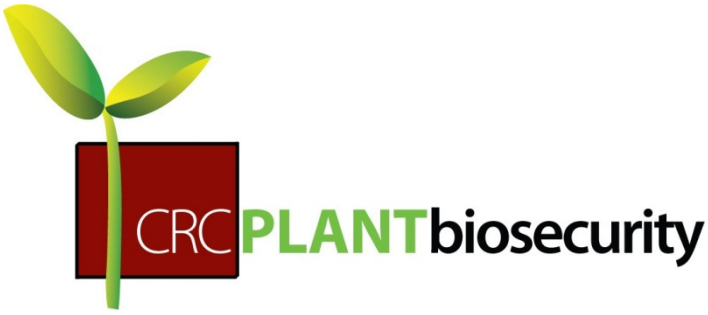

Cooperative Research Centre
for National Plant Biosecurity

Final Report

CRC300014

PDA-Assisted Surveillance

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1. Executive Summary

Australia remains committed to World Trade Organisation agreements, Sanitary and Phytosanitary agreements, the *International Plant Protection Convention* and International sanitary and phytosanitary measures and recognises the need for quarantine plant pest surveillance data of the utmost integrity is essential to support area freedom negotiations.

With most of Australia's agriculture produce exported, securing and maintaining market access is critical as is the need to demonstrate freedom from certain plant and animal pests and diseases. Surveillance is an important tool for securing market access and accordingly exporting countries now need to provide accurate, credible evidence to confirm absence (i.e known not to occur) for pest freedom status.

In the past, nearly all field collected surveillance information was recorded manually to paper reducing the rate of capture, integrity, conformity as well as security of the data. This Cooperative Research Centre for National Plant Biosecurity (CRCNPB) project focused on the development of pest surveillance data collection software and hardware using hand-held computers or PDAs (Personal Digital Assistants). This approach provides chain of evidence control, increases the volume of data collected as well as its integrity through relational databases and seamless data transfer to corporate systems.

In keeping with the CRCNPB's objectives of pursuing world-class research and recognising the need to encourage collaborators with different disciplines and backgrounds to add value to one another; we decided early on in this project not to look for a shrink wrapped solution. This meant that we would not work with less mature hardware like iPhone, instead we began development in the Windows Mobile environment allowing synchronisation to relational databases built with Microsoft Access and Oracle as well as full Microsoft Office integration.

For the PDA database development environment we decided that we needed software that was largely wizard driven to encourage collaborators to develop in-house solutions, to share techniques, code and modules. Visual CE was found to provide the functionality we needed. For our mapping needs we felt that Google would soon lead desktop and PDA mapping environments through Google Earth and Google Maps and we determined that our PDA applications should collect digital latitude and longitudes and port them to Google Maps as required for display. Digital lat/longs were chosen over analogue (degrees minutes and seconds) and UTM (eastings and northings) because they are now considered best practice for georeferencing by the Global Biodiversity Information Facility.

CRCNPB PDA software developed with Visual CE was successfully trialled during the 2007 post-border detection of Khapra beetle by providing evidence of complete eradication via 1,273 trap inspections. This achievement was supported by GPS-located traps, digital voice navigation itineraries, digital time and date stamps, field printed barcode labels, site imagery, Google Maps integration, all in a single hand-held unit.

New PDA hardware and software is under development by the CRCNPB for use in other pest surveillance activities. These include, hazard site pest surveillance, stored grain fumigation monitoring, grain insect resistance testing and fruit fly phenology studies.

2. Aims and objectives

In Australia nearly all field collected surveillance information is recorded manually to paper reducing the rate of capture, integrity, conformity and security of the data for biosecurity purposes. DAFF, PHA and the state agencies involved in plant biosecurity are developing datasets to enhance and maintain access to overseas markets and there is a need for a field based digital interface in the data collection chain to provide integrity and security. This project addresses the strategic goal of developing technically sound sample/survey methodologies and systems to enhance the ability to domestically capture, model and map a wide range of plant health information in an accurate and cost-effective manner.

The project objective was to encompass automation, including improved speed and security, of biosecurity surveillance data capture ensuring market access issues are addressed before they develop into trading incidents through the acquisition and provision of timely surveillance data. Ensuring that data collected is compiled in an acceptable format and non-target data can be employed to bolster market access cases.

Outputs include facilitation of the development of systems that automatically collect and synchronise data with server applications to provide live updates of detections and distribution for Commonwealth and state reporting and prediction systems. Recommendation of a standard to enable regulating at a base level the collection of plant Biosecurity surveillance data which is BioSIRT compliant and allowing transparent and consistent data exchange across collaborating organisations.

Mapping data standards were to be established that will allow GPS modules to collect data in appropriate form. And allow the rapid compilation of specific information for area freedom and other market access issues.

The project should deliver national PDA based software for the collection of surveillance information in the field ensuring that compatible hardware standards are established and flexible software packages adopted that can be adapted and used for a wide range of plant biosecurity surveillance related tasks. Software developed must interface with national surveillance databases.

The strategy initially involved three main software applications for surveillance to be covered in this project, although there was also a need to select PDA hardware that would be robust in the field and that have suitable memory capability, barcoding and GIS/GPS compatibility. USDA-CPHST and the CRC for Spatial Information would be consulted for software development and hardware selection respectively. Software applications developed were to be for trapping programs, destruction surveillance and general surveys however there was little interest from CRC participants involved in destruction surveys and, given the post-border detection of Khapra Beetle, this module was replaced with a Khapra beetle eradication application that was incorporated into the urban surveillance application.

The trapping software developed in the project was to use fruit flies as the model system and citrus tree removal for citrus canker will be used for the destruction surveillance system. The general survey system which covers temporary site trapping and other collection methods will be developed to dovetail in with the DAFF (OCPPO/BRS) urban surveillance initiative. All developed software to be BIOSIRT compliant and able to interface with to be developed National Plant Surveillance Reporting Tool (NPSRT) or the staging databases in the state agencies.

3. Key findings

This project began with an important workshop of representatives in December 2006 when it was agreed that the future in field biosecurity surveillance data collection lay in the use of hand-held field computers and that there was a need to collaborate and define hardware standards and software applications. QUADs PDA meeting delegates agreed to improve surveillance data quality by providing surveillance information that is more accurate, consistent, complete, verifiable and auditable. Preliminary work looked to develop data standards based on the BioSIRT checklist. The group also agreed that the advantages of PDAs include data entry at the point of observation, where the best appreciation of the data lies with no need for clerks to interpret field observations. There is also a seamless integration and exchange of corporate information and field data facilitating immediate decision-making in the field. Suitable technology is already here but has not been used to its full potential in plant biosecurity.

DAFWA's immediate contribution to the project (besides project leadership) was to develop a PDA application for the Urban Surveillance project (now Hazard Site Surveillance) through trapping and inspections for red imported fire ant, exotic snails, Asian gypsy moth, Malaysian fruit fly, citrus longicorn. Records collected during the pre-PDA surveillance in Western Australia were held in various unstructured dissimilar disparate spreadsheets and had to be laboriously converted to a relational Microsoft Access database. This must not be allowed to continue. Plant biosecurity workers must learn to work with relational databases. The current issue is that some enthusiastic workers with few computer skills left undirected can develop complex systems in spreadsheets that have no integrity whatsoever. This occurs as they enter data in the format that they would like to see it presented; that is as summary tables rather than data records

Initially our collaboration with DAFWA's Spatial Information Systems group meant that we were bound to work with Intergraph's IntelliWhere On-Demand deployed as a PDA extension to the desktop software Geomedia. Data is prepared in Geomedia in a desktop GIS environment and then published to a highly compressed file for use on a PDA. The use of airphoto or satellite imagery, or topographic map backdrops at the time was considered to be an important aid in confirming a user's location. Like other mobile GIS software, On-Demand displays an on-screen icon in the map interface to represent the users actual position on the ground. Aerial photos in particular are useful for confirming your position with reference to visible land marks. This mobile GIS solution required Geomedia and may not be well-received by other states who have developed parallel applications in the competing ESRI ArcView path. The development environment is complex but has the advantage of allowing users to use and edit maps and cadastre data visually on PDAs in the field.

As we worked with our GIS collaborators we found that they tend to want to start with a map and then add data; we were interested in pursuing more simple textual database solution. Our approach meant starting with a digital latitude and longitude, the maps could come later. Accordingly we built two prototype urban surveillance field data collection applications using both DDH Software's HanDBase and Syware's Visual CE.

HanDBase is widely used around the world by doctors who generally record patient data which can be synchronised directly to another doctor's PDA or a central server. It is a relational database that can read barcodes but does not support GPS. It is cheap at $45 per user but ran quite slowly on the PDA with 20,000 records and is likely to struggle as the database grows.

Visual CE proved to be the more industrial strength solution that runs relational databases on PDAs, can synchronise with Access and Oracle. Individual licences cost $200 and it supports barcode reading, PDA photography and full GPS support. The development environment is simple with wizards and an FAQ website to assist form development. The prototype urban surveillance database was built at DAFWA over two weeks by the Project Leader who is not a professional programmer. The prototype application has proved to be very fast and seamlessly pulled in data from the inbuilt GPS on the PDA. It allowed filtering to nearby properties and traps and could print and read barcode labels. Several PDAs can be synchronised on a single workstation.

During the second quarter of 2007 work was suspended while a post-border detection of Khapra beetle was dealt with. This significant investment in Khapra beetle eradication proved to be of value to the PDA project when it was decided that post-eradication monitoring for Khapra Beetle would become a start-up project. The Microsoft Access database holding the trap monitoring data was used daily providing the perfect beta test environment. It was inspected by the DAFWA Geospatial Information Systems group and declared BioSiRT compatible.

The urban surveillance data (approximately 18,000 flat records) was then imported into the new Khapra beetle relational database resulting in over 35,000 relational records fully synchronised between Access database and PDA.

After evaluating numerous PDA configurations 17 Ipaq RX5965 Travel Companions for field evaluation were purchased for distribution to beta testers from the Surveillance Reference Group. These units have Microsoft Windows Mobile 5.0 which includes Outlook, Word Excel as well as Bluetooth, WiFi internet and a built-in Sirfstar III GPS and TomTom navigation system. Daylight visibility is clear and we have found data entry via a software touch screen keyboard to be rapid and accurate. The GPS reduces battery life significantly when in use so field staff are expected to manage power by turning the unit off when not in use. Battery life was expected to be about six hours but the most achieved in actual use was 3.5 hours. Of course this is extended indefinitely with a car charger.

Trap run itineraries can be prepared using Google Earth or Google Maps and uploaded to the unit. These itineraries can then be used with TomTom to provide in-car voice navigation to properties. Traps can be held on the PDA as Points of Interest (POI) so that the unit beeps when within 100 metres of the trap. The ability to maintain itineraries and POI on desktop PCs and send to folders on the PDA is important because it allows the surveillance administrator to keep libraries of the various trapping runs on a PC and upload to PDAs as required. Navigation systems vary from PDA to PDA so some adaptation will be required. Newer locally purchased PDAs have been delivered with ALK Software's Copilot and the above use of itineraries and points of interest was readily adapted.

Initially printed of barcode labels was developed with a Zebra Road Warrior portable, ruggedized, Bluetooth thermal printer (approximately $1,300) which can be will be used to print two inch labels in the field for application to vials when specimens are found. While this unit worked well and could print in a wealth of different formats we found that the far cheaper Able-Systems model AP-1300 with Bluetooth connectivity worked just as well for our needs. This printer is very small and uses linerless labels.

The CRCNPB Science Exchange provided the opportunity for discussions with Dr Olivia Kvedaras (Research Entomologist, New South Wales Department of Primary Industries (NSWDPI), Wagga Wagga Agricultural Institute) and Dr Francis de Lima (Department of Agriculture and Food Western Australia) regarding incorporating the static and dynamic

fruit fly trap monitoring currently conducted in New South Wales (NSW) and Western Australia (WA). While we hoped to incorporate this new application in the existing one we found that it was sufficiently different to warrant a new application called Fruit Fly Phenology.

Syware's Visual CE was allowing rapid development and deployment of PDA applications and it was decided to upgrade to the Business Mobile suite (approximately $10,000) allowing four developers and unlimited users of PDA applications. This significant purchase provided a cross-platform application endorsed by the CRCNPB, with the potential to have developers in four states sharing the techniques, code and database with other collaborating organisations (including QUADs).

A workshop was held at DAFWA in 2008 to bring together collaborators from the grain industry with a view to adopting Personal Digital Assistants (PDAs) for better stored grains pest management. The workshop was attended by 21 researchers and industry representatives from eight organisations. There were short presentations from; **Ernestos Kostas** – Co-operative Bulk Handling Limited (CBH) an overview of challenges facing CBH with regard to inspecting grain stores for insects, and treating stores to avoid pests developing phosphine resistance. **Paul Pheloung** - National Perspective described field-based electronic systems developed over the past few years. **Damian Shepherd** – CRIS DAFWA an overview of how a geospatially-enabled client (land holder) and property database is linked with a number of other information systems at DAFWA. **Debra Riddell** – BioSIRT an overview of the BioSIRT Application and an update on the status of its implementation across Australia. **Antonio Robles-Kelly** – NICTA the work of NICTA in developing advanced computing and technology solutions for a number of projects across Australia. NICTA has the potential to provide an important capability for the development of sensor technology under this project. **Greg Hopkins** – ABB South Australia challenges facing ABB Grain with regard to inspecting grain stores for insects, and treating stores to avoid pests developing phosphine resistance. Previous attempts to introduce new technology (e.g. digital pens) to aid stored grain inspection and monitor phosphine application have not been successful. **Les Zeller** – National Perspective an overview of the benefits and limitations of using PDAs for a range of biosecurity and other applications of Australia. **Dean Bellingham** – Department of Primary Industries Victoria successful application of PDAs in Victoria for fruit fly surveillance based on the Urban Surveillance Database schema developed by the DAFWA CRCNPB PDA team. **Rob Emery** – DAFWA/CRCNPB demonstrated a successful application of PDA technology at DAFWA for urban surveillance of insect pests.

The workshop determined that future grain projects with PDAs should be focused on fumigation (phosphine) monitoring. There is a requirement to record details of infrastructure inspections (tarp, silo seals and pressure status etc) and it would be useful to be able to auto-generate alerts for these activities based on site history. There is a need for bulk handlers to maintain a chemical manifest and accurately record chemical usage and to incorporate insect pest collection records. There is also a need for a focus on grain identity preservation and grain hygiene compliance (grain spills and clean-up).

A side relationship developed along the way with Carissa Edmonds from the European House Borer project who continues to move forward with a multi-PDA pine tree monitoring application developed in collaboration with project CRC30014.

Analyst Programmer Nicolas Garel was appointed at DAFWA to work with the prototype application and develop a user-friendly interface with sub-forms to drill-down from Properties through Activities, Inspections to Specimens. The new interface incorporates

one-click links to Google Maps for Mobiles which will allow users to easily navigate to sites, view aerial photography of sites and even street views of properties. Issues resolved by the professional programmer include; GPS activation from within the application with one click, unique record IDs are generated within the application by combining deviceID and auto number so that data from multiple PDAs can be synchronised without primary key errors, the Visual CE imposed limit of three point Property and Activity filtering now adjusted to provide a rectangle around GPS points, GPSProxy used to redirect GPS output to the port used by the application (for devices that use unpredictable ports for GPS) and trap/activity barcode labels can be printed so that these barcodes can be used to verify correct trap/activity is being serviced when GPS fix is not available (recent developments now allow barcodes to be read with camera found on most PDAs), image recording of Activities and Specimens added so that users need only click an icon and a photograph will be taken and stored in the database.

Darryl Hardie, Rob Emery and Iain Martin (DAFWA IS Manager) presented the PDA Urban Surveillance PDA Application at a workshop in Canberra on the OCPPO-funded National plant pest indicator species surveillance program. This workshop held in February 2009 was attended by at least one representative from each state and territory except the ACT. The objective of the Surveillance Reference Group program is to collect surveillance data on indicator pests that are present in Australia but currently have limited geographic distribution. This information will be used to assess if pest distribution is changing as a result of changes in habitat or climatic conditions. The use of PDAs to assist data collection within this program will be trialled over the next few months and CRCNPB supplied six laptop and 15 PDAs for this purpose. Summary information from these activities will be included within the National Plant Surveillance Reporting Tool (NPSRT).

Feedback form these beta testers provided a number of refinements including a change to the way the PDA application records latitude and longitudes so that if a GPS fix cannot be found the user is asked to enter one or use the previous coordinates. This allows for one GPS reading to be taken outside, for example, a warehouse and this reading can be used for subsequent records added while inside the facility. Existing lat/long data were also protected against accidental replacement with a dialogue box. This is to ensure that remote lat/longs that would be very expensive to re-record cannot accidentally be over-written. A major structural change to the database was adopted so that cascading deletes meant that deleting a Property resulted in all child records for Activity, Inspection and Specimens being deleted thus maintaining referential integrity and ensuring smooth reliable synchronisation to the Access database on the desktop PC.

New forms were required in the desktop application to allow users to make changes and add data on the desktop PC as well as the PDA. Access has very sophisticated validation and referential integrity (Figure 1) however this cannot be transferred to the less refined PDA. Accordingly we developed a system where any record that is updated has its timestamp replaced to ensure new or edited data will be sent to the PDA at the next synchronisation. Also the use of multiple PDAs in the field required unique identifiers using the deviceID and an auto number and this system had to be replicated on the Access forms using the desktop PC hardware ID and an auto number compatible with that of the PDA.

Twenty Able-Systems AP-1300 portable thermal printers were purchased for distribution with PDA applications. These printers cost a little over $300 and will allow field printing of barcoded labels from within PDA applications. Validity checking, auditing and chain of evidence for sample collection will all be enhanced however to date few collaborators have

taken up the offer indicating that they may not be using the Urban Surveillance application to its best.

Debra Kent (NSW Ag) has worked closely with us on this project and has made small modifications to the Urban Surveillance database to facilitate her collection of Sycamore Lace bug data. Debra's distribution studies incorporate a lot of spatial data and images and she has found the Urban Surveillance application ideal for her needs. She is using the field printer and we have allocated one of the four Business Mobile 360 Visual CE developer licences to her so that she can modify the application further.

Toward the end of the project we took delivery of three HTC Touch HD PDA smartphones to evaluate how our Visual CE applications run in the new high definition 480 by 800 screens. Initial indications are that the Urban Surveillance application is fully functional however we need to consider how best to take advantage of the extra screen real estate while not compromising functionality on older 320 by 480 screens.

In January 2009, the CRCNPB revised the PDA contract to extend the project to 30 June 2009 to include the development of the Fruit Fly Phenology and PDA phosphine applications. The latter was to be built by an external contractor.

The Fruit Fly Phenology application was completed in June 2009 by adding eight fields to the urban surveillance database inspections table. It was completed and uploaded to the CRCNPB iMap document management system to join the Urban Surveillance / Khapra Beetle application which was completed and uploaded in March 2009.

A Contract Programmer was appointed to work on the Grains Phosphine Measurement PDA application. A very different approach was used to develop this application where it was decided to programmatically manage data. Unfortunately this approach had limitations set by the number of variables available in Visual CE and meant that only 19 fumigation sample lines could be recorded. A Select Site screen allows the user to select a site by selecting 'all sites' in the first drop down list; and then selecting the site in the second drop down list or by selecting sites within a distance, (100m, 400m, 1km, or 2km) in the first drop down list; this will reduce the number of sites to select in the second drop down list. The user can edit/set the selected sites latitude and longitude. Once the user has selected the site, they can then view the current treatments for each storage unit at the selected site. A Current Treatments screen lists all the storage units that are currently being treated at the selected site. From here the user would either, view existing readings or add new readings, for the selected storage unit. An Add Readings screen allows the user to enter an air reading and up to 3 line readings. If the user needs to add more than three line readings, then they can do so by clicking the 'Add more' button. The 'Add More' button, will take the user to another screen, where they can add another eight line readings. If the user still needs to add more line readings, then they can do so by clicking the 'Add more' button. The View Readings screen allows all readings to be viewed on the screen. The user clicks on the air reading in the top list, to see all the line readings in the bottom list. This work was completed uploaded to the CRCNPB iMap document management system in June 2009.

PDA applications developed in this project are now used to some extent in all states. The three main applications Urban Surveillance, Fruit Fly Phenology and Grain Fumigation are available as installable applications on the CRCNPB iMap document management system however it should be noted that the Urban Surveillance application incorporates Khapra beetle eradication as well as Khapra beetle monitoring bringing the total number of

applications developed by project CRC30014 to five. There are another two partner applications for European House Borer to Sycamore Lace bug developed by collaborators.

Note: An example layout of one of the three applications developed is provided below as an overview of the general approach used. Figure 1 shows the underlying Urban Surveillance Microsoft Access database and Figure 2 the Visual CE PDA interface in which data is collected prior to synchronising to the Access database. This one-is-to-many relationship of Property to Activity to Inspection to Specimen can be readily adapted to other surveillance projects

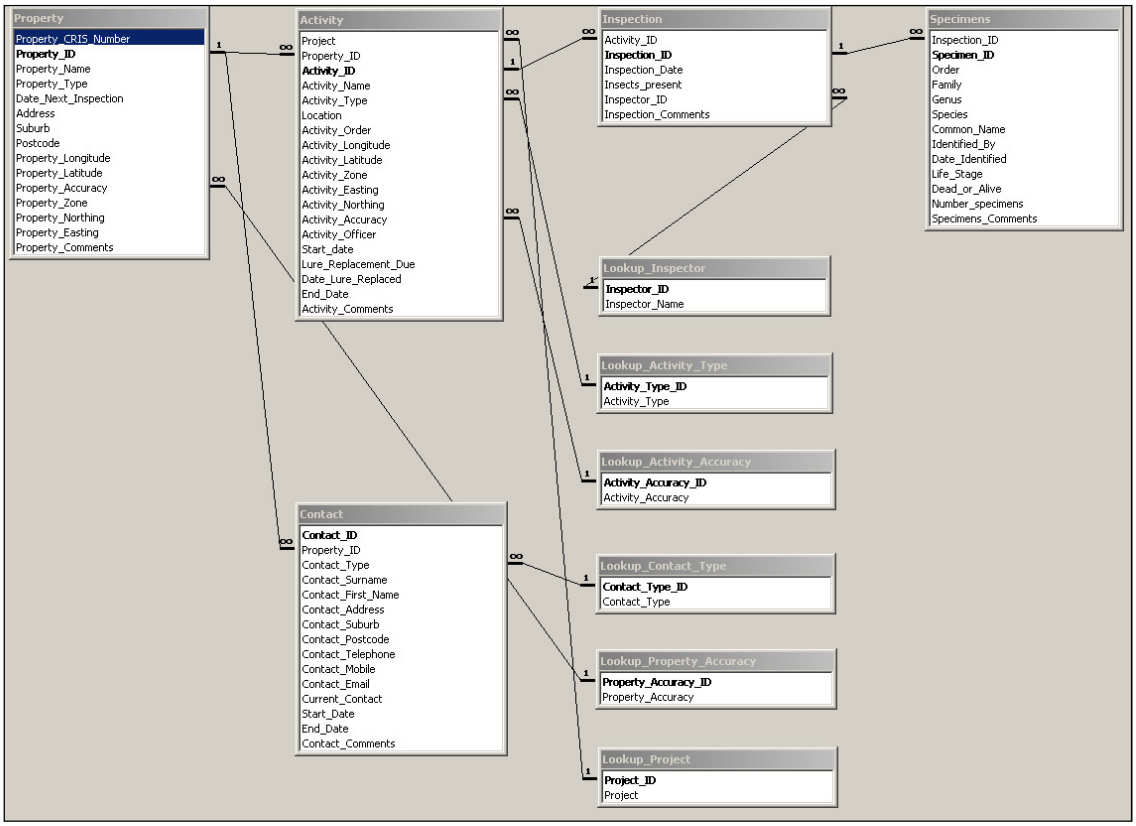

Figure 1 Urban Surveillance database relationships ensure referential integrity and provide a basis for other PDA applications.

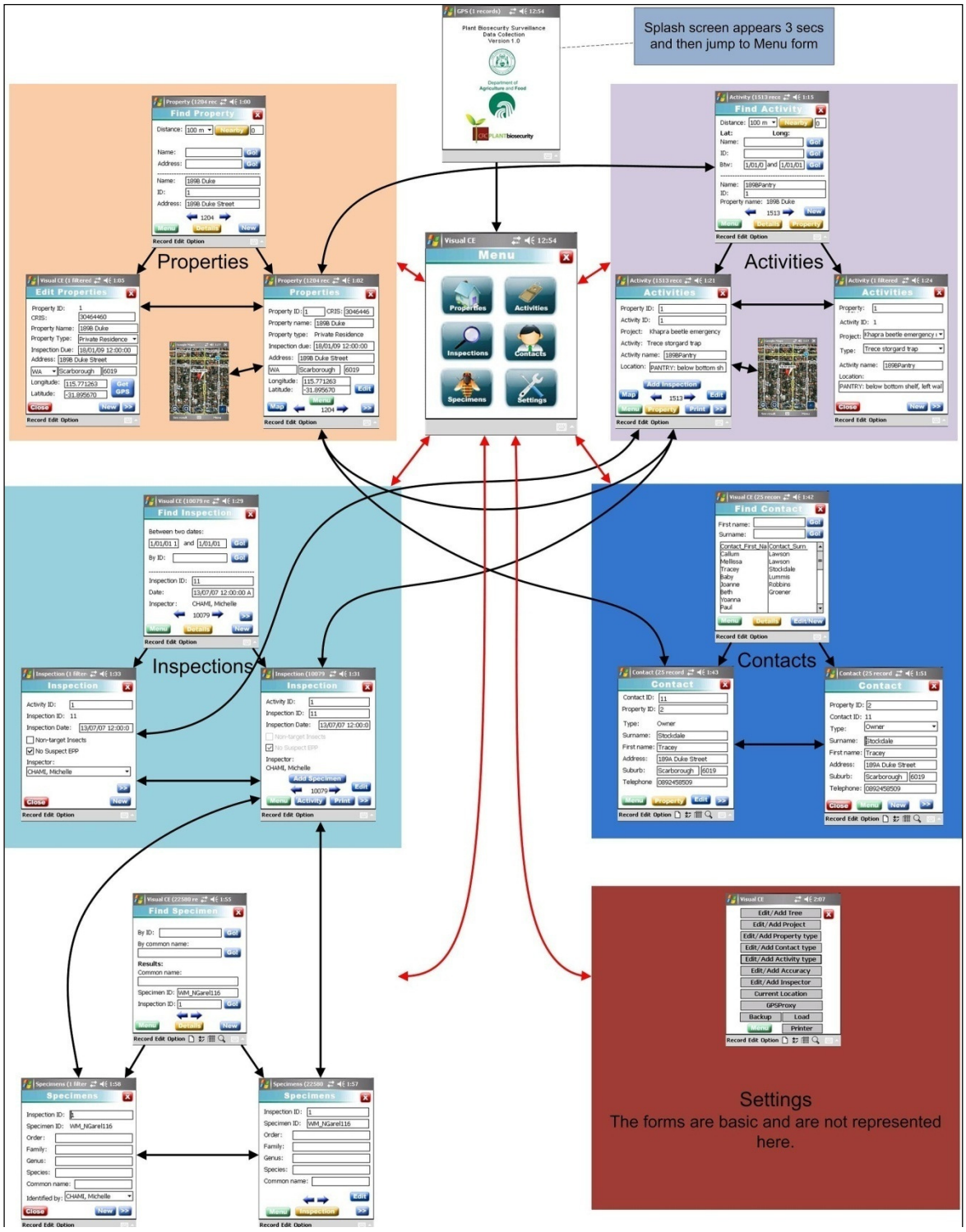

Figure 2 Urban Surveillance PDA application flow chart forms the basis for other PDA applications.

4. Implications for stakeholders

The implications for stakeholders are as laid out in the project aims as this project has achieved everything it set out to do. Data can now be collected with utmost integrity and, while it may not be required to support export industries right now, it may be in future if importing country challenges Australia's allegation that it is free of certain pests. Vast

amount of known not to occur data can be collected owing to the efficiencies of the PDA approach, these data have improved credibility and auditing with GPS coordinates, time and date stamps as well as evidentiary chain sample barcodes and PDA nag screens to remind field operatives to replace traps and or lures all add value to the zero. Non-target catches recorded serve to assure quarantine officials that the traps were serviceable thus providing supporting evidence to thwart claims that infestations of, for example khapra beetle, were not fully eradicated. Older paper-based systems may prove not to be worth the paper they are written on when compared to high quality digital data.

5. Recommendations

PDAs are here to stay.

An industry conference in July 2009 presented the push toward PDAs being ubiquitous in the retail industry. For example, companies are working towards a system where a user enters a retail outlet and the vendor's computer communicates with the user's PDA and determines things like groceries that need to be purchased, the user's clothing size etc. While not related to pest surveillance, the important thing is that PDAs are not going to be replaced with tablet PCs or mini-computers.

Several software developers have produced applications that use the PDAs built-in camera to read barcodes. We have trialled this in our existing units and it works well so potentially there will no longer be a need to carry a barcode reader with the additional load of charging batteries and making Bluetooth incoming connections. Two dimensional barcodes can hold a large amount of information and Taiwan is introducing a system where 2D barcodes will be used to track region of origin for agricultural produce.

The points above show that there is a strong future for PDA applications and the CRCNPB is a leader and should continue to closely monitor PDA developments to remain at the cutting edge. The application development environment chosen by this project, Syware Visual CE, appears to have a strong future. Smartphone & Pocket PC Magazine have awarded Visual CE 11 Professional Edition with Best Software Award in the Database Category for the fifth year in a row. Enthusiastic early-adopters in the Australian pest surveillance area should be encouraged participate in online discussion and to hold workshops to share ideas and modules developed in Visual CE rather than having CRCNPB collaborators solving the same problems in isolation.

One area not explored in the current project was the use of wireless synchronisation. While the project purchased a licence for Syware's mEnable wireless synchronisation server, it was not installed due to political/security implications because corporate databases would have to be hosted on a single server. The location of this server would have to be negotiated as would agreement of industry participants who may have concerns over the security of their data. If this can be resolved, PDA Visual CE users of CRCNPB developed applications will be able to synchronise their data from anywhere in the world provided their PDA can connect to the internet.

The project has been well-received by BioSIRT administrator Debra Riddell who has begun mapping fields so that PDA collected data can be seamlessly incorporated into BioSIRT. DAFF Surveillance Reference Group program leader Paul Pheloung has distributed PDAs to project staff and insisted that they return data to him following a specified structure. The follow-up PDA project CRC70085 must ensure that these relationships continue to flourish.

There is however some disappointment in the user uptake of this new technology. Some data collectors see the PDAs as an imposition because they have an established routine. Some complained that it was a minute or two slower to input data on the PDA than it was to write it on a clipboard; they forget that on returning to the laboratory many hours are spent inputting and double-checking data. This time is completely negated with the PDA approach as data is seamlessly synchronised with validity and integrity checking with one click.

The other concern is that some data collectors continue to store their data in spreadsheets and will tout 'It's all on the computer" but these data have no integrity whatsoever, there are no relational records no lookup tables and as a result duplication of records through misspellings and alternative spellings is rampant. A site entered in this way could sit among thousands of other records, analogous to returning a library book to the wrong shelf, and not be found for years. We must encourage users to work with PDAs and take advantage of the data integrity that is implicit. Our approach will also reduce the level of data loss to filing cabinets and other non-digital storages and provide avenues for a datum point to have multiple uses.

With this in mind we have developed a number of "enticements" for users the most recent being integration of Google Maps and itineraries into the PDA and desktop applications. We hope that users will be encouraged to work with the PDAs when they find that they can visualise sites with Google Maps and arrange these sites into a sensible itinerary and upload to the PDA so that voice navigation will lead field staff to locations in the most efficient manner.

The PDA data collection technology developed in the project has arrived a little before the users are ready and the challenge from here is to ensure uptake. This can be achieved by the CRC and other vested organisations providing help in the form of technical support from the IT and IS managements groups.

6. Abbreviations/glossary

ABBREVIATION	FULL TITLE
CRCNPB	Cooperative Research Centre for National Plant Biosecurity
EPP	Emergency plant pest
PDA	Personal digital assistant (Hand-held computer/ smartphone)

7. Plain English website summary

Please complete table using plain English. This information will be published on CRCNPB's website for a public audience.

CRC project no:	CRC30014
Project title:	PDA-Assisted Surveillance
Project leader:	Rob Emery
Project team:	Nicolas Garel, Michelle Chami, Darryl Hardie

Research outcomes:	There are increasing international concerns about food quality and safety, countries' import requirements are becoming more demanding and exporters including Australia now need not only to declare they are free from plant and animal pests and diseases, they need to demonstrate it too. As a result, pest surveillance has become a critical tool to secure market access. Exporting countries now need to provide accurate, credible data with evidentiary chain to confirm freedom status. Technical equipment, like Personal Digital Assistants (PDAs) have emerged as a powerful tool not only to collect information but also to improve the quality and application of the data collected. CRCNPB PDA software developed with Visual CE was successfully tested during the 2007 post-border detection of Khapra beetle in suburban Western Australia by providing evidence of complete eradication via 1,273 trap inspections. This achievement was supported by GPS-located traps, digital voice navigation itineraries, digital time and date stamps, field printed barcode labels, site imagery, Google Maps integration all in a single hand-held unit. New PDA hardware and software continues to be developed by the CRCNPB for use in other pest surveillance activities. These include, hazard site pest surveillance, stored grain fumigation monitoring, grain insect resistance testing and fruit fly phenology studies.
Research implications:	Australia remains committed to World Trade Organisation agreements, Sanitary and Phytosanitary agreements, the *International Plant Protection Convention* and International sanitary and phytosanitary measures and recognises the need for quarantine plant pest surveillance data of the utmost integrity is essential to support area freedom negotiations. With most of Australia's agriculture produce exported, securing and maintaining market access is critical as is the need to demonstrate freedom from certain plant and animal pests and diseases. Surveillance is an important tool for securing market access and accordingly exporting countries now need to provide accurate, credible evidence to confirm absence (i.e known not to occur) for pest freedom status. In the past nearly all field collected surveillance information was recorded manually to paper reducing the rate of capture, integrity, conformity as well as security of the data. This Cooperative Research Centre for National Plant Biosecurity (CRCNPB) project focused on the development of pest surveillance data collection software and hardware using hand-held computers or PDAs (Personal Digital Assistants). This approach provides chain of evidence control, increases the volume of data collected as well as its integrity through relational databases and seamless data transfer to corporate systems.

Research publications:	The applications completed during this project are the resultant publications. They are: Urban Surveillance application, Fruit Fly Phenology application, Grain Fumigation application and are available for download through the CRCNPB iMap document management system.
Acknowledgements:	Damian Shepherd, Iain Martin, John Bruce (DAFWA Spatial Information Systems) and Bob Vassallo (DAFWA Animal Biosecurity) provided technical input. DAFF Surveillance Reference Group participants collaborated with beta testing the Urban Surveillance application; Peter Gillespie, Deborah Kent, Craig Murdoch, Tony Monteith, Rebecca Yarrow, Bruce Baker, Wayne Marshall, Russell Elliott, Megan Szczerbanik, Nita Ramsden, James Swan, Heather Wallace, Richard Johnston, Cain Roberts, Melanie Hay, Jo Slattery, Sharyn Taylor, Stephen Dibley, Paul Pheloung, Gareth Men, Greg Hood, Debra Riddell, Peter Frecklington. Shirani Poogoda (DAFWA) beta tested the Fruit Fly Phenology application. Ern Kostas (CBH Group) beta tested the Grain Fumigation application. Peter Davis (DAFWA) beta tested with ant surveys on Christmas and Norfolk Islands.