliser product. Definitive and clearly identifiable criteria for environmentally sensitive fertiliser therefore needs to be agreed on and communicated to the public. While such criteria may already be in place, the fact that 40% of the customers interviewed at Canning's Trademart were not sure what constitutes an environmentally sensitive fertiliser suggests that there is a shortfall in communicating these criteria.

Finally, while many respondents were aware of the benefits of using an environmentally sensitive fertiliser, only 35% bought such a product during the belief elicitation phase. This could be a result of a "halo effect" (people providing socially desirable responses that do not reflect their actual behaviour), respondents being unsure about how well these products work, their uncertainty about what constitutes an environmentally sensitive fertiliser, or one of the many control beliefs that were mentioned. Indeed, it appears that issues of cost, availability, being able to locate the products in-store and a lack of information and guidance at the retailer may all impede a person's ability to buy environmentally sensitive fertiliser.

Based on the results of the elicitation phase, decisions were made about what beliefs to take into the next phase of the research involving a fixed-item belief measurement questionnaire where respondents essentially "rate" the beliefs. A number of factors were considered when deciding on the final pool of salient beliefs. First, only beliefs were chosen that could in some way be manipulated by the researchers and amenable to change through a persuasive communication intervention. In this context, control beliefs related to availability and cost were discarded, as these were subject to pricing and stock policies of Canning's Trademart (although assurances were given that suitable products would be available in-store during the course of the project). Second, the research team decided to discard the normative belief related to "family and friends." While it was mentioned by 22.5% of respondents, it was the only genuine normative belief raised by respondents. This suggested that normative influences did not play a significant role in fertiliser decision-making processes at Canning's Trademart. Finally, Ajzen and Fishbein (1980) suggest a number of decision rules for identifying a final pool of salient beliefs. One option is to include the ten or twelve most

frequently mentioned beliefs, as this is likely to result in a set that includes at least some of the beliefs cited by each respondent in the sample. Alternatively, beliefs could be chosen that exceed a certain frequency. For example, only select beliefs that are mentioned by at least 10% or 20% of respondents. Based on all these considerations, the following beliefs were chosen for the next phase of the research:

Behavioural Beliefs:

- Less impacts on the rivers and groundwater
- Safer for people and animals
- Healthier for the garden
- May not work so well on the garden

Control Beliefs:

- Hard to find in-store
- Lack of information in-store
- Lack of knowledgeable shop staff

Phase 3: Belief Measurement

Background

The third phase in developing a persuasive communication intervention based on the TPB involves measuring the strength and importance of the salient beliefs using a fixed-item questionnaire and identifying those that have potential for persuasion. For each belief selected from the belief elicitation phase, two questions are asked. In the context of behavioural beliefs, respondents are asked to judge how likely it is that performing the target behaviour will lead to each of the salient behavioural belief outcomes. This is measured using a 7-point scale anchored by the words “likely” and “unlikely” (or something comparable). Each likelihood rating is then weighted by a corresponding evaluation scale item with endpoints such as “good” and “bad.” The belief measures of likelihood and evaluation are multiplied together to form a cross-product for each behavioural belief. The means of these cross-products are analysed to determine if any significant differences exist in the underlying behavioural beliefs of performers and non-performers of the target behaviour (Ajzen, 1991; Ajzen & Fishbein, 1980; Fishbein & Manfredo, 1992). The cross-products are then summed to produce a belief-based measure of attitude towards the behaviour. As Ajzen and Fishbein (1980) explain:

> … attitudes are based on the total set of a person’s salient beliefs. People usually believe that performing a given behavior will lead to both positive and negative consequences; their attitudes toward the behavior correspond to the favorability or unfavorability of the total set of consequences, each weighted by the strength of the person’s beliefs that performing the behavior will lead to each of the consequences. (p. 67)

A similar set of principles applies to the measurement of control beliefs. Respondents are asked to judge how likely each of the control factors identified during the belief elicitation phase may facilitate or impede the performance of the behaviour, weighted by the power of these factors (Ajzen, 1991, 2002b). The corresponding cross-products are analysed to identify significant differences between performers and non-performers, and summed to produce an indirect belief-based measure of perceived behavioural control (PBC).

According to Ajzen and Fishbein (2008), knowing only one of these considerations for a particular category of belief is not sufficient. For example, consider the behavioural belief that using a voluntary shuttle bus service in a national park will allow the visitor to learn more about the park (via a driver commentary). If a person believes this is likely, it still has no obvious implication for the behaviour of using the shuttle bus without knowing the value the individual places on the outcome. If a person values "learning more about the park" as "good" or "desirable," then he or she is more likely to use the bus compared to a person who values it as "bad" or "undesirable." In other words, while individuals may hold similar beliefs about the likelihood of an outcome from the performance of a behaviour, they may evaluate the outcome differently. In the context of developing a belief measurement research instrument, each selected salient belief from the elicitation phase must therefore be accompanied by two questions: one measuring the strength of the belief, while the other measures the evaluation, motivation to comply or power component depending on the type of belief. Examples of these measures are presented in Table 7.

Procedures

Guided by the theoretical rationale and research procedures described in Ajzen (1991), Ajzen and Fishbein (1980, 2008), Francis et al. (2004), Ham et al. (2009) and Quine et al. (2001), belief measurement research was undertaken at Canning's Trademart over four weekends during September and October 2008. This involved self-completion questionnaires that were administered and returned on-site, where customers who had bought fertiliser were asked to rate the following salient beliefs elicited from the previous phase of research:

Behavioural Beliefs:

- Less impacts on the rivers and groundwater
- Safer for people and animals
- Healthier for the garden
- May not work so well on the garden

Control Beliefs:

- Hard to find in-store
- Lack of information in-store
- Lack of knowledgeable shop staff

Table 7: Examples of indirect measures based on the Theory of Planned Behaviour

Measure	Example
Behavioural belief strength	My walking on a treadmill for at least 30 minutes each day in the forthcoming month will lower my blood pressure. Likely ____ : ____ : ____ : ____ : ____ : ____ : ____ Unlikely
Outcome evaluation	Lowering my blood pressure is: Good ____ : ____ : ____ : ____ : ____ : ____ : ____ Bad
Normative belief strength	My family thinks that: I should ____ : ____ : ____ : ____ : ____ : ____ : ____ I should not walk on a treadmill for at least 30 minutes each day in the forthcoming month.
Motivation to comply	When it comes to walking on a treadmill for at least 30 minutes each day in the forthcoming month: I want ____ : ____ : ____ : ____ : ____ : ____ : ____ I do not want to do what my family thinks I should do.
Control belief strength	I expect that my work will place high demands on my time in the forthcoming month. True ____ : ____ : ____ : ____ : ____ : ____ : ____ False
Power	My work placing high demands on my time in the forthcoming month would make it: Difficult ____ : ____ : ____ : ____ : ____ : ____ : ____ Easy for me to walk on a treadmill for at least 30 minutes each day.

(source: Ajzen, 2002a)

A copy of the questionnaire is contained in Appendix B. Each belief question was worded according to the target behaviour of a person buying (action) environmentally sensitive fertiliser (target) at Canning's Trademart (context) during their visit at the store (time). The strength of each behavioural belief outcome was scored on a scale from -3 ("unlikely") to +3 ("likely"). The accompanying outcome evaluation was scored on a scale from -3 ("bad") to +3 ("good"). Similarly, the strength of the control beliefs was scored on a scale from -3 ("false") to +3 ("true"), while the accompanying power measure was scored on a scale from -3 ("more difficult for me") to +3 ("easier for me").

In addition to the belief-based questions, the research instrument contained an intention measure to ascertain respondents' prior intention to purchase environmentally sensitive fertiliser. While visitors' final product choice was observed on-site, their prior purchasing intention was measured using a 7-point self-report scale item ranging from +1 ("strongly intending NOT to buy an environmentally sensitive fertiliser") to +7 ("strongly intending to buy an environmentally sensitive fertiliser"). The mid-point was labelled "unsure."

As was the case for the previous phase, the research instruments included questions about respondents' socio-demographic characteristics in order to provide a check on the constituency of the sample. Furthermore, questions were asked of respondents about what they considered to be environmentally sensitive fertiliser and where else they shopped for fertiliser.

Results

Although data collection took place over four weekends in Spring where the number of customers purchasing fertiliser was expected to be high, only 68 questionnaires were completed. Indeed, this represented a census: everyone who bought fertiliser on those days completed a questionnaire.

Respondent Profile

A summary of the socio-demographic characteristics of respondents is presented in Table 8, with the majority of respondents being Australian males. The mean age was 45. As in the previous phase, caution should be taken in viewing this profile as representative of gardener characteristics in suburban Perth given the small sample size. In terms of where else respondents purchased fertiliser for their home gardens, 70% said Bunnings.

Table 8: Socio-demographic profile of respondents during the belief measurement phase (n=68)

Characteristic	Percent	Characteristic	Percent
Gender		*Which suburb do you live in?*	
Male	59.3%	Canning Vale	13.8%
Female	40.7%	Forrestdale	10.8%
		Oakford	9.2%
		Byford	6.2%
Age		Harrisdale	6.2%
18-29	4.4%	Como	3.1%
30-39	35.3%	Kardinya	3.1%
40-49	25.0%	Mt Pleasant	3.1%
50-59	26.5%	Port Kennedy	3.1%
60-69	7.3%	Southern River	3.1%
70+	1.5%	Spearwood	3.1%
		Anketell	1.5%
Nationality		Ardross	1.5%
Australian	83.8%	Armadale	1.5%
British	7.4%	Attadale	1.5%
Italian	2.9%	Atwell	1.5%
New Zealand	2.9%	Banjup	1.5%
Canadian	1.5%	Bedfordale	1.5%
South African	1.5%	Beeliar	1.5%
		Dumbleyung	1.5%
Place of Birth		Jandakot	1.5%
Australia	64.2%	Mt Nasura	1.5%
UK	17.9%	Perth	1.5%
New Zealand	6.0%	Perth Central	1.5%
Canada	3.0%	Piara Waters	1.5%
Italy	3.0%	Roleystone	1.5%
Germany	1.5%	Rossmoyne	1.5%
Gibraltar	1.5%	Secret Harbour	1.5%
Singapore	1.5%	Serpentine	1.5%
South Africa	1.5%	South Perth	1.5%
		Waikiki	1.5%
Where else do you buy fertiliser for your garden?		Wilson	1.5%
Bunnings	70%		

Intentions and Type of Fertiliser Purchased

The belief measurement phase typically involves comparing the beliefs of compliers (i.e., people who purchased an environmentally sensitive fertiliser) with non-compliers (i.e., people who did not purchase an environmentally sensitive fertiliser). It was therefore important to initially establish what type of fertilisers respondents had purchased, which were recorded by

data collectors on-site. The products are summarised in Table 9 with a complete itemised list of each respondent in Appendix C.

Table 9: Fertilisers purchased by respondents during the belief measurement phase (n = 68)

Product Purchased	**n**	**%**
Lawn Food / Fertiliser	16	23.5%
Mulch	5	7.4%
Potting mix	5	7.4%
Soil improver	4	5.9%
Rose food/fertiliser	4	5.9%
Bailey's fertiliser (product not specified)	4	5.9%
Slow Release Fertiliser	4	5.9%
Blood and Bone	3	4.4%
Cresco Garden Fertiliser	2	2.9%
NPK Blue	2	2.9%
Manure	2	2.9%
Feed and Weed	1	1.5%
Cresco Ammonia	1	1.5%
Dynamic Lifter	1	1.5%
Eco-Growth Humus	1	1.5%
Richgro Premier Tomato and Vegetable Fertiliser	1	1.5%
River Safe Nutrient Manager*	1	1.5%
Yates Thrive	1	1.5%
Munns Wetting Agents†	1	1.5%
(could not observe)	14	20.6%

Expert advice was once again sought from the problem identification workshop attendees to classify these products. The results of this process were as follows:

- 11 respondents purchased environmentally sensitive fertiliser
- 26 respondents purchased non-environmentally sensitive fertiliser
- 17 products were not classified (the products were either not a fertiliser or there was not enough information about the product to classify it)
- 14 products could not be observed by the data collectors.

Of the 37 respondents who bought fertiliser, 30% purchased a product that could be classified as “environmentally sensitive.”

Respondents were asked what their prior purchasing intention was using a 7-point self-report scale item ranging from +1 (“strongly intending NOT to buy an environmentally sensitive fertiliser”) to +7 (“strongly intending to buy an environmentally sensitive fertiliser”). The mean intention of compliers was 4.78, while the mean intention of non-compliers was 4.41 (intention for the entire sample was 4.78). These results show that intentions were not strong one way or the other with regards to purchasing environmentally sensitive fertiliser.

Belief Measurement

Given the small sample size, analysis of the belief measurement data was restricted to simple comparisons of the means rather than more complex statistical analysis. As mentioned previously, analysis of the belief measurement data typically involves comparing the results of the belief measures of compliers and non-compliers. The results of this analysis for the behavioural beliefs are presented in Table 10. Looking at the mean cross-products, compliers more strongly believed that purchasing environmentally sensitive fertiliser would have fewer impacts on the rivers and groundwater and would be healthier for their garden. There was less of a difference in the belief of “safer for people and animals” (with non-compliers more strongly believing in this). In the context of the belief “not work so well on my garden,” compliers rated this belief as less likely to occur than non-compliers, and also evaluated the outcome more negatively. Based on the “psychology of the double negative,” this unlikely bad outcome makes a positive contribution to a person’s attitude (Ajzen & Fishbein, 1980, 2008), with the resultant mean cross-product of compliers being higher than non-compliers. Consistent with the logic of the TPB, the summed cross-products resulted in compliers having a more positive attitude toward buying environmentally sensitive fertiliser compared to non-compliers.

Table 10: Behavioural belief measures of compliers (n=11) and non-compliers (n=26) during the belief measurement phase

Behavioural belief	Mean belief strength		Mean evaluation		Mean cross-product		Cross-product difference
	Complier	Non-complier	Complier	Non-complier	Complier	Non-complier	
Fewer impacts on the rivers & groundwater	2.20	1.93	2.90	2.48	6.38	4.79	1.59
Safer for people & animals	2.00	2.41	3.00	2.78	6.00	6.70	-0.70
Healthier for my garden	2.30	1.81	2.80	2.81	6.44	5.09	1.35
Not work so well on my garden	-1.40	-0.88	-2.50	-1.54	3.50	1.36	2.14
Belief-based attitude					22.32	17.94	4.38

Note. Mean belief strength scored from -3 (unlikely) to +3 (likely). Mean evaluation scored from -3 (bad) to +3 (good). Cross-products range from -9 to +9. Belief-based attitude ranges from -36 to +36.

The results of the control beliefs are presented in Table 11. While both compliers and non-compliers had a negative summed PBC (suggesting that it was difficult for them to purchase environmentally sensitive fertiliser at Canning's Trademart), the main difference among the mean cross-products for the individual beliefs was that non-compliers found environmentally-sensitive fertiliser hard to find in-store.

Table 11: Control belief measures of compliers (n=11) and non-compliers (n=26) during the belief measurement phase

Control belief	Mean belief strength		Mean power		Mean cross-product		Cross-product difference
	Complier	Non-complier	Complier	Non-complier	Complier	Non-complier	
Hard to find in-store	-1.10	0.65	-1.60	-1.67	1.76	-1.09	2.85
Not enough information in-store	1.10	1.00	-2.20	-1.64	-2.42	-1.64	-0.78
Knowledgeable shop staff	-0.33	0.16	1.00	1.44	-0.33	0.23	-0.56
Belief-based PBC					-0.99	-2.50	1.51

Note. Mean belief strength scored from -3 (false) to +3 (true). Mean power scored from -3 (more difficult for me) to +3 (easier for me). Cross-products range from -9 to +9. Belief-based attitude ranges from -27 to +27.

Given the small number of compliers and non-compliers, the entire sample of 68 respondents was pooled together for the purpose of viewing the mean belief scores of a larger sample. The results for the behavioural beliefs are presented in Table 12. Overall, respondents strongly believed that purchasing environmentally sensitive fertiliser would have fewer impacts on the rivers and groundwater, and would be safer for people and animals ("healthier for my garden" had a moderately strong cross-product). However, respondents were less sure about how well these products would work on their garden.

Table 12: Behavioural belief measures of ALL respondents (n=68) during the belief measurement phase

Behavioural belief	**Mean belief strength**	**Mean evaluation**	**Mean cross-product**
Fewer impacts on the rivers & groundwater	2.18	2.78	6.06
Safer for people & animals	2.34	2.87	6.71
Healthier for my garden	1.66	2.87	4.76
Not work so well on my garden	-0.94	-1.82	1.71
Belief-based attitude			19.24

Note. Mean belief strength scored from -3 (unlikely) to +3 (likely). Mean evaluation scored from -3 (bad) to +3 (good). Cross-products range from -9 to +9. Belief-based attitude ranges from -36 to +36.

The results of the pooled control beliefs are presented in Table 13. Overall, the belief cross-products revealed that respondents believed that environmentally sensitive fertiliser was hard to find in store, and there was a lack of available information. However, knowledgeable shop staff made a small positive contribution to PBC. Nevertheless, PBC was negative overall.

Table 13: Control belief measures of ALL respondents (n=68) during the belief measurement phase

Control belief	Mean belief strength	Mean power	Mean cross-product
Hard to find in-store	0.12	-1.69	-0.20
Not enough information in-store	1.06	-1.92	-2.04
Knowledgeable shop staff	0.25	1.46	0.37
Belief-based PBC			-1.87

Note. Mean belief strength scored from -3 (false) to +3 (true). Mean power scored from -3 (more difficult for me) to +3 (easier for me). Cross-products range from -9 to +9. Belief-based attitude ranges from -27 to +27.

What is Environmentally Sensitive Fertiliser?

As in the previous phase, respondents were asked to describe what they considered to be "environmentally sensitive fertiliser." These responses are summarised in Table 14 with a complete itemised list in Appendix C. Of the 50 respondents that provided an answer, 20% associated it with a lower chemical composition, 16% with an organic type product, 16% with manure-based products, 10% with compost or mulch, while 18% were unsure.

Table 14: Types of fertiliser described by respondents as "environmentally sensitive" during the belief measurement phase (n=50)

Product Type	No.	%
Phosphate free/low phosphate/low nitrogen	10	20.0%
Don't know	9	18.0%
Organic/natural products	8	16.0%
Manure	8	16.0%
Animal based products	5	10.0%
Believe what the writing on the packaging says	4	8.0%
Compost	3	6.0%
Blood and Bone	3	6.0%
Bailey's products	3	6.0%
Seasol	2	4.0%
Mulch	2	4.0%
Slow release	1	2.0%
None	1	2.0%
Doesn't matter	1	2.0%
Anything that is man-made	1	2.0%
Dynamic lifter	1	2.0%
Native products	1	2.0%

Discussion

Although the small sample of compliers and non-compliers meant that traditional statistical analysis techniques could not be applied, the results from the belief measurement phase nevertheless provided some useful insights. While attitudes toward purchasing environmentally sensitive fertiliser are quite favourable (even among non-compliers), the barriers to purchasing such products appear grounded in issues of control. Specifically, there was a general consensus among respondents that environmentally sensitive fertilisers were hard to find in-store and that there was a lack of available information. Those able to locate such products in-store appeared more likely to purchase environmentally sensitive fertiliser.

With this in mind, combined with the fact the respondents had not previously formed strong intentions to purchase or not purchase environmentally sensitive fertiliser, the researchers decided that the best approach for developing an intervention was to focus on issues of control at Canning's Trademart. Specifically, the intervention would attempt to make environmentally sensitive fertilisers easier to find in-store and to provide more information on these products. Assuming that respondents are being honest when saying that these control issues inhibit their ability to purchase environmentally sensitive, making them more visible and providing more information should translate into a greater proportion of respondents purchasing the products based on the logic of the TPB.

Phase 4: Intervention Evaluation

Intervention Development

To address the control beliefs that emerged during the belief measurement phase—the difficulty of locating environmentally sensitive fertiliser products in-store and an absence of sufficient information—an intervention was developed that involved three components. First, the manager of Canning's Trademart was asked whether it would be possible to reposition the environmentally sensitive fertiliser products in a more visible location, as the current layout appeared to make finding the products difficult. As illustrated in Figure 3, the products in the store are generally stacked on wooden pallets and laid in rows, with parallel aisles running perpendicular to the shop entrance. The manager advised the researchers that this would be possible.

Figure 3: Interior of Canning's Trademart

To complement the repositioning of the products, the second component of the intervention involved developing a large directional sign and a series of smaller "marker signs." The directional sign (see Figure 4) was positioned in a prominent location close to the entrance of

Canning's Trademart and next to the central sales counter so that it caught the attention of customers entering the shop. Printed on A1 laminated card (59cm x 84cm), the sign posed the question "Thinking of buying environmentally sensitive fertiliser?" followed by an arrow pointing to the location of the products. Based on theoretical principles of communication, framing the text as a question was designed to capture attention and initiate elaboration among the customers (Rucker & Petty, 2006). Underneath this text were the words, "Better for the rivers, better for the groundwater." This text acted as an appeal to the behavioural belief "fewer impacts on the rivers and groundwater." Given that customers during the previous phase of research already strongly believed in this outcome, and evaluated it positively, this belief was incorporated into the sign as an appeal to reinforce the behaviour and what people already believed.

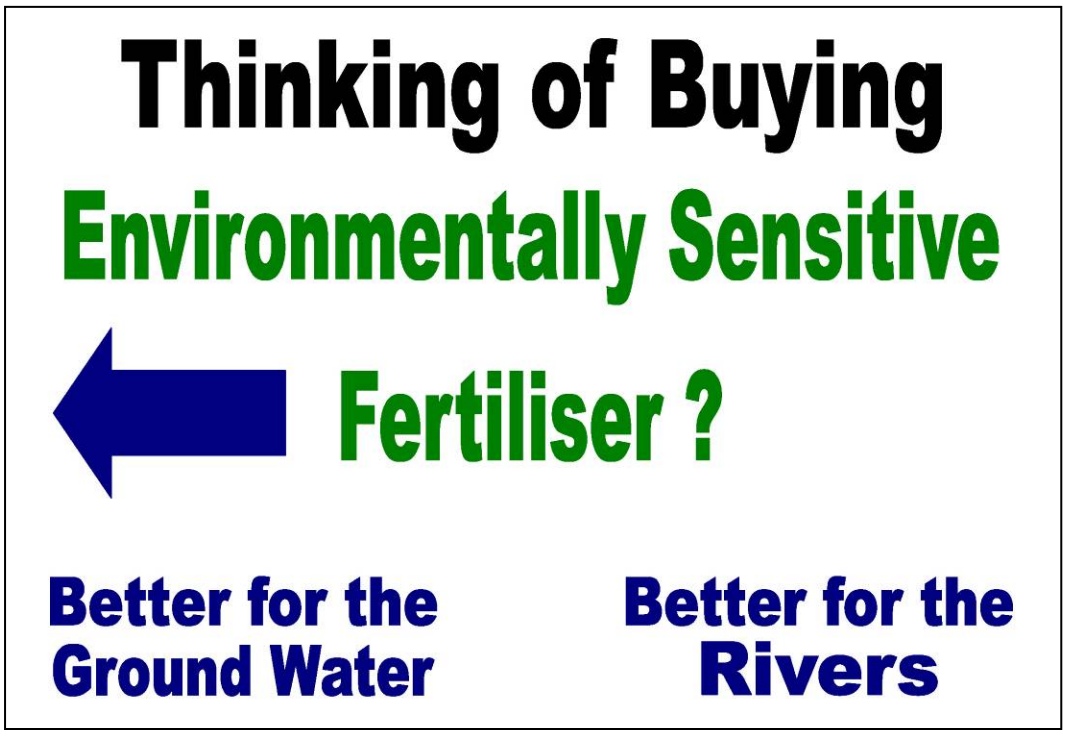

Figure 4: Directional sign positioned at the entrance of Canning's Trademart

Consisting of the text "environmentally sensitive fertiliser," the smaller marker signs (see Figure 5) were printed on laminated A4 cards (21cm x 29.7cm) and positioned around the store next to fertiliser products deemed as environmentally sensitive based on expert advice.

The intent of these signs was to help customers identify which products were environmentally sensitive. Where possible, the marker signs were placed in purpose built 1.2 metre tall metal stands provided by Canning's Trademart. The stands improved the visibility of the signs for customers browsing in the store, as they could be read from some distance away.

Figure 5: Marker sign positioned next to environmentally sensitive fertiliser products

The final component of the intervention aimed to provide customers with more information on environmentally sensitive fertiliser. This involved setting up a display in-store with brochures from the "Fertilise Wise" campaign (see Figure 6). In combination, these three intervention components aimed to make the target behaviour of buying environmentally sensitive fertiliser at Canning's Trademart easier for customers.

Figure 6: Fertilise Wise campaign brochures

Procedures

Guided by the theoretical rationale and research procedures described in Ajzen (1991), Ham and Weiler (2005), Ham et al. (2009), Quine et al. (2001) and Stead et al. (2005), intervention evaluation research was undertaken at Canning's Trademart over four weekends during April and May 2009 to coincide with the Autumn season for fertilising. This involved the introduction of the intervention and the administration and return of self-completion questionnaires on-site with customers who had bought fertiliser.

Due to time constraints, the results from the belief measurement phase were used as the control condition to compare with the data collected after the introduction of the intervention. While the belief measurement data were collected in Spring 2008, there was no reason to suspect that there would be any systematic differences in the dependent variables of interest between the two phases of research given the short time frame and the absence of any changes in the recruitment and measurement procedures. In other words, the control and intervention groups were assumed to be equivalent prior to the introduction of the intervention. Nevertheless, evidence supporting this assumption (in terms of particular belief-based measures and the socio-demographic profile of respondents) was sought during the analysis of the results.

In order to assess the intervention's impact on customers' underlying beliefs, the evaluation questionnaire contained exactly the same belief-based questions as the belief measurement

questionnaire (see Appendix B). By including all the beliefs from the previous phase's instrument, and not just the ones target in the intervention, this allowed for direct before and after comparisons of the full suite of beliefs, as well as the belief-based measures of attitude and PBC. The same questions related to respondents' socio-demographic characteristics, purchasing intentions, as well as what they considered to be environmentally sensitive fertiliser, were also included.

Results

Although data collection took place over four weekends in Autumn to coincide with a recommended time for residents to fertilise their gardens (as recommended in the Fertilise Wise campaign), only 60 questionnaires were completed. As in the previous phase, this represented a census: everyone who bought fertiliser on those days completed a questionnaire.

Furthermore, despite assurances from the manager of Canning's Trademart that the floor stock would be manoeuvred to make the environmentally sensitive fertiliser products more visible, this did not occur. The directional and marker signs were therefore the only means of making the products easier to find for customers.

Respondent Profile

A summary of the socio-demographic characteristics of respondents is presented in table 15. As in the previous phases, caution should be taken in viewing this profile as representative of gardener characteristics in suburban Perth given the small sample size. Nevertheless, the mean age is exactly the same as in the previous phase (45), and in addition to other similar characteristics (e.g., nationality and place of birth), the results support the assumption of equivalency among the groups between the two phases of research.

*Table 15: Socio-demographic profile of respondents during the intervention phase (*n=*60)*

Characteristic	Percent
Gender	
Male	45.0%
Female	55.0%
Age	
18-29	5.1%
30-39	25.5%
40-49	30.5%
50-59	30.5%
60-69	6.8%
70+	1.7%
Nationality	
Australian	85.0%
British	6.7%
German	1.7%
Kenyan	1.7%
New Zealand	1.7%
Rhodesian	1.7%
South African	1.7%
Place of Birth	
Australia	63.8%
UK	16.7%
South Africa	3.3%
Czech Republic	1.7%
Fiji	1.7%
Germany	1.7%
Kenya	1.7%
Malaysia	1.7%
Netherlands	1.7%
New Zealand	1.7%
Rhodesia	1.7%
Zimbabwe	1.7%

Characteristic	Percent
Which suburb do you live in?	
Byford	10.2%
Thornlie	10.2%
Oakford	8.5%
Banjup	6.8%
Canning Vale	6.8%
Forrestdale	6.8%
Armadale	5.1%
South Perth	5.1%
Wandi	5.1%
Darling Downs	3.4%
Kelmscott	3.4%
Brookdale	1.7%
Cardup	1.7%
Coogee	1.7%
Fremantle	1.7%
Hammond Park	1.7%
Joondalup	1.7%
Kenwick	1.7%
Lynwood	1.7%
Mt Pleasant	1.7%
Rockingham	1.7%
Roleystone	1.7%
Secret Harbour	1.7%
Southern River	1.7%
Success	1.7%
Warnbro	1.7%
Wellard	1.7%
Wungong	1.7%
Where else do you buy fertiliser for your garden?	
Bunnings	67%

Impact on the Target Beliefs

The belief data were analysed to determine whether the intervention had an impact on the target beliefs related to the difficulty of locating environmentally sensitive fertiliser products and an absence of sufficient information. In contrast to the belief measurement phase where comparisons are typically made between compliers and non-compliers of the target behaviour, the intervention evaluation phase focuses on comparing the mean cross-products of respondents who were exposed to the intervention and those who were not, regardless of whether they purchased environmentally sensitive fertiliser. Given the larger sample sizes in each group, with 68 respondents from the belief measurement ("control") phase and 60 from the intervention phase, independent-samples t-tests were undertaken to compare the means.

The control belief comparison is presented in Table 16. For the belief "hard to find in-store," the mean strength decreased from 0.12 during the control phase to -0.83 during the intervention phase. In other words, respondents did not believe so strongly that environmentally sensitive fertiliser was hard to find. Multiplied by the corresponding evaluation scores, the mean cross-product increased from -0.20 to 1.60, thus representing a positive contribution to respondents' perceived control (PBC) to purchase environmentally sensitive fertiliser. This represented a statistically significant increase in the target belief. Similarly, for the belief "not enough information in-store," the mean strength decreased from 1.06 during the control phase to 0.26 during the intervention phase. Multiplied by the corresponding evaluation scores, the mean cross-product increased from -2.04 to -0.34. While this was still a negative contribution to PBC, suggesting that more information could be provided, the change nevertheless represented a statistically significant increase in the target belief. The combination of these changes led to a statistically significant increase in belief-based PBC between the two phases, with respondents importantly having a positive PBC value in the intervention phase. Thus, in terms of impacting on the target beliefs, the intervention was successful.

Table 16: Comparison of control belief measures between the intervention phase (n=60) and the control (belief measurement) phase (n=68)

Control belief	Mean belief strength		Mean power		Mean cross-product		Cross-product difference
	Intervention	Control	Intervention	Control	Intervention	Control	
Hard to find in-store	-0.83	0.12	-1.93	-1.69	1.60	-0.20	1.80*
Not enough information in-store	0.26	1.06	-1.29	-1.92	-0.34	-2.04	1.70*
Knowledgeable shop staff	1.02	0.25	1.71	1.46	1.74	0.37	1.37
Belief-based PBC					3.00	-1.87	4.87*

Note. Mean belief strength scored from -3 (false) to +3 (true). Mean power scored from -3 (more difficult for me) to +3 (easier for me). Cross-products range from -9 to +9. Belief-based attitude ranges from -27 to +27.

* $p < .05$

Although behavioural beliefs were not targeted in the intervention (the belief related to fewer impacts on the rivers and groundwater was included only as an appeal), Table 17 presents the results of the behavioural belief comparison. As expected, given that the beliefs were not targeted in the intervention and that customers' beliefs and attitudes toward the target behaviour were already quite positive, there was little change in the underlying beliefs and belief-based attitude (no statistically significant differences emerged). These results also support the assumption that the two groups were equivalent prior to the introduction of the intervention.

Table 17: Comparison of behavioural belief measures between the intervention phase (n=60) and the control (belief measurement) phase (n=68)

Behavioural belief	Mean belief strength		Mean evaluation		Mean cross-product		Cross-product difference
	Intervention	Control	Intervention	Control	Intervention	Control	
Fewer impacts on the rivers & groundwater	2.10	2.18	2.77	2.78	5.82	6.06	-0.24
Safer for people & animals	2.13	2.34	2.73	2.87	5.81	6.72	-0.91
Healthier for my garden	1.80	1.66	2.75	2.87	4.95	4.76	0.19
Not work so well on my garden	-1.22	-0.94	-1.67	-1.82	2.04	1.71	0.33
Belief-based attitude					18.62	19.25	-0.63

Note. Mean belief strength scored from -3 (unlikely) to +3 (likely). Mean evaluation scored from -3 (bad) to +3 (good). Cross-product values range from -9 to +9. Belief-based attitude ranges from -36 to +36.

* $p < .05$

Intentions and Type of Fertiliser Purchased

Respondents were asked what their prior purchasing intention was using a 7-point self-report scale item ranging from +1 ("strongly intending NOT to buy an environmentally sensitive fertiliser") to +7 ("strongly intending to buy an environmentally sensitive fertiliser"). The mean intention of respondents during the intervention phase was 4.88, which is similar to the mean intentions of respondents during the belief measurement phase (4.78). This result once again highlighted that intentions were not strong one way or the other with regards to purchasing environmentally sensitive fertiliser prior to arriving at Canning's Trademart.

Table 18 summarises the fertiliser products that respondents purchased during the intervention phase with a complete itemised list in Appendix C. Based on the expert advice previously received from attendees at the problem identification workshop, 28% of the 53 respondents who purchased fertiliser bought a product that could be classified as

"environmentally sensitive." This was a small decrease to the 30% in the belief measurement phase, and was surprising given the statistically significant impacts on the target beliefs.

Table 18: Fertilisers purchased by respondents during the intervention phase (n = 53)

Product Type Purchased	**N**	**%**
Manure	17	32.1%
Lawn fertiliser/food	10	18.9%
Potting mix	5	9.4%
Soil improver/conditioner	5	9.4%
Seasol	4	7.5%
Rose food/fertiliser	3	5.7%
Good Earth Slow Release Fertiliser	3	5.7%
Blood and bone	3	5.7%
Bio Organics Liquid Fertiliser	3	5.7%
Langley Macrocote	2	3.8%
Cresco Garden Fertiliser	2	3.8%
Eco-Growth Humus	2	3.8%
Soil wetting agents	2	3.8%
Mulch	1	1.9%
Baileys fertiliser premium mix	1	1.9%
Thrive Plant Food	1	1.9%
Fertilise Wise Shades of Green*	1	1.9%
Dynamic Lifter	1	1.9%
Munns Organic Garden Booster Fertiliser	1	1.9%
Native plant fertilisers	1	1.9%
Yates Fertiliser	1	1.9%

However, during the process of documenting the purchased products from the field data, certain trends became apparent. Specifically, not one respondent during the intervention phase purchased products such as Cresco NPK Blue or Munns Golf Course Green fertiliser, which were two of the more popular non-environmentally sensitive products during the previous belief elicitation and measurement phases. Instead, there was a noticeable increase in manure-based and other products labelled as "organic" or "natural." Based on the results listed in Table 19, which will be described in the next section, these represented products that *respondents considered to be environmentally sensitive as opposed to what the experts' classified as environmentally sensitive*. With this in mind, the products in Table 18 were reassessed based on what respondents believed were environmentally sensitive products. This included products such as manure and fertilisers referencing terms such as "organic",

"phosphate free" and other nature-based themes. As a result, 75% of respondents who bought fertiliser purchased a product that they considered to be environmentally sensitive. A similar reassessment of products purchased during the belief measurement phase was also conducted. In contrast to the intervention phase, only 38% of respondents bought products that they considered to be environmentally sensitive.

What is Environmentally Sensitive Fertiliser?

Table 19 presents the results from respondents to the question regarding what they considered to be environmentally sensitive fertiliser with a detailed list in Appendix C. Of the 46 respondents that provided an answer, 32.6% associated it with an organic type product, 20% with manure-based products, 8.7% with a specific animal based product (including worm castings and fish-based products), 6.5% with a lower chemical composition, while 26% were unsure. These results are generally consistent with the previous phases of research, and highlight the disparity in the views of customers and the experts regarding what is environmentally sensitive fertiliser.

Table 19: Types of fertiliser described by respondents as "environmentally sensitive" during the intervention phase (n=48)

Product Type	**No.**	**%**
'Organic' products	15	32.6%
Don't Know	12	26.1%
Manure	9	19.6%
Fish/worm based products	4	8.7%
Phosphate free/low phosphate/low nitrogen	3	6.5%
Blood and Bone	2	4.3%
Seasol	2	4.3%
Compost	1	2.2%
Dynamic lifter	1	2.2%
Macrocote	1	2.2%
Brewery waste	1	2.2%
Products labelled as "environmentally sensitive"	1	2.2%
(no answer)	14	23.3%

Discussion

When it comes to purchasing "green" products, a number of studies have argued that if consumers are not confident in their own ability to purchase these products (e.g., not having enough time, opportunities, money, or are unable to find or identify them), then this will potentially have significant motivational implications on their intentions and behaviour (Chan & Lau, 2001; Kalafatis, et al., 1999; Robinson & Smith, 2002). Consumers may have favourable attitudes and feel a sense of social pressure to buy green products, but if the behaviour is not easy to perform, then they may use this as a reason (whether real or just as an excuse) to not buy such products.

Such a scenario emerged in the present study, where factors of control appeared to be a major inhibitor to purchasing environmentally sensitive fertiliser at Canning's Trademart. As a result, an intervention was developed that aimed to make environmentally sensitive fertilisers easier to find in-store, as well as providing more information to customers regarding such products. One of the most pleasing outcomes that came out of this final phase of research was that the intervention was successful in impacting on the target beliefs, resulting in customers having a positive PBC value in the context of purchasing environmentally sensitive fertiliser at Canning's Trademart. In other words, customers appeared to have greater confidence in their own ability to buy such products. However, this did not translate into a greater percentage of respondents purchasing fertilisers classified as environmentally sensitive based on the expert advice provided previously by attendees from the problem identification workshop. Instead, there was a 37% increase in purchased fertilisers that *respondents believed* were environmentally sensitive.

A number of factors could have contributed to this result. First, in the absence of further information or clearer branding, the term "environmentally sensitive fertiliser" is open to interpretation. If a person believes that manure falls into this category, then he/she has indeed complied with what the intervention set out to do (remember that the directional sign located at the entrance of Canning's Trademart prompted customers to consider buying an "environmentally sensitive fertiliser"). Second, while Fertilise Wise brochures were provided on-site as part of the intervention, there was no guarantee that the respondents actually read

these. Seeing the brochures in-store may have made customers think “yes, there was information on environmentally sensitive fertiliser at Canning’s Trademart,” but that does not mean that respondents took the time to read and digest the information. Third, the layout of the store, with its extensive range of fertiliser products occupying a relatively confined space, may have made it difficult for respondents to distinguish certain products from others, despite the introduction of the signs. Customers may have viewed both the directional sign and the marker signs as identifying groups of products in a particular area of the store, especially when there seems to be a tendency at Canning’s Trademart to locate similar “themed” products close together (e.g., blood and bone, manure, “organic” products). The researchers hoped to avoid this confusion by having all the desired products located in one specific space, which unfortunately did not eventuate. Finally, other factors not targeted in the intervention may have played a role. For example, people may have found some of the marked products as too expensive, and therefore selected a cheaper product that they considered to be environmentally sensitive.

Despite this disparity in the views of what is an environmentally sensitive fertiliser among customers at Canning’s Trademart and the experts, the difference in the type of products purchased during the intervention phase compared to previous phases of research is significant. Specifically, it appears that the signs used during the intervention phase, and the promise of making the task of finding environmentally sensitive fertiliser in-store easier, were enough to prompt customers to want to do “the right thing,” especially when their attitudes to purchasing environmentally sensitive fertiliser are already quite positive. What customers appear to need is further direction as to what is the “right” type of environmentally sensitive fertiliser.

Implications and Recommendations

The aim of this project was to apply behaviour change principles from the social sciences to develop a persuasive communication intervention to influence human behaviour impacting on the health of the Swan-Canning river system. After an initial problem identification workshop, the target behaviour selected for the project involved customers purchasing environmentally sensitive fertiliser at Canning's Trademart. This target (desired) behaviour was a response to the problem of excessive nutrients entering the river system from domestic gardens through the use of fertilisers containing high concentrations of phosphorus and other nutrients. Using the theory of planned behaviour as a guiding theoretical framework, the research was successful in identifying the salient beliefs underlying customers' fertiliser purchases at Canning's Trademart, isolating a subset of these beliefs that had potential for persuasion, and developing an intervention based on these beliefs to increase compliance with the target behaviour. Consistent with the underlying causal logic of the TPB, impacts on behaviour could be linked to a corresponding impact on the targeted beliefs. The results from the project therefore contribute to the growing evidence supporting the application of the social sciences, in particular the TPB, in the field of natural resource management.

A number of implications for managers of the Swan-Canning river system emerge from this project. First, it is important for managers to recognise the underlying nature of the targeted, and non-targeted, beliefs in the intervention. Specifically, it was the control beliefs of customers (i.e., their sense about the presence and power of situational or internal factors that made the behaviour easy or difficult to do) that came across as the main obstacle to buying environmentally sensitive fertiliser. In contrast, respondents seemed well aware of the benefits of using environmentally sensitive fertiliser, suggesting that organisations and initiatives such as the Phosphorus Action Group and the Fertilise Wise campaign are raising awareness within the community about the repercussions of fertiliser use on the Swan-Canning river system. However, educating the community and producing favourable attitudes will not always be enough to engender behaviour change. This is a sentiment that was echoed in the review of the Swan Canning Cleanup Program Action Plan. If they were, then environmentally sensitive fertiliser would be a "best seller" based on people's attitudes alone. This is where the value of applying the social sciences becomes clear, as the TPB depicts a person's behavioural intention and subsequent behaviour as a function of three constructs—

attitude, subjective norm and perceived behavioural control—and not just attitudes. Indeed, if the intervention in the present study had targeted the behavioural beliefs of respondents, it would be doubtful that any noticeable impact on the target behaviour would have occurred, as the intervention would have effectively communicated to the target audience what they already knew.

Another implication of the research is the considerable evidence highlighting the disparity in the opinions of experts and the public about what is environmentally sensitive fertiliser. This inconsistency and lack of consensus has been a factor throughout the project: from selecting the final wording of the target behaviour, to discrepancies in the classification of the purchased fertiliser products among attendees from the problem identification workshop, as well as the diversity of responses provided by customers as to what is an environmentally sensitive fertiliser. Clearly, what the Swan River Trust and community groups classify as environmentally sensitive fertiliser (and there is even inconsistency between these organisations) is not the same as what the public believes is environmentally sensitive fertiliser. While this discrepancy can influence how some of the results from this project are interpreted, managers should not lose sight of the fact that there is a public out there willing to buy environmentally sensitive fertiliser. They just need clearer and consistent direction as to what these products are.

Based on the findings of this research, a number of recommendations can be made. Given that community behaviour change is likely to be a core component in the ongoing management of the Swan-Canning river system, behaviour change frameworks from the social sciences should be used to inform persuasive efforts. These frameworks essentially remove the "guesswork" from knowing what factors are relevant to the target audience, and help ensure that interventions are communicating the right message efficiently and effectively. Otherwise, interventions risk communicating irrelevant or well-established beliefs that will have little influence on behaviour. In the future, managers may want to consider returning to the list of priority problems identified during the problem identification workshop and use the social sciences to inform persuasive communication interventions to promote target (desired) behaviours in response to these problems.

While the current project focused on the TPB, managers and campaign designers are recommended to explore the use of other frameworks from the social sciences. This includes the "elaboration likelihood model of persuasion," which looks at how audience and context characteristics, routes to persuasion, message objectives and various design features can influence the delivery, processing and impact of a message (Rucker & Petty, 2006). While the TPB can assist in identifying the critical beliefs to target in an intervention, communication theories such as the elaboration likelihood model offer guidance as to *how* these beliefs can be best communicated. Rather than relying on a single intervention, as was the case in the present study, this may involve a persuasive communication *campaign* where the target audience is repeatedly exposed to strategic messages for a longer period of time across a variety of locations, increasing opportunities for them to elaborate on the message and for the intervention to have an impact on their underlying beliefs.

During each phase of the research, respondents were asked where else they purchased fertiliser for their home garden. The most frequently mentioned retail outlet was Bunnings. If they have not done so already, organisations such as the Swan River Trust and the Phosphorus Action Group should seek Bunnings' cooperation in trying to persuade customers to purchase environmentally sensitive fertiliser for their home garden. Having Bunnings on-board could have a considerable impact on getting residents to "fertilise wise" (although some of the major fertiliser manufacturers may have a problem with competing products being given priority). Indeed, the procedures outlined in this project could be replicated at a Bunnings' store to determine how the beliefs of customers differ and whether a different type of intervention would be required.

Perhaps the most pressing recommendation to emerge from this research is to address the confusion in the community about what exactly is an environmentally sensitive fertiliser. This includes breaking down long-held views that "natural" products such as manure do not cause any harm to the environment. If this confusion remains, people who want to do the right thing are likely to continue to purchase products that are only environmentally sensitive by name or misguided associations, rather than in practice. While being cautious about generalising the results from the present study to other settings, some strategies that may be worth considering could involve deciding on a standardised wording for these products, making products easily recognisable and easy to locate (e.g., logos; a "river friendly" star rating system; strategic

positioning in stores), and producing updated lists of fertiliser products that are endorsed by organisations such as the Swan River Trust.

The task of getting people to perform a desired behaviour is a complex issue that cannot be left to intuitive or generic attempts at behaviour change. To this end, the present study demonstrates that persuasive communication interventions informed by the social sciences can assist natural resource managers in achieving certain conservation outcomes. Given that the pressures on the Swan-Canning river system are unlikely to subside in the near future, persuasive communication, in conjunction with other measures of behavioural influence (e.g., regulations), has the potential to assist the public to become part of the solution through the development of targeted and compelling interventions.

Research Limitations

As with most empirical and field research studies, a number of limitations must be acknowledged that may have influenced the results and implications arising from the present study. First, while the TPB provides an objective theoretical framework for guiding the conduct of the research, a number of decisions were informed by other factors falling outside the scope of the theory. For example, during the belief elicitation phase, judgements were made about the persuasion potential of particular beliefs. This resulted in the exclusion of beliefs related to product availability and price. While these beliefs were not carried forward into the later phases of the research, it is important to recognise that such beliefs represented genuine impediments to carrying out the target behaviour and cannot be overcome by communication alone. Indeed, many of the so-called environmentally sensitive fertilisers purchased in the final phase of research (e.g., manure) may have partially been influenced by price.

Another limitation was the constant challenge of getting sufficient quotas of respondents. While data collection was timed to coincide with recommended fertiliser times (Spring and Autumn) and on days where the number of potential respondents was expected to be high (i.e., weekends), actual respondent numbers were lower than expected. Indeed, during the belief measurement and intervention phases, the respondent numbers represented a census. In other words, every customer who bought fertiliser on those days completed a questionnaire. Whether these small numbers were influenced by the choice of study site or the fact that buying fertiliser may be more of an infrequent event (i.e., a bag of fertiliser may last a couple of seasons) is open for debate. Nevertheless, it is important to recognise that the present study did not seek to obtain results that could be generalised to a larger population, which would have required bigger sample sizes. Instead, the research focused primarily on testing for differences in the means of beliefs between selected customers, assuming that those selected in the study were representative of the general condition being investigated. Furthermore, it is equally important to recognise that the data collected during the course of the study were always from a real-world sample of the target population in the immediate timeframe of a decision-making context. In other words, the research was not compromised by using data collected at a time that was more removed from the decision-making context, where self-

reports of a distil or hypothetical behavioural choice may have compromised the validity of the findings.

A final limitation of the study is that caution should be taken in generalising the results to other contexts and behaviours, regardless of how similar they might seem. While the theoretical basis and procedures applied during this project are transferable to a wide range of other settings, the beliefs identified during this project are specific to customers at Canning's Trademart. While customers at other garden centres may hold similar beliefs, they cannot be assumed to be the same. For example, a store that has a better and clearer layout of stock might mean that a belief such as "hard to find in-store" may not be so prominent. When applying persuasive communication principles in other contexts, it is important to conduct original belief elicitation and measurement research to ensure that any intervention is relevant to the specific target audience.

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Appendix A: Belief Elicitation Instrument

OBSERVE THE TYPE OF FERTILISER PURCHASED

Brand: Product name:

Behavioural Belief Questions

1. What do you see as the *advantages* or *good things* that could occur if you buy an environmentally sensitive fertiliser from this store today for your home garden?

2. What do you see as the *disadvantages* or *bad things* that could occur if you buy an environmentally sensitive fertiliser from this store today for your home garden?

Normative Belief Questions

3. Who (individuals or groups whose opinions you consider personally influential) do you think would *support* or *approve* of you buying an environmentally sensitive fertiliser from this store today for your home garden?

4. Who (individuals or groups whose opinions you consider personally influential) do you think would *object* or *disapprove* of you buying an environmentally sensitive fertiliser from this store today for your home garden?

Control Belief Questions

5. What factors or circumstances *enable* or make it *easy* for you to buy an environmentally sensitive fertiliser from this store today or your home garden?

6. What factors or circumstances make it *difficult* for you to buy an environmentally sensitive fertiliser from this store today for your home garden?

Socio-Demographic Profile Questions

7. Observe and record respondent's gender. ☐ Male ☐ Female

8. What is your age, as of your last birthday? _____ Years

9. Which best describes the highest level of education you have completed? [Mark ☒ ONE only]

   ☐ Primary/Some Secondary ☐ Completed Secondary ☐ Completed Tertiary

10. Where do you live? _____ Suburb

11. What is your nationality? [Mark ☒ ONE only]

    ☐ Australian ☐ Other (Please specify): _____

12. In which country were you born? _____

13. Apart from this store, where else do you go to buy fertiliser for your home garden?

14. Finally, what types of fertiliser do you consider as "environmentally sensitive?"

Appendix B: Belief Measurement and Evaluation Instrument

Fertiliser Questionnaire

Your opinions matter to us!

A study about buying environmentally sensitive fertiliser

Curtin University of Technology

MONASH University

The purpose of these questions is to find out what you believe about buying an environmentally sensitive fertiliser for your home garden at this store. **Place an 'X'** on the line that represents how strongly you believe the statement.

1. **If I buy an environmentally sensitive fertiliser from this store today, it will have fewer impacts on the rivers and groundwater.**

LIKELY____ : ____ : ____ : ____ : ____ : ____ : ____UNLIKELY

2. **Fewer impacts on the rivers and groundwater is:**

BAD____ : ____ : ____ : ____ : ____ : ____ : ____GOOD

3. **If I buy an environmentally sensitive fertiliser from this store today, it will be safer for people and animals.**

UNLIKELY____ : ____ : ____ : ____ : ____ : ____ : ____LIKELY

4. **People and animals being safer is:**

GOOD____ : ____ : ____ : ____ : ____ : ____ : ____BAD

5. **If I buy an environmentally sensitive fertiliser from this store today, it will be healthier for my garden.**

LIKELY____ : ____ : ____ : ____ : ____ : ____ : ____UNLIKELY

6. **My garden being healthier is:**

BAD____ : ____ : ____ : ____ : ____ : ____ : ____GOOD

7. **If I buy an environmentally sensitive fertiliser from this store today, it will not work so well on my garden.**

LIKELY____ : ____ : ____ : ____ : ____ : ____ : ____UNLIKELY

8. **An environmentally sensitive fertiliser that does not work so well on my garden is:**

GOOD____ : ____ : ____ : ____ : ____ : ____ : ____BAD

9. **Environmentally sensitive fertiliser is hard to find in this store.**

TRUE____ : ____ : ____ : ____ : ____ : ____ : ____FALSE

10. Hard to find environmentally sensitive fertiliser in this store makes buying it:

EASIER FOR ME_____:_____:_____:_____:_____:_____:_____MORE DIFFICULT FOR ME

11. There is not enough information on environmentally sensitive fertiliser in this store.

FALSE_____:_____:_____:_____:_____:_____:_____TRUE

12. Not enough information on environmentally sensitive fertiliser in this store makes buying it:

EASIER FOR ME_____:_____:_____:_____:_____:_____:_____MORE DIFFICULT FOR ME

13. Shop staff are knowledgeable about environmentally sensitive fertiliser in this store.

TRUE_____:_____:_____:_____:_____:_____:_____FALSE

14. Before making your final decision on which fertiliser to buy today at this store, were you:

Strongly intending to NOT buy an environmentally sensitive fertiliser_____:_____:_____:_____:_____:_____:_____Strongly intending to buy an environmentally sensitive fertiliser

Unsure

15. What is your age, as of your last birthday? _____ Years

16. Which suburb do you live in? _____

17. What is your nationality? *Mark* ☒ *ONE only*

☐ Australian ☐ Other (Please specify): _____

18. In which country were you born?

☐ Australian ☐ Other (Please specify): _____

19. Apart from this store, where else do you buy fertiliser for your home garden?

_____

20. Finally, what types of fertiliser do you consider to be "environmentally sensitive?"

_____

_____

_____

DOCUMENT PRODUCT NAME OF THE PURCHASED FERTILISER:

_____

Questionnaire ID: Male/Female [Circle One] Date:

Appendix C: Detailed product response lists for the three survey phases.

Elicitation Survey Phase(N = 40)

Observed Products purchased by respondents during the belief elicitation phase survey

ID	Product purchased	ID	Product purchased
1	Munns Garden n' Lawn % Organic	21	Macrocote Plus
2	Cresco NPK Blue Concentrated Fertiliser	22	DPM Grow pack – poultry manure, NPK Blue special concentrated fertiliser
3	Brunnings Rose Feed	23	Richgro Green Leaf Potting Mix
4	Seasol Rose Food (liquid)	24	Richgro extra green lawn fertiliser
5	Brunnings Blood and Bone % Natural	25	Richgro moisture plus potting mixture
6	Weed 'n' Feed	26	Yates green earth rose planting mix
7	(could not observe)	27	Bailey's potting mix
8	Macracote	28	Cresco NPK Blue
9	Baileys Fertilisers Soil Improve	29	(could not observe)
10	Mulch†	30	Cresco NPK Blue
11	(could not observe)	31	Bio organic mulch†
12	Rose Food, Complete Garden Food, Pure Organic Potting Mix*	32	Cresco NPK Blue
13	Blood and bone	33	Pro-green/Munns Blood and bone; % organi
14	Sheep manure	34	Rich gro extra green
15	Brilliance Lawn Fertiliser	35	Munns/Budget overslow and new lawns
16	(could not observe)	36	Hortico Target Green Lawn Food
17	Nutrafert God's Gift to Gardens Organic	37	Rich gro premium azalea and camellia
18	Nutrafert God's Gift to Gardens Organi	38	Brunnings all purpose NPK fertiliser
19	(could not observe)	39	(could not observe)
20	Lawn grow and grow spray	40	(could not observe)

Types of fertiliser considered to be "environmentally sensitive" by elicitation survey respondents

ID	Perceived as Environmentally Sensitive	ID	Perceived as Environmentally Sensitive
1	Dynamic Lifter (which I think is based on chicken poo!)	21.	Blood and bone
	Pro-green, organic fertilisers; blood and bone	22.	Organic stuff
3	Don't know	23.	Don't know
4	Don't know, because I don't read what is on the package	24.	Don't know
5	Don't know	25.	Don't know
6	Believe what the writing on the packaging says	26.	Don't know
7	If it has a funny smell; Organic labelling	27.	Don't know
8	Quick release fertiliser (quick and short term); Organic fertiliser	28.	Blood and bone; Pulverised chook manure
9	Less mass produced fertilisers	29.	Not sure
10	Don't know	30.	Don't know
11	Don't know	31.	Phosphate-free fertilisers; Rich Gro, which is frog friendly
12	Fertilisers based on Australian Standards or "Certified Organic"	32.	Don't know
13	Don't know	33.	There aren't any because the nitrogen goes into the water
14	No idea	34.	Anything that does not leach through the soil and enter the river
15	A lot of fertilisers are	35.	Animal manure; Worm castings
16	All types	36.	Fertilisers with less phosphates
17	Nutrafert	37.	Homemade organic compost; Targeted plant products
18	Don't know	38.	Mulch/manure; Slow release products; Non-chemical products
19	Blood and bone; Low in phosphorus	39.	Organic products; Sheep manure
20	Low nitrogen and HIGH phosphate levels (for faster release)	40.	Animal products

Belief Measurement Survey Phase (N = 68)

Fertilisers purchased by respondents during the belief measurement phase

ID	Product purchased	ID	Product purchased
1.	Potting Mix & Mulch†	35.	Baileys Lawn Food
2.	Bio Organic Mulch†; Blood and bone*	36.	Cresco Garden Fertiliser
3.	Eco-Growth Humus 400*	37.	Baileys Soil Improver*, Liquid Fertiliser and Rose Food
4.	(could not observe)	38.	Baileys Lawn Food
5.	(could not observe)	39.	Munns Golf Course Green
6.	(could not observe)	40.	Munns Golf Course Green
7.	Slow release (granules)‡	41.	Garden Gold Slow Release Fertiliser
8.	(could not observe)	42.	Baileys (no product specified)‡
9.	(could not observe)	43.	River Safe Nutrient Manager*
10.	Baileys (no product specified)‡	44.	Cresco Lawn and Garden Fertiliser
11.	Munn's Golf Course Green Quality Lawn Fertiliser	45.	Baileys Soil Improver*
12.	(could not observe)	46.	Dynamic Lifter*
13.	Manure	47.	Munns Golf Course Green
14.	Baileys Potting Mix†	48.	Yates Blood and Bone*
15.	Baileys (phosphate free) Brilliance Lawn Food	49.	Munns Golf Course Green
16.	Baileys Lawn Improver	50.	Blood and Bone*; Richgro Slow Release Nutrients; Richgro Cow Manure
17.	Baileys Fertiliser‡	51.	(could not observe)
18.	Cresco NPK Blue	52.	Richgro Premier Tomato and Vegetable Fertiliser
19.	Richgro Water Saver Mulch†	53.	Brunnings Feed and Weed; Richgro for Roses
20.	Cresco Lawn Fertiliser; Cresco NPK Blue	54.	Baileys Potting Mix†
21.	Baileys Soil Improver*	55.	(could not observe)
22.	Munns Golf Course Green	56.	(could not observe)
23.	(could not observe)	57.	Slow release (no product specified)‡
24.	(could not observe)	58.	Baileys Potting Mix†
25.	Yates Thrive	59.	Munns Wetting Agents†
26.	Yates Bindi and Broadleaf†	60.	Baileys Soil Improver*
27.	Baileys Mulch†	61.	(could not observe)
28.	Munns Weta Lawn and Garden†	62.	Richgro Extra Green Lawn Fertiliser*
29.	Bio-organics Elegant Mulch†	63.	(could not observe)
30.	Baileys Rose Plant Food	64.	Munns Golf Course Green and Wetting Agents
31.	(could not observe)	65.	Baileys Fertiliser‡
32.	Richgro Rose	66.	Baileys Lawn Fertiliser
33.	Baileys Lawn Food	67.	Cresco Ammonia
34.	Baileys Potting Mix†	68.	Cresco Garden Fertiliser

** Classified as "environmentally sensitive" based on expert opinion † Not classified as a fertiliser* ‡ Not able to be classified

Types of fertiliser considered to be "environmentally sensitive" by belief measurement survey respondents

ID	Perceived as Environmentally Sensitive	ID	Perceived as Environmentally Sensitive
1.	I don't look at the brands, just the contents	35.	Don't know
2.	Organic	36.	Products that show it is "environmentally sensitive" (would like some sort of rating system)
3.	(no answer)	37.	Organic-based; no chemicals; products by Baileys (they are made in WA)
4.	Don't know	38.	(no answer)
5.	Don't know	39.	(no answer)
6.	Compost; worm farms	40.	Not sure
7.	Animal-based products	41.	Worm juice; manure
8.	Fertilisers that contain the correct information and instructions on how to use effectively, and warnings on impacts if used incorrectly	42.	Biodegradable; phosphate free
9.	Manure	43.	Products by Baileys
10.	(no answer)	44.	(no answer)
11.	(no answer)	45.	Unsure; not fully informed yet
12.	(no answer)	46.	Anything that is man-made
13.	Manure	47.	Organic products
14.	(no answer)	48.	Compost; manure; blood and bone; dynamic lifter
15.	Native products	49.	(no answer)
16.	Seasol	50.	(no answer)
17.	Phosphate-free	51.	Blood and bone
18.	(no answer)	52.	Low in phosphorus
19.	No idea	53.	Bio-organic
20.	Non-phosphate types	54.	Blood and bone
21.	Unsure	55.	Natural mulch; compost
22.	Don't know	56.	(no answer)
23.	Organic/natural ingredients; vegetable mulch	57.	Manure
24.	Whatever the label says	58.	(no answer)
25.	Phosphate-free; slow release; organic	59.	Manure
26.	Manure	60.	Organic; Seasol
27.	Organic	61.	Worm castings; low in phosphorus and nitrogen
28.	Fish products	62.	(no answer)
29.	Less phosphate	63.	(no answer)
30.	(no answer)	64.	(no answer)
31.	None (comment from "Evolve Landscape Design")	65.	Low in nitrates
32.	Doesn't matter – whatever my customers want	66.	(no answer)
33.	No phosphate	67.	Manure
34.	Don't know	68.	Baileys Green

Message Intervention Survey Phase (N = 60)

Fertilisers purchased by respondents during the intervention phase

ID	Product purchased	ID	Product purchased
1.	Bailey's Brilliance Lawn Food "Phosphate free"	31.	Richgro Moisture Plus Cow Manure
2.	Cresco Fully Granulated Garden Fertiliser	32.	Blended manure
3.	Cresco Fully Granulated Garden Fertiliser	33.	Munns Lawn Food
4.	Blood and bone*	34.	Bio Organics Gro Tonic Liquid Fertiliser Solution
5.	Richgro Moisture Plus Blended Manure	35.	Good Earth Blended Manure
6.	Richgro Extra Green Lawn Food*	36.	Bio Organics Gro Tonic Liquid Fertiliser Solution
7.	Richgro Moisture Plus Blended Manure	37.	Langley Macrocote Plus Outdoor
8.	Richgro Lawn Marvel Organic Top Dress; Richgro granulated Rose Plus Premium fertiliser; Seasol Liquid Fertiliser*	38.	Langley Natural Garden Macrocote Plus
9.	Richgro Native Plant Mix with Osmocote	39.	Blood and bone*; Bailey's Brilliance Plus Lawn Food
10.	Native Potting Mix with Osmocote†	40.	Munns Buffalo Booster
11.	Richgro Extra Green Lawn Fertiliser*	41.	-
12.	Richgro Extra Green Lawn Fertiliser*	42.	Good Earth Slow Release Fertiliser
13.	Richgro Moisture Plus Blended Manure	43.	Good Earth Slow Release Fertiliser
14.	Richgro Moisture Plus Cow Manure	44.	Sheep manure; Ezi Wet†
15.	Richgro Moisture Plus Cow Manure	45.	Premium Potting Mix†
16.	Richgro Moisture Plus Potting Mix†; Baileys Moisture Mulch†	46.	Seasol*; Fish emulsion*
17.	Richgro Extra Green Lawn Fertiliser*	47.	Dynamic lifter*; fish emulsion*, Seasol*
18.	Richgro Rose Plus	48.	Richgro Sheep Manure
19.	Richgro Moisture Plus Cow Manure	49.	Garden Essentials Blood and Bone*; Richgro Fruit and Citrus
20.	Munns Organic Garden Booster Fertiliser	50.	Ezi-Wet Granulated (Premium) Soil Wetter (Aquatic Friendly)†
21.	Blended manure; Richgro organic-based vegetable premium fertiliser	51.	Good Earth Blended Chicken Manure; Bailey's Soil Improver*
22.	Eco Growth Humus 400 Soil Conditioner*	52.	Bailey's Soil Improver*
23.	Richgro Moisture Plus Cow Manure	53.	Munn's Betta Bloom Fertiliser; Moisture Plus Cow Manure; Moisture Plus Sheep Manure
24.	Sulphate of Ammonia	54.	Door Buster Cow Blended Manure
25.	Easy Wet Wetting Agent†; Mushroom compost†; Organic Potting Mix†	55.	Bio Organics Gro Tonic Liquid Fertiliser
26.	Good Earth Sheep Manure	56.	Bailey's Fertiliser Premium Mix
27.	Soil Conditioner Planting Mix	57.	Yates Fertiliser
28.	Thrive Plant Food	58.	Good Earth Slow Release Fertiliser
29.	Fertilise Wise Shades of Green*	59.	Bailey's Soil Improver Plus*; Eco Growth Humus 400 Soil Conditioner*
30.	Yates Trace Elements Premium Potting Mix†	60.	Yates Thrive Granular Lawn Food

* Classified as "environmentally sensitive" based on expert opinion
† Not a fertiliser

Types of fertiliser considered to be "environmentally sensitive" by message intervention survey respondents

ID	Perceived as Environmentally Sensitive	ID	Perceived as Environmentally Sensitive
1.	As close to organic as possible	31.	(no answer)
2.	Unsure	32.	Manure
3.	Manure-based	33.	(no answer)
4.	Organic	34.	Don't know
5.	Natural, not manufactured	35.	Organic
6.	Products labelled as "environmentally sensitive"	36.	Seasol; fish emulsions; blood and bone; low chemical content
7.	Brewery waste	37.	Macrocote
8.	Organic; fish and seaweed based	38.	Don't know
9.	Organic	39.	(no answer)
10.	Unsure	40.	Not sure
11.	Natural products	41.	Natural products
12.	Phosphate-free	42.	Manure
13.	(no answer)	43.	(no answer)
14.	(no answer)	44.	Don't know
15.	(no answer)	45.	Don't know
16.	Don't know	46.	Fish emulsion
17.	(no answer)	47.	Seasol; dynamic lifter
18.	(no answer)	48.	Manure
19.	Manure	49.	Organic; slow release
20.	Organic; low in nitrogen	50.	Compost; Manure
21.	(no answer)	51.	Organic
22.	Manure	52.	Organic; Natural products
23.	(no answer)	53.	Worm castings
24.	(no answer)	54.	Organic
25.	(no answer)	55.	Unsure
26.	No Phosphates	56.	Manure
27.	Don't know	57.	Unsure
28.	(no answer)	58.	Blood and bone; Osmocote
29.	Organic	59.	Organic
30.	Seaweed extract; Sheep manure	60.	Unsure

Appendix D: Criteria to be considered for identification of "Environmentally Sensitive Fertiliser"

SERCUL Fertilise Wise Endorsement Criteria

1. Product is labeled for appropriate soil type.

2. Recommended application rates are labeled specific to plant type (according to plant uptake and Nitrogen and Phosphorous guidelines).

3. Will not contribute to excessive soil acidification and is labeled accordingly.

4. Contains adequate trace elements for healthy plant growth.

5. *Does not contain hazardous levels of heavy metals, persistent organic pollutants, radioactive isotopes, etc. that are known to damage human or ecological health, including use over decades of domestic application.

6. Addresses Albrecht's Base Cation Saturation Ratio.

7. *Level of Total Dissolved Nitrogen leached does not exceed xx.x g/m^2 at recommended application rates.

8. *Level of Total Dissolved Phosphorus leached does not exceed x.x g/m^2 at recommended application rates.

* According to testing procedures outlined in the SERCUL Fertilise Wise Product testing statement.