

# ***The Virtual Australian Herbarium***

**Strategic Plan of the  
Herbarium Information Systems Committee (HISCOM),  
advisory committee to  
Council of Heads of Australian Herbaria (CHAH)**

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Council of Heads of Australian Herbaria, HISCOM members, AE Orchard ABRIS)

## ***The Vision of HISCOM***

“A widely accessible integrated Australian flora information system.”



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## 1. Summary

Since Australia's colonisation over 200 years ago, herbaria have been involved in cooperatively projecting information on Australia's rich and unique flora through publication of learned scientific works and popular authoritative handbooks.

This strategic plan maps a course over the three years from 1999 to 2001 for projecting these data and information on the Australian flora (plants, algae and fungi) electronically in an integrated way through:

- the development of a web site projecting a distributed, fully integrated Australian flora information system known as the *Virtual Australian Herbarium*
- completing data capture and setting up data quality protocols relating to herbarium collections (over 6 million, of which about 40% have been captured to date in data capture programmes in the Australian herbaria), including geocoded point location data
- completing the protocols for maintaining a shared national census and nomenclator of current and historic scientific names (via the *Australian Plant Names Index*) with input from specialists in plant groups and state and regional censuses maintained by Government herbaria
- gaining access to other distributed data linked to scientific names (images, descriptions, identification keys, etc.), largely held in herbaria
- development of applications enhancing business outcomes of Australian herbaria and the Virtual Australian Herbarium. Examples are:
  - ◇ mapping distributions (current knowledge, predictive)
  - ◇ modelling for comparing geographic and ecological areas in terms of plant biodiversity or threatened species)
  - ◇ provision of electronic regional, state or national floras or electronic manuals on specific plant groups
- setting up an framework for administering the Virtual Australian Herbarium

The development of this readily accessed flora information system will provide for the first time access to much of the data and information relating to Australian plants, algae and fungi stored in Australian herbaria or emanating from there. These data have been previously difficult to access, being locked up in individual specimen labels or technical manuals. Digitisation of data and use of modern software applications (such as in spatial modelling and identification tools) has increased accessibility and customisation to suit particular users.

## 2. Credits

This Strategic Plan arose from workshop sessions at the 1998 Canberra meeting of Herbarium Information Systems Committee (see Appendix for list of participants).

The strategic plan in this present draft form was prepared by Bill Barker with significant input by Paul Chododniuk, Chris Radbone, Nick Lander, Paul Gioia, Alan Brooks, Barry Conn, ... Authorship should be applied to all.

## 3. Further information

Further information can be obtained from:

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## 4. The role of Australian herbaria in advancing knowledge of biodiversity

### 4.1. *Historical perspective*

The Australian herbaria have had a long history of cooperation in advancing the knowledge of Australia's unique diversity of plants, algae and fungi through the publication of learned scientific works and popular authoritative handbooks. This quest for scientific knowledge dates back to the early voyages of discovery and, with British colonisation, the earliest land exploration. By the mid 1800s Government herbaria had been established in Sydney and Melbourne and resident systematists (botanists defining, describing and naming species and their relationships) increasingly took the role of providing information on our plant biodiversity.

### 4.2. *Specimens underpinning the growing biodiversity knowledge base*

Underpinning this knowledge has been a vast assemblage of 6.5 million specimens of plants, algae and fungi housed in the Government and other herbaria around the continent. This provides a foundation for providing distributional data on each species and a basis for the continuing scientific research which is essential to improving knowledge of each plant group.

This increasingly representative collection of specimens has led to increased resolution in the scientific understanding of the species that make up the Australian flora and their systematic relationships. Numbers of flowering plant species described for the continent have grown from x in 1810 (after Flinders's voyage), [6000] in [1863] (Bentham's *Flora australiensis*), to about 21 000 today (the assemblage of a long period of ongoing scientific studies, and state, regional and national handbooks).

Species names and circumscriptions change as the knowledge of all groups of Australian plants continues to advance. It is imperative therefore that biological data be attached to specimens (vouchers) to ensure accurate upgrading of names. Data not associated with such vouchers are prone to major decay in reliability.

### 4.3. *The cooperative approach to advancing knowledge*

For more than a century Australia's herbaria have worked cooperatively. Cooperation between herbaria has been built on the tenet that the most efficient way to advance knowledge of Australia's biodiversity is to research groups Australia-wide. Plants do not recognise State borders.

Out of such cooperation developed

- major traffic of specimens between herbaria in the form of loans and exchange
- field work by specialists in each herbaria taking place across the continent
- participation by Australian plant group specialists in handbooks in other states.
- the *Flora of Australia* project, first mooted in [1961], and now a major programme of the Australian Biological Resources Study (Environment Australia).
- The Council of Heads of Australian Herbaria (CHAH), founded in 19  . It has met

annually ever since.

- The society representing scientists involved in the taxonomy of Australian plants, the Australian Systematic Botany Society (ASBS), was founded in 1970, and sponsored many symposia and several major publications.

#### **4.4. Computers, data and information management and the founding of HISCOM**

Since the 1970s computers have been increasingly utilised in storing, collating and disseminating information. The herbaria in that time have developed an collections data interchange standard HISPID which is being used to facilitate exchange of data associated with exchanged collections. This standard has led the biological world and become accepted as an international standard.

In 1995 the Herbarium Information Systems Committee (HISCOM) was formed at a meeting in the National Herbarium of New South Wales as a working group of the active IT personnel (IT managers and systems analysts/programmers) giving advice to CHAH.

The aim of HISCOM from the outset has been to enhance through cooperative processes the capture, management and dissemination of data and information on Australia's plant biodiversity.

#### **4.5. The origins of the concept of the Virtual Australian Herbarium**

The Virtual Australian Herbarium (VAH) is the natural outcome of that initial aim of HISCOM. It describes the future, whereby data and information from the individual Australian herbaria are linked electronically into an effective, single, distributed entity.

The platform for the VAH is the World Wide Web. Its capability is achievable on present technology. Prototypes have already been developed for accessing distributed data, e.g. as presented by the Environmental Resources Information Network (ERIN: Environment Australia). Access to the large datasets involved is becoming increasingly more efficient; greater numbers of customers (users) are now able to draw information from databases in numbers and means that have never been available before. The science of informatics was recently the subject of an international symposium "Biological Informatics" in Canberra in July 1998

The overall aims of this project are to provide increased access to information and reduce costs and effort associated with gathering and delivering that information.

The VAH was first projected to CHAH at its meeting in 1996, and was presented in Adelaide in 1997 to a national conference of botanical and biological systematists. A poster on the VAH was presented to the international "Biological Informatics" symposium in Canberra in July 1998 (Appendix).

#### **4.6. The development of HISCOM's Strategic Plan**

This Strategic Plan arose from workshop sessions at the 1998 Canberra meeting of Herbarium Information Systems Committee. [It is being developed through a series of drafts before being ultimately presented to CHAH for ratification in late 1998]. It sets out the first steps to

making the vision of the Virtual Australian Herbarium a reality.

## **5. The role of the Herbarium Information Systems Committee (HISCOM).**

HISCOM was established to advise the Council of Heads of Australian Herbaria (CHAH) on matters relating to the cooperative development information systems within Australian herbaria.

With their business in managing large amounts of data and producing large information products, Australian herbaria have been involved with computers from the early 1970s. Developments in computerised information systems have proceeded unequally between herbaria through differences in ability to resource and in views on the immediate applicability of current information technology to the long-standing programmes in data and information.

HISCOM was formed in 1995 with the realisation across the herbaria that certain cooperative Australia-wide programmes were achievable with the existing resources and good-will. Proof of this cooperation was evident from the long tradition of cooperation between herbaria and, in particular:

- The development of a data interchange standard HISPID
- The free sharing of information and expertise in information system development between herbaria on an *ad hoc* basis

HISCOM's role therefore is:

- Provision of a forum for Australian herbaria for the exchange of ideas
- Setting cooperative directions for handling data and information
- Promotion of the advantages of a cooperative approach to management of herbarium data and information
- Continued development of data interchange standards, with the development of a specimen data interchange standard HISPID to two editions
- Promotion of sharing of expertise
- Promotion of the free exchange of common and shared datasets

Since its formation HISCOM has achieved:

- The development of *HISPID3* to a functional standard. It is already fully operating between several herbaria, and has been adopted as an international data standard by the Taxonomic Databases Working Group (TDWG).
- A proof of concept of a functional Web site for a Virtual Australian Herbarium with the placement of the Australian Type Photo Database with a record viewing and insertion capability
- The promotion of utilisation of taxonomic tools at a hands-on workshop at the Joint National Conferences of the Australian Systematic Botany Society and Society of Australian Systematic Biologists in Adelaide in September 1997
- The promotion of the concept of a cooperative approach to biodiversity data and information, including the concept of a Virtual Australian Herbarium, at the same conference in the symposium "Software in Systematics"
- The promotion of awareness of issues affecting all herbaria:

- ◇ Year 2000;
- ◇ move from an Australian to a World geodetic datum;
- ◇ ways of value-adding to point location data for setting biodiversity conservation priorities
- Overseeing the development of major shared resource for Australian herbaria, the *Australian Plant Names Index*, based in Centre for Plant Biodiversity Research, CSIRO, Canberra.

Expertise on HISCOM includes:

- Development of Web sites for all data types involved in plant biodiversity information. Western Australia's *FloraBase* is a functional plant biodiversity information system (Web URL: <http://florabase.calm.wa.gov.au/>). Other herbaria are in the process of developing similar Web sites.
- The development of PC tools, e.g. species data editing utility *Max* by the Western Australian Herbarium (this incorporates a names database, electronic collecting book, and various utilities, e.g. map and image display, locality coordinate calculator, etc.)
- Systems design in Oracle, KE TExpress, Access, FoxPro on Unix and the various Windows platforms
- LAN and PC requirements

## 6. The Vision of HISCOM

HISCOM's vision is "A widely accessible integrated Australian flora information system."

## 7. The Business Objective of HISCOM

The Virtual Australian Herbarium is a cooperative electronic flora information system. It meets the business objective of HISCOM to improve the sharing of data and information in Australian herbaria. For the external user, it will be an electronic Australian Flora, a one-stop source of information available on the plants, algae and fungi of a continent.

## 8. The Business Requirements of HISCOM

HISCOM seeks more efficient ways of providing access to Australia wide data and information traditionally provided by individual herbaria. The tabulation below portrays some of the ways in which these traditional activities will be handled with computerisation. It should be noted that some of these activities can be and are being handled electronically within largely traditional systems, but there are overall benefits of efficiency, cost, scope and accessibility to be had by a fully integrated electronic systems.

| Traditional activity ...<br>provision of:     | Electronic equivalent ...<br>provision via: |
|---|---|
| • Collector's label and names data associated | • Simultaneous querying of the distributed  |

| with herbarium specimens   | datasets in each herbarium   |
|--|--|
| <ul style="list-style-type: none"> <li>• Authoritative censuses (lists) of the scientific names currently recognised for the region under the Herbarium's jurisdiction (e.g. within State boundaries)</li> </ul>   | <ul style="list-style-type: none"> <li>• Use of the <i>Australian Plant Names Index</i>, a shared centralised dataset, either as an Australia-wide queries, but also for State and regional queries</li> </ul>   |
| <ul style="list-style-type: none"> <li>• Data relating to the nomenclature of all scientific names</li> </ul>  | <ul style="list-style-type: none"> <li>• Use of the <i>Australian Plant Names Index</i></li> </ul>   |
| <ul style="list-style-type: none"> <li>• Various data, often vouchered (linked to specimens to associate records with changes to current names). Data include: <ul style="list-style-type: none"> <li>◊ old names (synonyms),</li> <li>◊ descriptions,</li> <li>◊ identification keys,</li> <li>◊ text on ecology and biology,</li> <li>◊ uses,</li> <li>◊ common names,</li> <li>◊ conservation status,</li> <li>◊ weed status,</li> <li>◊ vouchers for scientific studies</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Links to distributed datasets held in herbaria</li> <li>• Currency of names facilitated by vouchering and updating of current names as collection datasets updated</li> </ul>   |
| <ul style="list-style-type: none"> <li>• Popular, semi-popular and scientific publications (floras, handbooks to plant groups, regional censuses). Note: Hardcopy versions can go out of date at an uneven rate as knowledge in groups advances.</li> </ul>  | <ul style="list-style-type: none"> <li>• Web information outputs vary to maximise use to clients.</li> <li>• Data sets will be kept current dynamically by maintenance by specialists and herbaria.</li> <li>• Protocols for hardcopy outputs can be established for production at any time</li> </ul> |
| <ul style="list-style-type: none"> <li>• Identification services.</li> </ul>   | <ul style="list-style-type: none"> <li>• Electronic interactive keys which now are being developed for PC/Web functionality</li> <li>• Text dichotomous keys in hypertext format</li> <li>• Image banks</li> </ul> <p>Note: all these will be maintained largely via distributed datasets</p>          |
| <ul style="list-style-type: none"> <li>• Publishing distribution maps (often a manual process)</li> </ul>  | <ul style="list-style-type: none"> <li>• Automated, dynamically linked to distributed geocoded specimen data</li> </ul>  |
| <ul style="list-style-type: none"> <li>• Advice on biodiversity conservation priorities (ad hoc, on limited to great awareness of distribution detail)</li> </ul>  | <ul style="list-style-type: none"> <li>• Access to consistently geocoded distributed full specimen record dataset</li> <li>• Predictive spatial modelling</li> </ul>   |
| <ul style="list-style-type: none"> <li>• Interpreting patterns in biodiversity data (in relation to physical and biological variables)</li> </ul>  | <ul style="list-style-type: none"> <li>• Automated process</li> </ul>  |
| <ul style="list-style-type: none"> <li>• Internal curatorial and business services (e.g. loans and exchange of specimens, data and information)</li> </ul>   | <ul style="list-style-type: none"> <li>• Barcoding</li> <li>• Electronic documentation</li> </ul>  |
| <ul style="list-style-type: none"> <li>• Early warning on new plant introductions (ad hoc process)</li> </ul>  | <ul style="list-style-type: none"> <li>• Automated process can be established.</li> </ul>  |

It is important that recognition be given to the Australian herbaria, the major long-standing custodians of data and information relating to Australia's plant, algal and fungi. The Virtual Australian Herbarium will be developed to insure that security, access, commercial and confidentiality interests of each participating Herbarium are protected.

While the Virtual Australian Herbarium will have its own point of access on the Web (with the URL *flora.net.au*), it will be able to be accessed from other nodal Government sites for biodiversity information used by the various herbaria.. This follows ERIN's model for the Australian Coastal Atlas.

## **9. Benefits of the Virtual Australian Herbarium**

The Australian herbaria have long been the major resource of sustainable data on Australia's plant, algal and fungal biodiversity and have had a long tradition of providing authoritative information and advice in this area. It is anticipated that Australian herbaria and collaborative organisations will gain increased national and international exposure via this new integrated access point to plant biodiversity data and information, while maintaining their recognition as data and information custodians.

There is a great demand for biodiversity data and information in digitised form. For example, experience with the public, community groups and schools has shown that the new computerised identification tools are much more attractive than the traditional handbooks. It is anticipated that meeting this increased demand for information will have a direct benefit to resourcing the scientific work of Australian herbaria in advancing the plant biodiversity knowledge base and continuing the dissemination of information about it.

A number of benefits therefore can be derived from pursuing the vision. These include:

- Increased access to database information.
- Increased exposure of Australian herbaria nationally and internationally.
- Reduced costs of processing data.
- Increased public awareness for the need of conservation issues.
- Virtual centralisation of datasets in the Australian herbaria, while giving herbaria appropriate custodianship, ownership and confidentiality, and protecting their commercial interests.
- Access to resources at multiple sites from a central port of call.

## **10. Benefits for external organisations in establishing strategic alliances in the development of the VAH**

Data and information on plant, algal and fungal biodiversity is basic to organisations in the areas of:

- applied health and medical research (pharmaceuticals)
- biotechnology
- agriculture and fisheries
- forest and forest products industries

- conservation and resource management
- ecotourism
- education
- basic biological science

In the past, such data and information, through its widely dispersed storage, have been effectively locked up in data associated with individual collections and in periodic limited views of that data summarised in specific ways such as presented in floras, handbooks, censuses and a dispersed scientific literature.

The development of the readily accessed flora information system envisaged as the Virtual Australian Herbarium will provide for the first time access to the complete pool of data, able to be customised to suit particular users.

## **11. Strategy for achieving a working Virtual Australian Herbarium**

The strategy proposed here is in the form of a series of prioritised projects strategically directed to meet the business needs of the Australian herbaria and their major customers.

Included is a Project Framework, which summarises the project attributes, and a detailed set of Project Plans.

The projects were decided upon and prioritised at the 1998 meeting of HISCOM. Priorities have been set in the first instance to maintain some major ongoing programmes in herbaria (specimen data capture and the final development stages of the *Australian Plant Names Index*) and bring a useful interim Virtual Australian Herbarium Web site into operation. The setting up of a fully integrated VAH Web site then follows.

## **12. Support required**

The support of the Australian herbaria in the form of computing hardware, personnel time and financial commitment is essential to the successful design, construction and implementation of the Virtual Australian Herbarium. **[Insert here a line re ratification of the Strategic Plan by CHAH98]**

However, without substantial external resources the Virtual Australian Herbarium will not progress beyond an interim capability in the short to medium term.

Resources required are summarised in the next section and given more detail in the Project Plans themselves.

### 13. Key Projects for the three years 1999/2000, 2000/2001, 2001/2002

A, essential for VAH Web site in first instance; B, desirable; C, optional (may be essential in longer term). †, partially implemented at State Level.

| No.  | Project title  | Status     | Priority code | Resources |                   |                   |
|--|--|------------|---------------|-----------|-------------------|-------------------|
|  |  |            |               | Committed | Internal required | External required |
| <b>Developing the VAH Web site</b>   |  |            |               |           |                   |                   |
| 1  | Develop an interim Virtual Australian Herbarium on the World Wide Web.   | Ongoing†   | A             |           |                   |                   |
| 2  | Develop a fully functional, integrated Virtual Australian Herbarium on the World Wide Web  | Future     | A             |           |                   |                   |
| 3  | Initiate and train herbarium and systematist users on capability of the VAH  | Ongoing    | A             |           |                   |                   |
| 4  | Develop capability for presentation of spatial data on the Web for the VAH   | Future†    | A             |           |                   |                   |
| 5  | Develop capability for accessing and presenting distributed data sets relating to identification tools, descriptive data sets, images, etc.          | Ongoing†   | C             |           |                   |                   |
| 6  | Publish VAH metadata in appropriate places (VAH site, ANZLIC metadatabase)   | Commenced† | C             |           |                   |                   |
| <b>Data capture and quality</b>  |  |            |               |           |                   |                   |
| 7  | Complete capture and validation of data associated with specimens in Australian herbaria   | Ongoing†   | A             |           |                   |                   |
| 8  | Bring the <i>Australian Plant Names Index</i> to be accessible on the Web maintained by specialists and the Australian herbaria as a shared resource | Ongoing    | A             |           |                   |                   |
| 9  | Complete development of <i>Australian Type Photo Database</i>  | Ongoing    | B             |           |                   |                   |
| 10   | Upgrade the data interchange standard HISPID on an ongoing basis   | Ongoing    | A             |           |                   |                   |
| 11   | Establish protocols and bring herbarium spatial data into line with new world-aligned geodetic datum (GDA94)   | Ongoing    | C             |           |                   |                   |
| <b>Applications development enhancing business outcomes of Australian herbaria and VAH</b> |  |            |               |           |                   |                   |
| 12   | Upgrade WA Herbarium's field data management tool <i>Max</i> to meet needs of Australian herbaria in general   | Proposed   | C             |           |                   |                   |
| <b>VAH Administration</b>  |  |            |               |           |                   |                   |
| 13   | Create and fill Project Manager and Administrative Support positions for the development of the VAH  | Future     | A             |           |                   |                   |
| 14   | Develop alliances of mutual benefit with external bodies   | Future     | B             |           |                   |                   |
| 15   | Herbaria (CHAH) to reach agreement on data access costs and charging mechanisms  | Proposed   | A             |           |                   |                   |
| 16   | Review strategic plan  | Ongoing    | A             |           |                   |                   |

## **14. Project Plans**

#### 14.1. Project Plan 1.

*Develop an interim Virtual Australian Herbarium on the World Wide Web*

##### **Project description**

Develop a Web site demonstrating a number of aspects envisaged for the Virtual Australian Herbarium, including

- a central access Web site with links to distributed image data using the *Australian Type Photo Database* (in Sydney and Perth),
- access to a subset of the national scientific names database *Australian Plant Names Index*,
- access by single query to distributed TExpress specimen databases (e.g. in Sydney and Adelaide) of an agreed group of plants.
- an online Web-generated point distribution mapping functionality (Project 4)
- a mechanism for client feedback by email

**Project status: Ongoing (partially implemented at state level)**

##### **Project objective**

- To establish a working interim Virtual Australian Herbarium Web site giving integrated and distributed functionality that can be built upon in Project 2.
- To confirm that the security issues relating to the various data custodians are satisfied.
- To confirm the ability of Australian herbaria to provide data cooperatively.

##### **Resourcing**

###### **Previous costs/ time frame**

External: \$20 000 (KE  
Software, *Aust. Type Ph. Db*)  
Internal \$ 300 000 (largely  
APNI)

###### **Investment required:**

External: \$ 250 000  
Internal \$ 100 000

##### **Key Performance Indicators**

- Query and secure read/write access to distributed image data in *Aust. Type Photo Db*.
- Read-only remote access to *Aust. Plant Names Index* at Canberra site
- Client feedback by email
- Query and read access to distributed specimen data at 2 sites
- Production of point distribution maps using dynamically produced distributed data

### Achievements to date

- An interim Web site at National Herbarium of New South Wales (URL: ) has been set up
- Proof-of-concept of read and write access to database at site (*Australian Type Photo Database*) has been achieved

### Action plan

| No  | Action  | Resourcing                                       | Target date | Progress  |
|-----|---|--|-------------|---|
| 1.1 | Establish the domain name of the VAH as <a href="http://www.flora.net.au">www.flora.net.au</a> (with HISCOM separated as <a href="http://www.hiscom.net.au">www.hiscom.net.au</a> )   |  | 31 Oct 98   | Applied for   |
| 1.2 | Investigate and report on establishment of strategic remote Web sites (IT nodes) for delivery of the VAH  | \$10 000   | 28 Feb 1999 |   |
| 1.3 | Prototype (test) distributed data access over Web using <i>Australian Type Photo Database</i> , including establishment of strategic IT nodes in Sydney and Perth, providing necessary infrastructure including licencing.  | Consulting: \$30 000<br>Infrastructure: \$50 000 | 31 Apr 1999 |   |
| 1.4 | Establish a subset of the <i>Australian Plant Names Index</i> in Canberra for read-only access from the VAH site  | Consulting: \$5 000<br>Infrastructure: \$5 000   | 31 Mar 1999 | In progress in Centre Plant Biodiversity Research, Canberra |
| 1.5 | Establish distributed secure access from the VAH Web site to specimen data on an agreed group of plants to strategic IT nodes in Sydney and Adelaide, providing the necessary infrastructure links to their TExpress databases<br>(Note: For extension of distributed specimen data access to other herbarium IT nodes, see Project Plan 2) | Consulting: \$60 000<br>Infrastructure: \$20 000 | 31 Jul 1999 |   |
| 1.6 | Establish on-line, Web-generated point distribution mapping functionality, utilising the spatial component of the specimen data from 1.5.<br>(Note: Assumes ability to use existing IT node and mapping infrastructure, e.g. in ERIN or State Government agencies)  | Consulting: \$40 000<br>Infrastructure: \$30 000 | 30 Sep 1999 |   |
| 1.7 | Establish a mechanism for client feedback by email  |  | 31 Apr 1999 | Functional on existing HISCOM Web page                      |

|

## 14.2. Project Plan 2.

*Develop a fully functional, integrated Virtual Australian Herbarium on the World Wide Web*

### **Project description**

Bring interim Virtual Australian Herbarium to full functionality by:

- incorporating existing distributed datasets relating to plant, algal and fungal biodiversity in each Government herbarium and ultimately all herbaria with Australian specimens and other data
- utilising existing “n-tier” web browser technology

### **Project status: Future**

### **Project objective**

- To provide on-line access for the public, land managers and conservation decision-makers, scientists and plant systematists and herbaria to integrated data and information previously available in non-integrated hardcopy.
- To establish a consistent charging regime, as determined by Council of Heads of Australian Herbaria, on data provided collectively by the Australian herbaria.

### **Assumptions**

- Sufficient specimen databasing and data validation has been completed to allow for a reasonable level of functionality for users (Project 7)
- The interim Virtual Australian Herbarium has delivered business outcomes using data from various herbaria (may have been in non-integrated form) (Project 1).
- An appropriate level of project management and administrative support is required (see Project 13).

### **Resourcing**

#### **Previous costs/ time frame**

See Project 1

#### **Investment required:**

External: \$350 000

External recurrent: \$80 000

Internal (staffing): \$120 000

#### **Key Performance Indicators**

- A functional interim VAH Web site
- Accessibility of sufficient specimen, names and other data for a reasonable level of functionality for users
- 

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### Action plan

| No. | Action   | Resourcing  | Target date | Progress    |
|-----|--|---|-------------|-------------|
| 2.1 | Review progress to date with <ul style="list-style-type: none"> <li>• interim Virtual Australian Herbarium (Project 1)</li> <li>• data capture and validation of herbarium specimens (Project 7)</li> <li>• spatial presentation of specimen data (Project 1)</li> <li>• accessing other distributed data sets (Project 5)</li> <li>• bringing <i>Australian Plant Names Index</i> to being maintained over the Web (Project 8)</li> </ul> | Consulting:<br>\$20 000   | 30 Nov 1999 | Applied for |
| 2.2 | Plan and provide necessary enhancements to interim VAH Web site <ul style="list-style-type: none"> <li>• front end (Web)</li> <li>• back end (distributed access, including normalisation of data)</li> <li>• middle layer (integration, security, access levels)</li> </ul>   | Consulting:<br>up to \$80 000<br>Infrastructure:<br>up to \$150 000 | 31 Apr 2000 |             |
| 2.3 | Implementation (training, standards, central and remote site management)   | Consulting:<br>up to \$80 000                                       | 30 Jun 2000 |             |
| 2.4 | Post-implementation review   | Consulting:<br>\$20 000   | 31 Dec 2000 |             |
| 2.5 | Ongoing annual support and maintenance (licencing, site management, etc.)  | \$80 000 p.a.   |             |             |

14.3. *Project Plan 3.*

*Initiate and train herbarium and systematist users on capability of the VAH*

**Project description**

**Project status: Ongoing**

**Project objective**

| <b>Resourcing</b>                 |
|-----------------------------------|
| <b>Previous costs/ time frame</b> |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |
| <b>Investment required:</b>       |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |

| <b>Key Performance Indicators</b> |
|-----------------------------------|
| •                                 |

**Achievements to date**

**Action plan**

| <b>No.</b> | <b>Action</b> | <b>Target date</b> | <b>Progress</b> |
|------------|---------------|--------------------|-----------------|
|            |               |                    |                 |

14.4. *Project Plan 4.*

*Develop capability for presentation of spatial data on the Web for the VAH*

**Project description**

- Investigation and evaluate of alternative methods for the generation and distribution of plant distribution data for graphic display over the WWW.
- Investigate and evaluate alternative delivery mechanism, eg. real-time map generation vs batch processing.

**Project status: Future**

**Project objective**

Evaluation of effective methods for the provision of current distributional information for Australian plant taxa in graphic format which can be displayed in the WWW environment with some level of user interaction.

**Resourcing**

**Previous costs/ time frame**

External:  
Internal: \$30 000  
(WA Herbarium)

**Investment required:**

External: \$70 000  
Internal: \$5 000

**Key Performance Indicators**

- Provision of a range of alternative methods and costings

**Achievements to date**

**Action plan**

| <b>No.</b> | <b>Action</b> | <b>Target date</b> | <b>Progress</b> |
|------------|---------------|--------------------|-----------------|
|            |               |                    |                 |

14.5. *Project Plan 5.*

*Develop capability for accessing and presenting distributed data sets relating to identification tools, descriptive data sets, images, etc.*

**Project description**

**Project status: Ongoing**

**Project objective**

| <b>Resourcing</b>                 |
|-----------------------------------|
| <b>Previous costs/ time frame</b> |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |
| <b>Investment required:</b>       |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |

| <b>Key Performance Indicators</b> |
|-----------------------------------|
| •                                 |

**Achievements to date**

**Action plan**

| <b>No.</b> | <b>Action</b> | <b>Target date</b> | <b>Progress</b> |
|------------|---------------|--------------------|-----------------|
|            |               |                    |                 |

*14.6. Project Plan 6.*

*Publish VAH metadata in appropriate places (VAH site, ANZLIC metadata base)*

**Project description**

Publish metadata descriptions of all natural resource data and information held by the Australian herbaria

**Project status: Commenced, partially implemented at State level**

**Project objective**

To describe general attributes of herbarium data sets and information and disseminate these data via the VAH site and appropriate metadata publications

**Resourcing**

**Previous costs/ time frame**

External: 0 FTE

\$0

Internal 0.25 FTE

\$15 000

**Investment required:**

External: FTE

\$0

Internal 0.05 FTE

\$2 500

**Key Performance Indicators**

- VAH Metadata published in ANZLIC metadata base
- ditto VAH site
- ditto annually

**Achievements to date**

Fully implemented at the State Herbarium of South Australia and the National Herbarium of New South Wales, within the ANZLIC metadata framework

**Action plan**

| <b>No.</b> | <b>Action</b>  | <b>Target date</b> | <b>Progress</b> |
|------------|--|--------------------|-----------------|
| 1          | Compile an ANZLIC compliant metadata set for the VAH | July 1999          |                 |
| 2          | Establish an annual review process for this data set | July 2000          |                 |

#### 14.7. Project Plan 7.

##### *Complete capture and validation of data associated with specimens in Australian herbaria*

#### **Project description**

Digitise all data associated with specimens in Australian Government and University and other herbaria in form able to meet HISPID data transfer standard, beginning with Government herbaria to provide representation across Australia. Include data quality programme, particularly in geocode for spatial inventory. Provide for ongoing maintenance programme for application of current scientific name to each collection.

#### **Project status: Ongoing**

Ongoing in all herbaria (there will be a permanent need to keep names up to date and to database incoming collections).

Some herbaria (Western Australian, Queensland, Northern Territory) fully databased, with ongoing programmes handling incoming collections. Some of these need data validation programme, e.g. to check quality of geocode fields

Most herbaria still with a large legacy of existing holdings to be databased.

#### **Project objective**

To provide:

- a fully digitised distributed set of site data for all herbarium specimens of Australian plants, collectively the only sample of Australia's plant, algal and fungal biodiversity able to be maintained with current names as taxonomic knowledge advances.
- a dynamic ongoing specimen-vouchered spatial inventory to provide foundation for establishing sound priorities in biodiversity conservation by way of predictive spatial modelling.

#### **Resourcing**

##### **Previous costs/**

External: \$10 000 000 (e.g. ABRIS, ERIN)

Internal: \$300 000 000

##### **Investment required:**

External: \$21 000 000 (existing specimen holdings)

Internal: \$4 750 000 annually (incoming specimens)

#### **Key Performance Indicators**

- Protocols for validation of data (particularly point and names data) set up in each herbarium
- Compatibility confirmed/established in core fields
- Attainment of annual goals for data capture (to be determined) with projection on Virtual Australian Herbarium Web site

### Achievements to date

Data capture in Australian herbaria. Estimated costs (

| Herbarium            | Date commenced | Total specimen holdings | Cost of collection and maintenance (\$50/specimen) (cf. J. Armstrong paper) | Number of existing holdings to be databased                                  | Cost of capturing & maintaining data for existing holdings (\$4.50/specimen) | Annual accession | Cost of capturing & maintaining incoming (\$4.50/specimen) |
|----------------------|----------------|-------------------------|---|--|--|------------------|--|
| Adelaide             | 1989           | 850 000                 | \$43M   | 680 000  | \$3.0M   | c. 12 000        | \$60 000   |
| Brisbane*            |                | 600 000                 | \$30M   | None for some data, but some additional data fields for whole to be captured | \$1.2M   | c. 15 000        | \$75 000   |
| Canberra             |                | 1 214 000               | \$61M   | 750 000  | \$3.8M   | c. 15 000        | \$75 000   |
| Darwin*              |                | 174 000                 | \$9M  | 0  | \$0.1M   | c. 5 000         | \$25 000   |
| Hobart               |                | 435 000                 | \$22M   | 370 000  | \$1.8M   | c. 5 000         | \$25 000   |
| Melbourne            |                | 1 125 000               | \$56M   | 1 010 000  | \$5.05M  | c. 10 000        | \$50 000   |
| Perth*               | 1988           | 465 000                 | \$24M   | c. 15 000  | \$0.1M   | c. 15 000        | \$75 000   |
| Sydney               |                | 1 000 000               | \$50M   | 700 000  | \$3.5M   | c. 15 000        | \$75 000   |
| University herbaria* |                | 350 000                 | \$18M   | 300 000  | \$1.5M   | c. 3 500         | \$17 500   |
| Overseas*            |                | 200 000                 | \$10M   | 0  | \$1.0M   | 0                | 0  |
| <b>Totals</b>        |                | <b>6 413 000</b>        | <b>\$323M</b>   | <b>3 825 000</b>   | <b>\$21M</b>   | <b>c. 95 000</b> | <b>\$477 500</b>   |
|                      |                |                         |   | <b>plus Brisbane's</b>   |  |                  |  |

\* "Fully databased": note that data may have to be normalised to make compatible with other herbaria owing to early activity in data capture before current standards set.

**Project Plan 7 (cont.)**

**Action plan (3 year programme: wider time frame is negotiable)**

| <b>No.</b> | <b>Action</b>  | <b>Resourcing</b>  | <b>Target date</b> | <b>Progress</b> |
|------------|--|--|--------------------|-----------------|
| 7.1.       | Develop data validation protocols for specimen data across all herbaria<br>(Note: ERIN has an in-house program which tests species distributions against an old version of BIOCLIM. This could be modified for use in its present form, in the first instance, but could be upgraded to accommodate new versions of BIOCLIM) | Consulting:<br>up to \$50 000<br>Infrastructure:<br>up to \$50 000 | 30 Jun 1999        |                 |
| 7.2.       | Accommodate the new world-aligned geodetic and grid datums (Project 11)  | See Project 11   |                    |                 |
| 7.2.       | Agree on and modify the core fields required to provide consistency in integrated data sets and test compatibility of these core fields  | Internal:<br>HISCOM  | 30 Jun 1999        |                 |
| 7.3.       | Institute 3 year data capture and data validation programme  | Contracts by<br>Govt herbaria:<br>\$21 000 000                     | 30 Jun 2002        |                 |



14.8. *Project Plan 8.*

*Bring the Australian Plant Names Index to be accessible on the Web maintained by specialists and the Australian herbaria as a shared resource*

**Project description**

**Project status: Ongoing**

**Project objective**

| <b>Resourcing</b>                 |
|-----------------------------------|
| <b>Previous costs/ time frame</b> |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |
| <b>Investment required:</b>       |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |

| <b>Key Performance Indicators</b> |
|-----------------------------------|
| •                                 |

**Achievements to date**

**Action plan**

| <b>No.</b> | <b>Action</b> | <b>Target date</b> | <b>Progress</b> |
|------------|---------------|--------------------|-----------------|
|            |               |                    |                 |

14.9. *Project Plan 9.*  
*Complete development of Australian Type Photo Database*

**Project description**

**Project status: Ongoing**

**Project objective**

| <b>Resourcing</b>                 |
|-----------------------------------|
| <b>Previous costs/ time frame</b> |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |
| <b>Investment required:</b>       |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |

| <b>Key Performance Indicators</b> |
|-----------------------------------|
| •                                 |

**Achievements to date**

**Action plan**

| <b>No.</b> | <b>Action</b> | <b>Target date</b> | <b>Progress</b> |
|------------|---------------|--------------------|-----------------|
|            |               |                    |                 |

14.10. Project Plan 10.

*Upgrade the data interchange standard HISPID on an ongoing basis*

**Project description**

Upgrade the data interchange standard HISPID on an ongoing basis

**Project status: Ongoing**

**Project objective**

To develop HISPID so that it is able to cater for various data formats and types

| <b>Resourcing</b>                 |
|-----------------------------------|
| <b>Previous costs/ time frame</b> |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |
| <b>Investment required:</b>       |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |

| <b>Key Performance Indicators</b> |
|-----------------------------------|
| •                                 |

**Achievements to date**

**Action plan**

| <b>No.</b> | <b>Action</b> | <b>Target date</b> | <b>Progress</b> |
|------------|---------------|--------------------|-----------------|
|            |               |                    |                 |

14.11. *Project Plan 11.*

*Establish protocols and bring herbarium spatial data into line with new world-aligned geodetic datum (GDA94)*

**Project description**

**Project status: Ongoing**

**Project objective**

- To bring HISPID into line
- Use modified HISPID and the various government's geodetic services to bring each herbarium spatial data inot line
- provide education process for collectors etc to use these standards

| <b>Resourcing</b>                 |
|-----------------------------------|
| <b>Previous costs/ time frame</b> |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |
| <b>Investment required:</b>       |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |

| <b>Key Performance Indicators</b> |
|-----------------------------------|
| •                                 |

**Achievements to date**

**Action plan**

| <b>No.</b> | <b>Action</b> | <b>Target date</b> | <b>Progress</b> |
|------------|---------------|--------------------|-----------------|
|            |               |                    |                 |

14.12. Project Plan 12.

*Upgrade WA Herbarium's field data management tool Max to meet needs of Australian herbaria in general*

**Project description**

1. Bring the *Australian Plant Names Index* (APNI) into Max.
2. Construct a centralised electronic collecting book satisfying the needs of all Australian herbaria, with (a) all HISPID fields supported, (b) customizable forms, (c) exportable reports in HISPID format.

**Project status:** Proposed. Subject to availability of external funding.

**Project objective**

- To enable all Australian herbaria to provide their collectors with a standardized a method and tool to record label data and input these into institutional database systems.
- To leverage collector effort to maximise data recording quality, quantity and uptake, thus enabling herbaria to make the best of limited resources.

**Resourcing**

**Previous costs/ time frame**

Time frame: 2 years

External: 0 FTE

\$0

Internal 0.5 FTE

\$50 000

**Investment required:**

Time frame: 1 month

External: 0.1 FTE

\$5000

Internal 0.1 FTE

\$5000

**Key Performance Indicators**

- APNI ported to MAX
- System tested, debugged, refined

**Achievements to date**

**Action plan**

| <b>No.</b> | <b>Action</b> | <b>Target date</b> | <b>Progress</b> |
|------------|---------------|--------------------|-----------------|
|            |               |                    |                 |

14.13. *Project Plan 13.*

*Create and fill Project Manager and Administrative Support positions for the development of the VAH*

**Project description**

**Project status: Future**

**Project objective**

| <b>Resourcing</b>                 |
|-----------------------------------|
| <b>Previous costs/ time frame</b> |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |
| <b>Investment required:</b>       |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |

| <b>Key Performance Indicators</b> |
|-----------------------------------|
| •                                 |

**Achievements to date**

**Action plan**

| <b>No.</b> | <b>Action</b>                                   | <b>Target date</b> | <b>Progress</b> |
|------------|---|--------------------|-----------------|
| 13.1       | Create and fill Project Manager position        |                    |                 |
| 13.2       | Create and fill Administrative Support position |                    |                 |

14.14. *Project Plan 14.*  
*Develop alliances of mutual benefit with external bodies*

**Project description**

**Project status: Future**

**Project objective**

| <b>Resourcing</b>                 |
|-----------------------------------|
| <b>Previous costs/ time frame</b> |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |
| <b>Investment required:</b>       |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |

| <b>Key Performance Indicators</b> |
|-----------------------------------|
| •                                 |

**Achievements to date**

**Action plan**

| <b>No.</b> | <b>Action</b> | <b>Target date</b> | <b>Progress</b> |
|------------|---------------|--------------------|-----------------|
|            |               |                    |                 |

14.15. *Project Plan 15.*  
*Herbaria (CHAH) to reach agreement on data access costs and charging mechanisms*

**Project description**

**Project status: Proposed**

**Project objective**

| <b>Resourcing</b>                 |
|-----------------------------------|
| <b>Previous costs/ time frame</b> |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |
| <b>Investment required:</b>       |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |

| <b>Key Performance Indicators</b> |
|-----------------------------------|
| •                                 |

**Achievements to date**

**Action plan**

| <b>No.</b> | <b>Action</b> | <b>Target date</b> | <b>Progress</b> |
|------------|---------------|--------------------|-----------------|
|            |               |                    |                 |

14.16. *Project Plan 16.*  
*Review strategic plan*

**Project description**

**Project status: Ongoing**

**Project objective**

| <b>Resourcing</b>                 |
|-----------------------------------|
| <b>Previous costs/ time frame</b> |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |
| <b>Investment required:</b>       |
| External: FTE                     |
| \$                                |
| Internal FTE                      |
| \$                                |

| <b>Key Performance Indicators</b> |
|-----------------------------------|
| •                                 |

**Achievements to date**

**Action plan**

| <b>No.</b> | <b>Action</b>  | <b>Target date</b> | <b>Progress</b> |
|------------|--|--------------------|-----------------|
| 16.1       | Canvass user requirements for the Virtual Australian Herbarium |                    |                 |

## 15. HISCOM Virtual Australian Herbarium Project Team

### IT Managers and Systems Analysts/Programmers in Australian Government Herbaria

#### *State Herbarium of South Australia (AD)*

Bill Barker (Project Manager ex officio Convener, HISCOM)

Sharon Pearn

Chris Radbone

#### *Queensland Herbarium (BRI)*

Peter Bostock

#### *Centre for Plant Biodiversity Research (CANB)*

Jim Croft, Hosting Institution Convener

Pennie Hohnen

John Hook

Greg Whitbread

#### *Northern Territory Herbarium (DNA)*

Clyde Dunlop

Anne Fuchs

#### *Tasmanian Herbarium (HO)*

Alison Melrose

#### *National Herbarium of Victoria (MEL)*

Paul Cholodniuk

Peter Neish

#### *National Herbarium of New South Wales (NSW)*

Gary Chapple

Barry Conn

#### *Western Australian Herbarium (PERTH)*

Alex Chapman

Paul Gioia

Nik Lander

### Special participants in HISCOM projects

Alan Brooks, KE Software (formerly NSW)

Tony Orchard (ABRS)

Tony Rosling (ERIN)

Kevin Thiele (Botanical Consultant)

**16. Appendix: Presentation to Biological Informatics conference on  
the Virtual Australian Herbarium**