



Collection, storage and presentation of 3S data: some examples from the Archaeological Computing Laboratory, University of Sydney

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Archaeological Computing Laboratory

The International Symposium on Historical Research of Plank
Roads and Applications of 3S Technology.
Hanzhong, 16 May 2007

Outline

- Site studies using 3S technology
 - Sydney *TimeMap*
 - Museum interactive using GIS
 - Geo-referenced historical maps
 - Angkor
 - Remote sensing
 - GIS for sites and structures
 - Reuse of digital data
 - Monitoring site impacts
- Techniques
 - Mapping photographs with GPS
 - Documenting digital fieldwork

The Museum of Sydney on the Site of First Government House



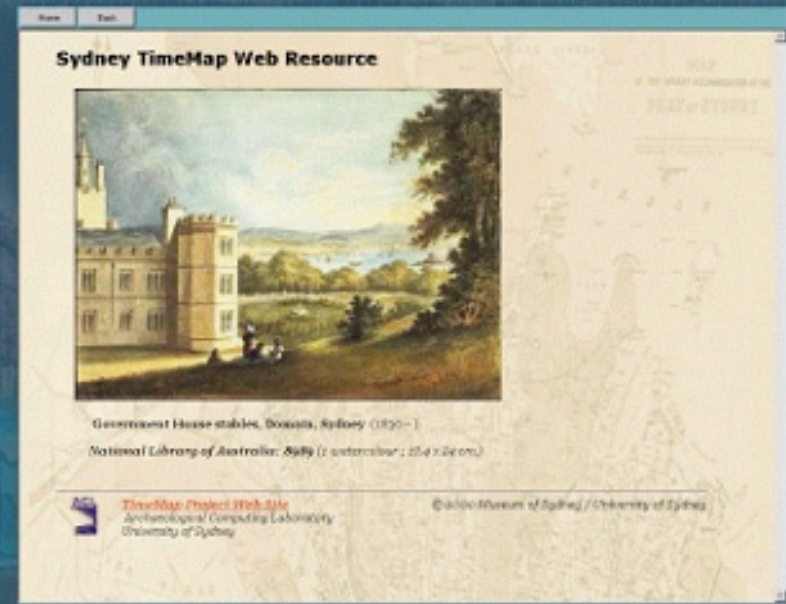
Sydney *TimeMap* - kiosk installation

- Stand-alone interactive
 - Museum's Information Centre



Sydney TimeMap - kiosk installation

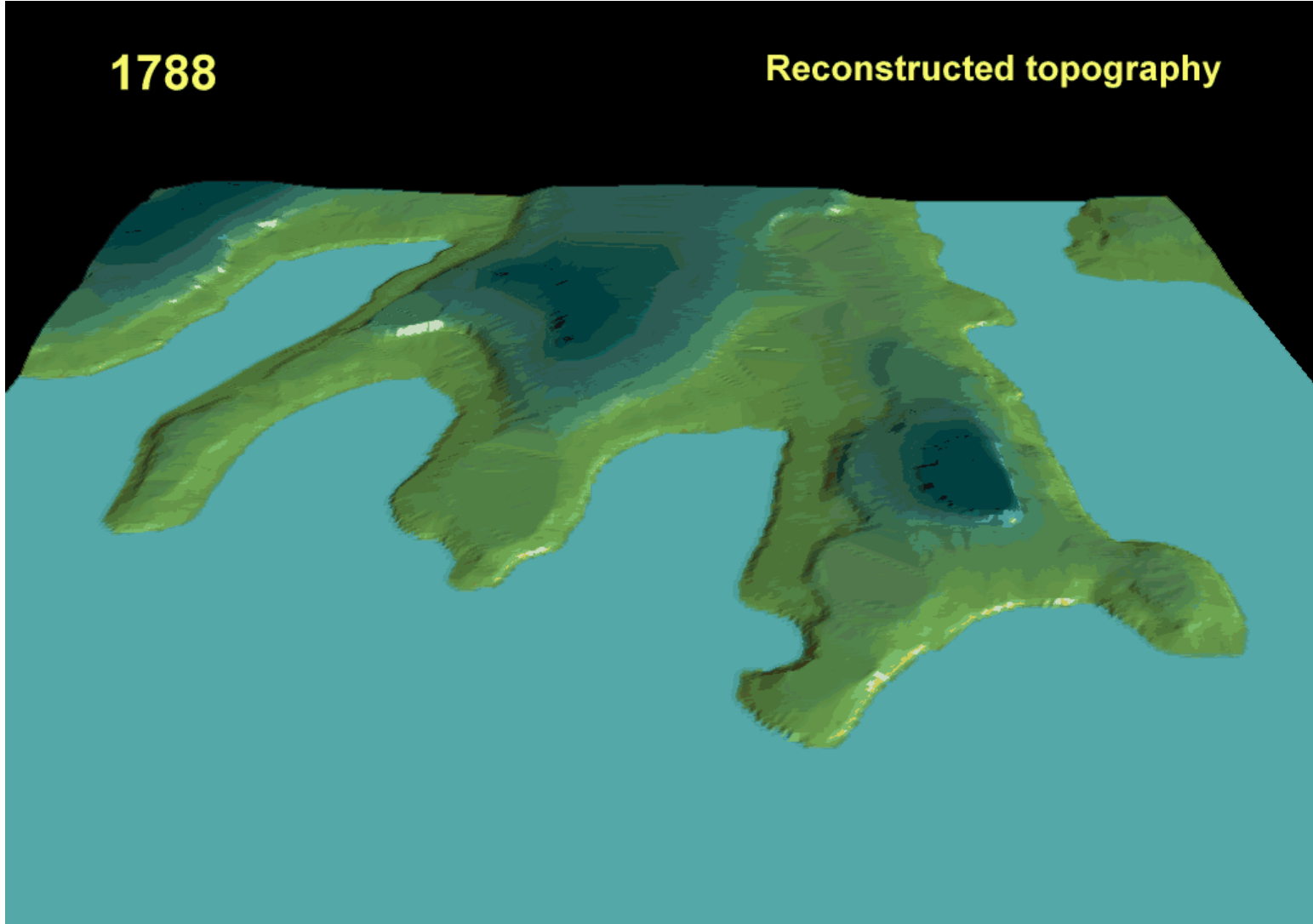
- Access to map based resources
 - Normal GIS functionality
 - Time slider bar – selection by time



Sydney *TimeMap* – historic maps

1788

Reconstructed topography





Greater Angkor Project

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Welcome



Welcome to the web site of the Greater Angkor Project (GAP), an international, multidisciplinary research programme interested in the decline of urbanism at Angkor, in Cambodia. Specifically, the project is investigating the relationship between the vast extent of Angkor in the 12th to 16th centuries AD, land clearance for rice production and regional ecological damage both then and now. The study has implications for the past and the future health of the regional ecosystem, sustainable development and the management of Angkor as a national and an international cultural resource.

This web site provides a general overview of the project's objectives and outcomes in addition to providing a resource for students and professionals involved in the project. If the information you need is not available here, or if you would like further information, please email us at gap@acl.arts.usyd.edu.au

News, events and announcements will appear regularly within the [Activities](#) section so please make sure to check out our [calendar of events](#).

We will be hosting an international conference [Angkor - Landscape, City and Temple](#) in Sydney from 18-23 July 2006

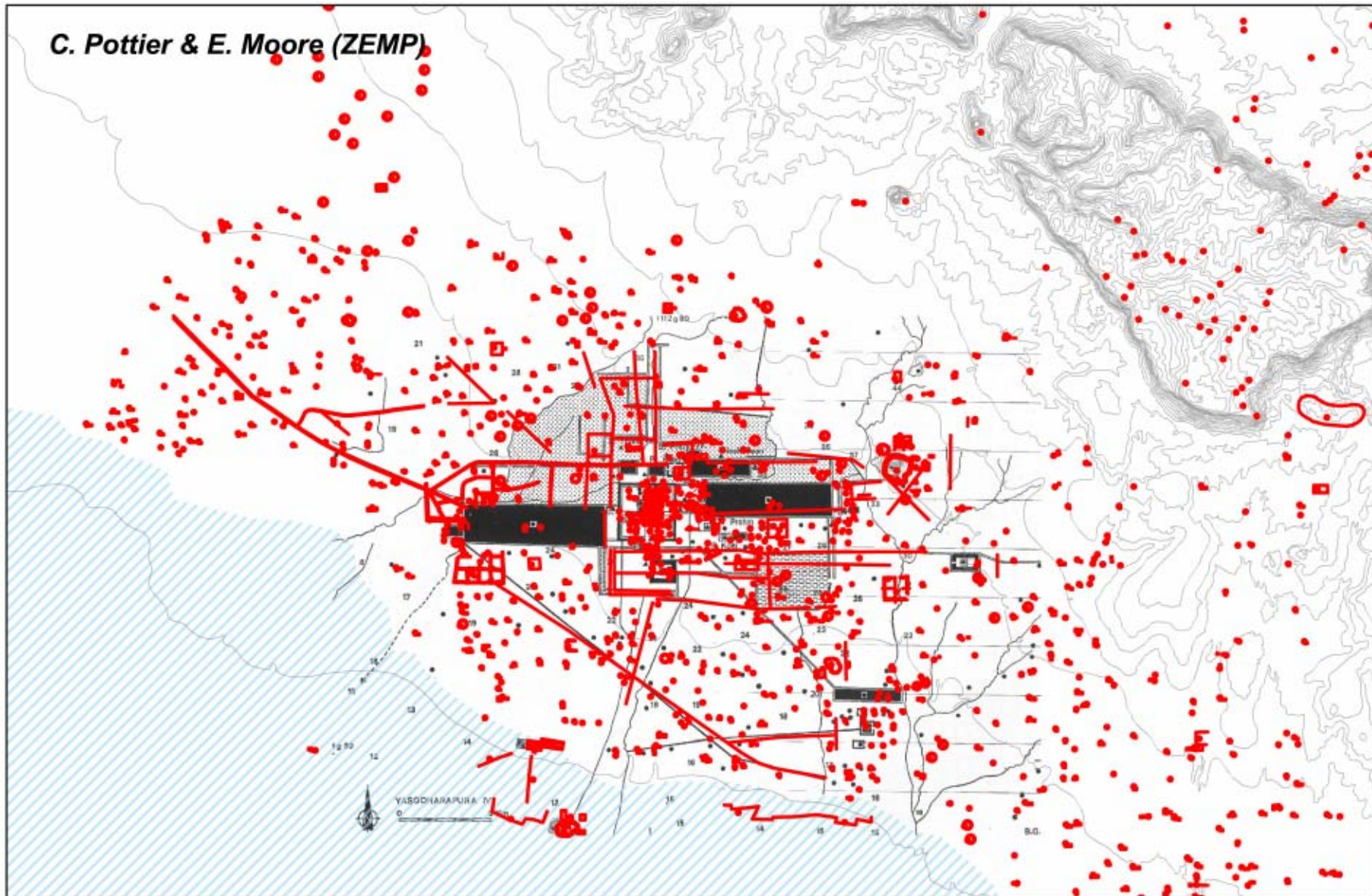
Students and professionals looking to become involved in the project should consult the [page](#).

Important: GAP project members should email the webmaster on the email below to obtain a password in order to view special-access sections of this site. If you have a username and password, please click on the panel on the left hand side of every page.

Members of the general public may also register with us to gain access to certain resources by using the "No account? Create one" link on the login panel at left.



C. Pottier & E. Moore (ZEMP)

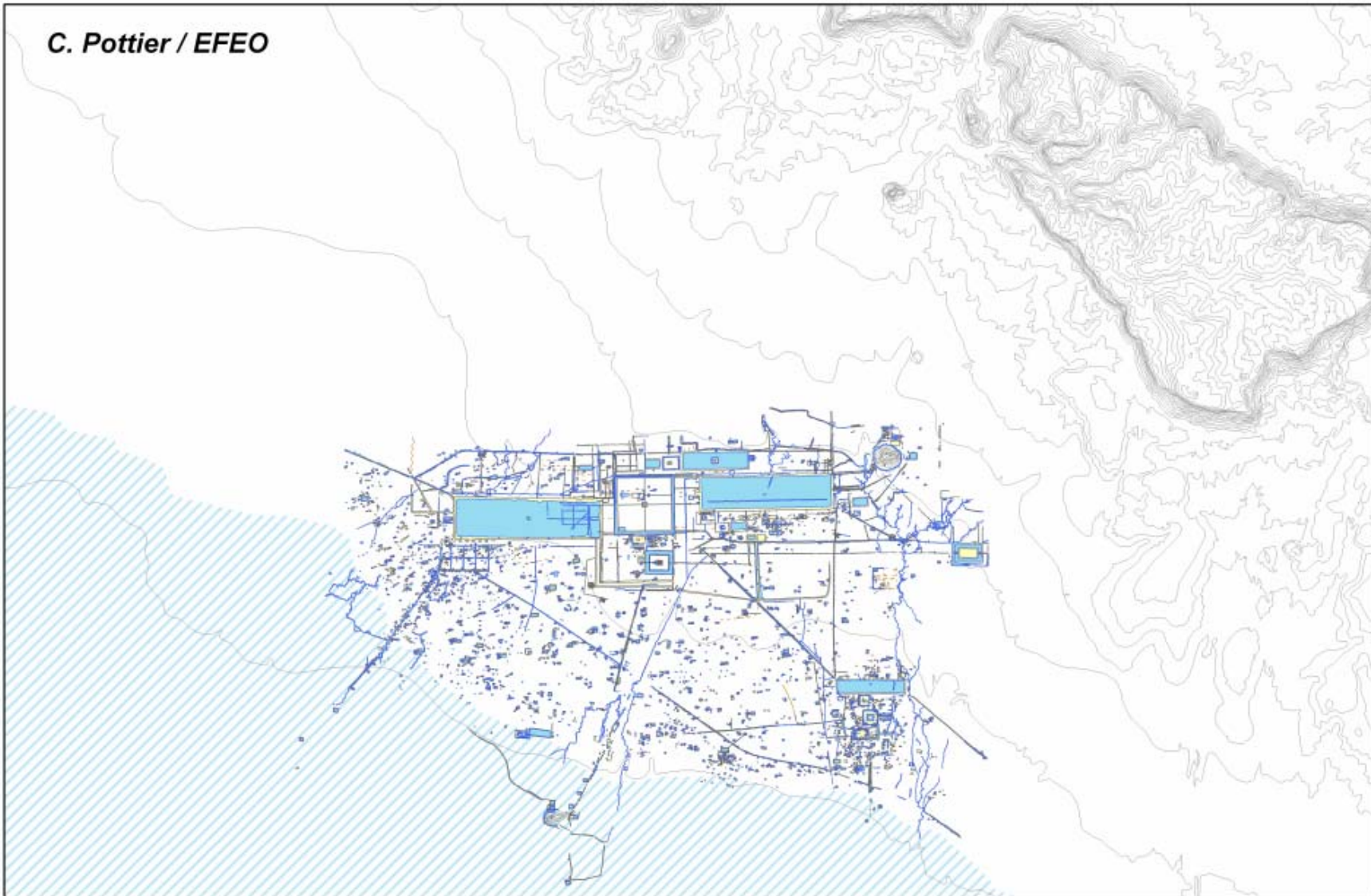


0 5 10 20 Kilometers

evans@acl.arts.usyd.edu.au



C. Pottier / EFEO

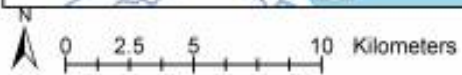
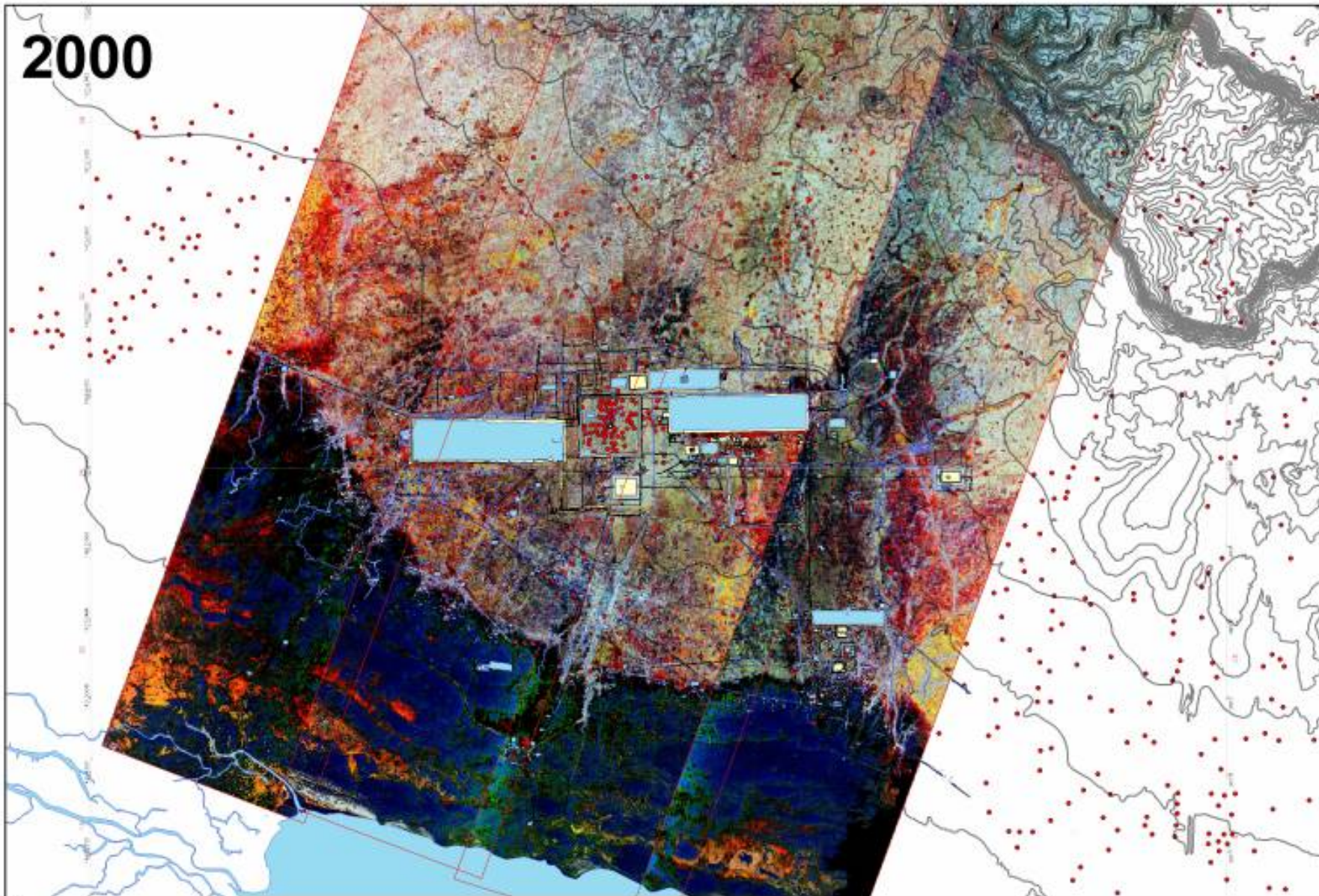


0 5 10 20 Kilometers

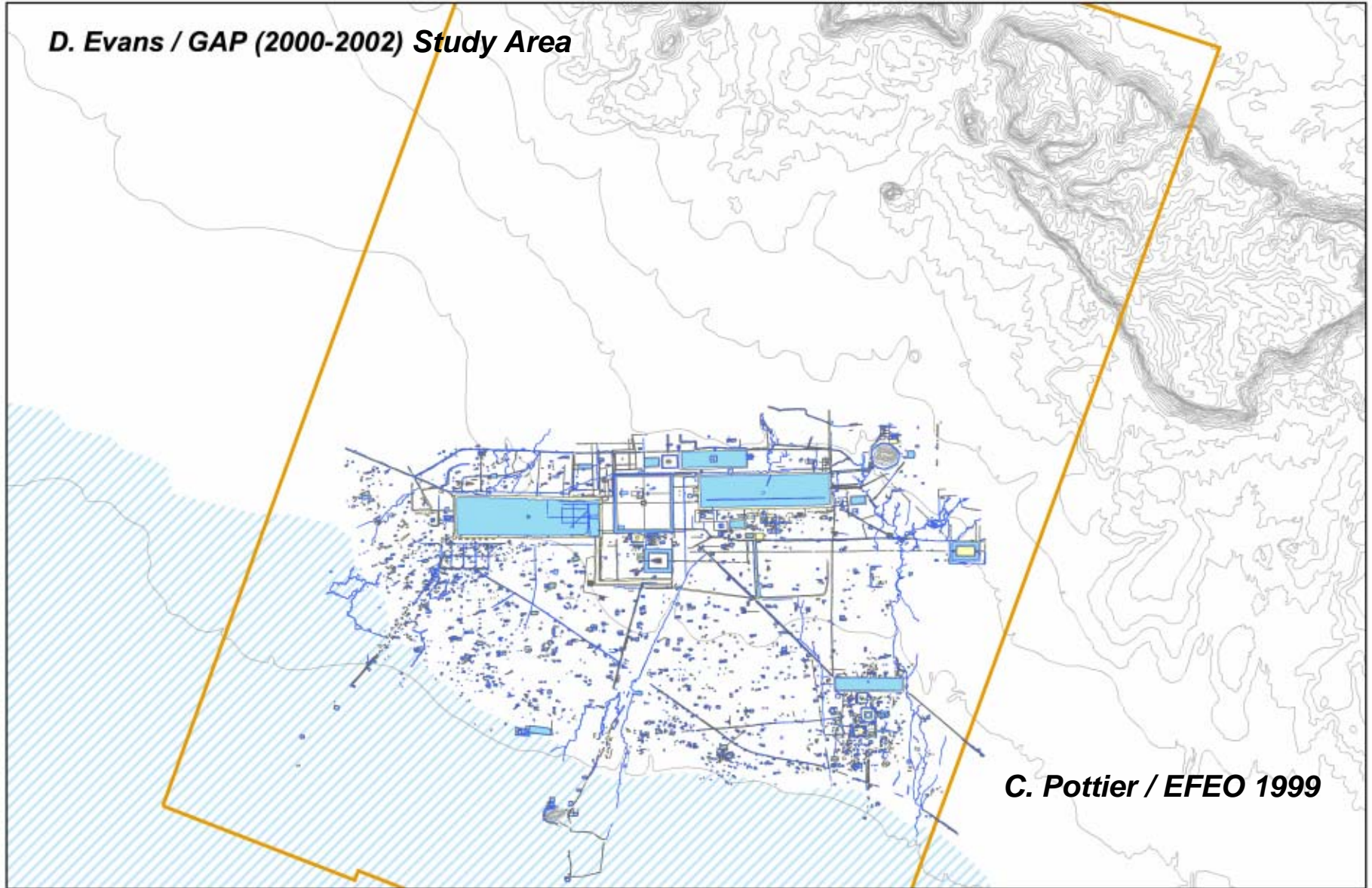
evans@acl.arts.usyd.edu.au



2000



D. Evans / GAP (2000-2002) Study Area



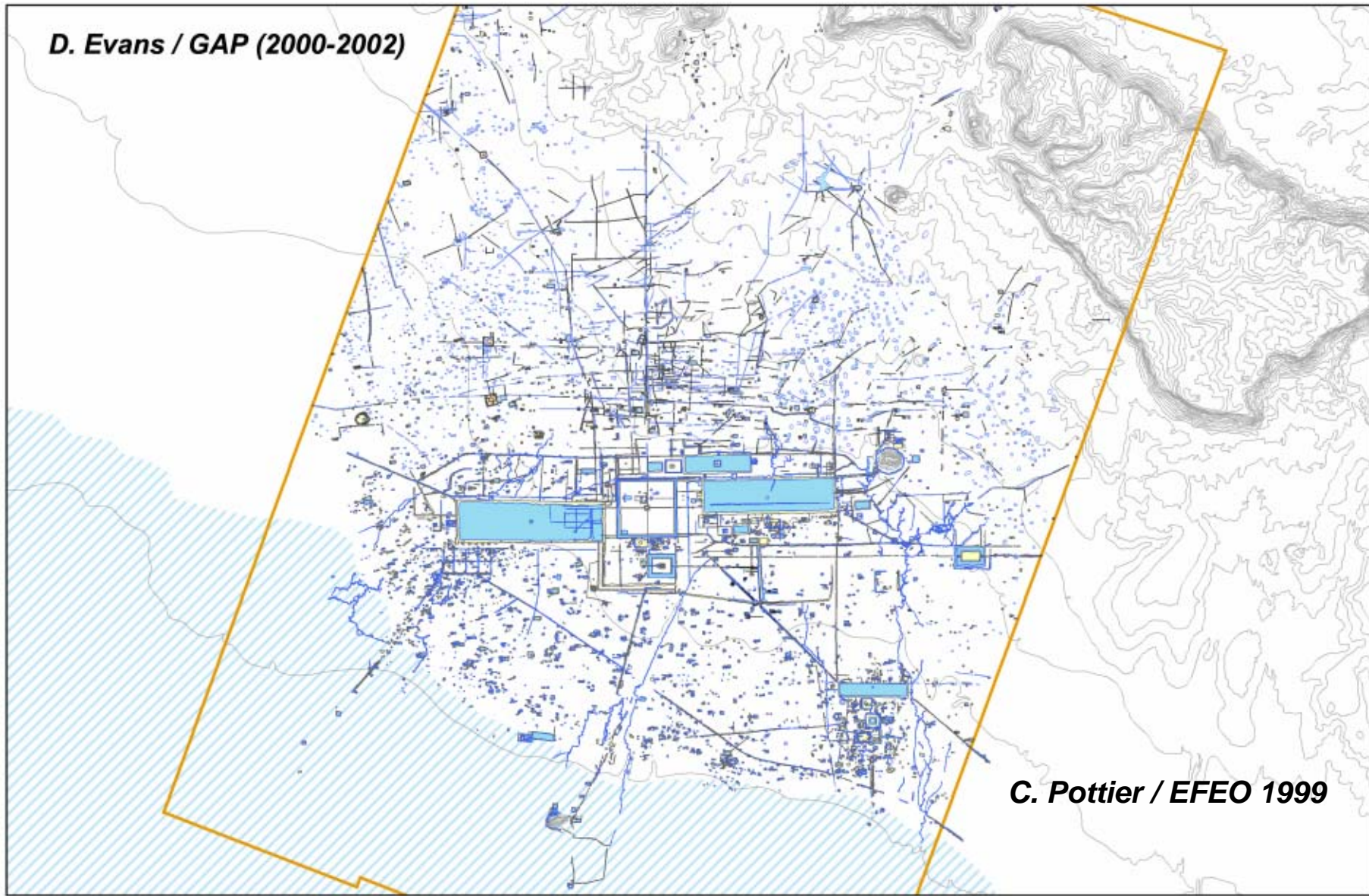
C. Pottier / EFEO 1999

0 5 10 20 Kilometers

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D. Evans / GAP (2000-2002)



C. Pottier / EFEO 1999

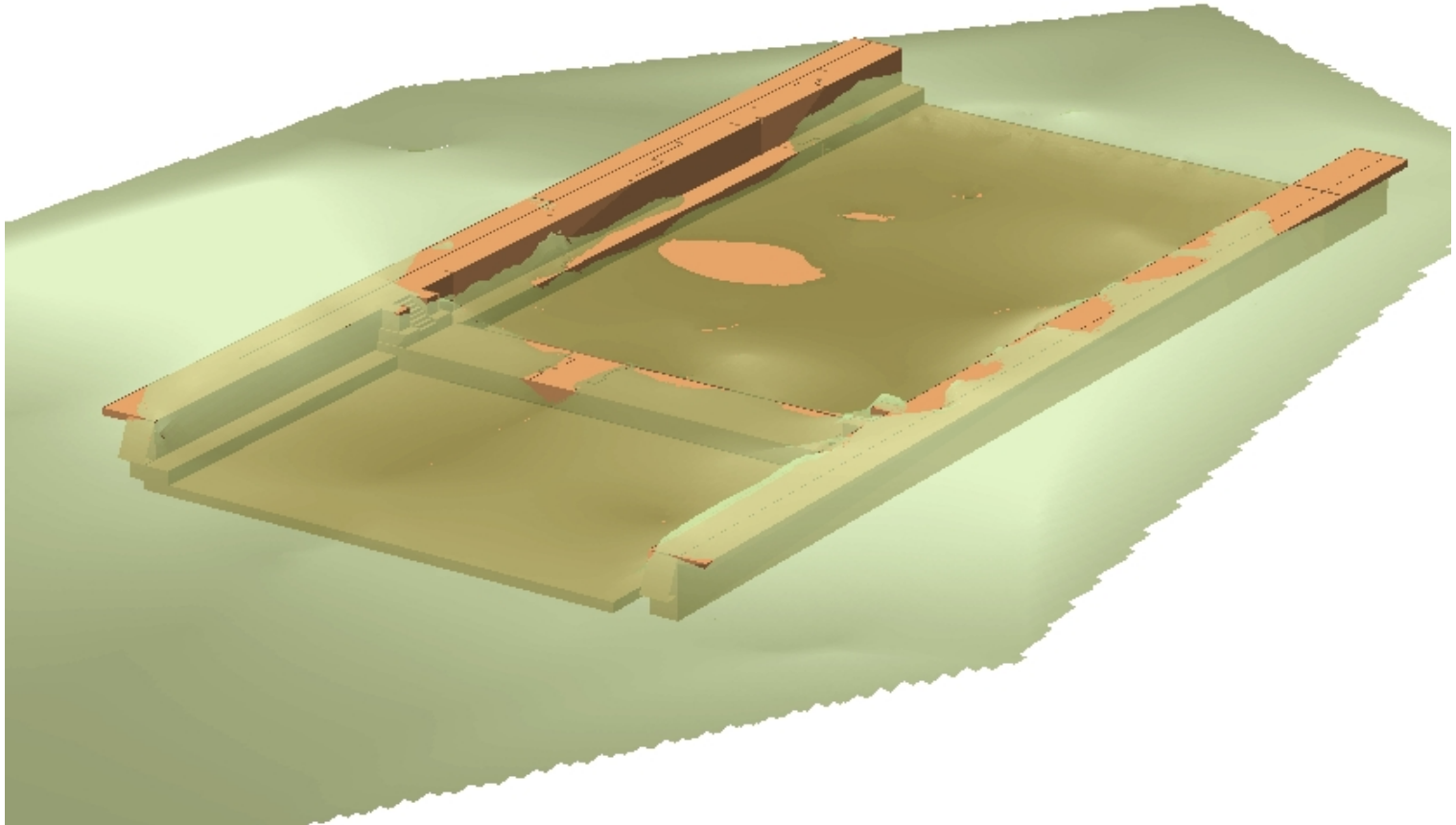


evans@acl.arts.usyd.edu.au



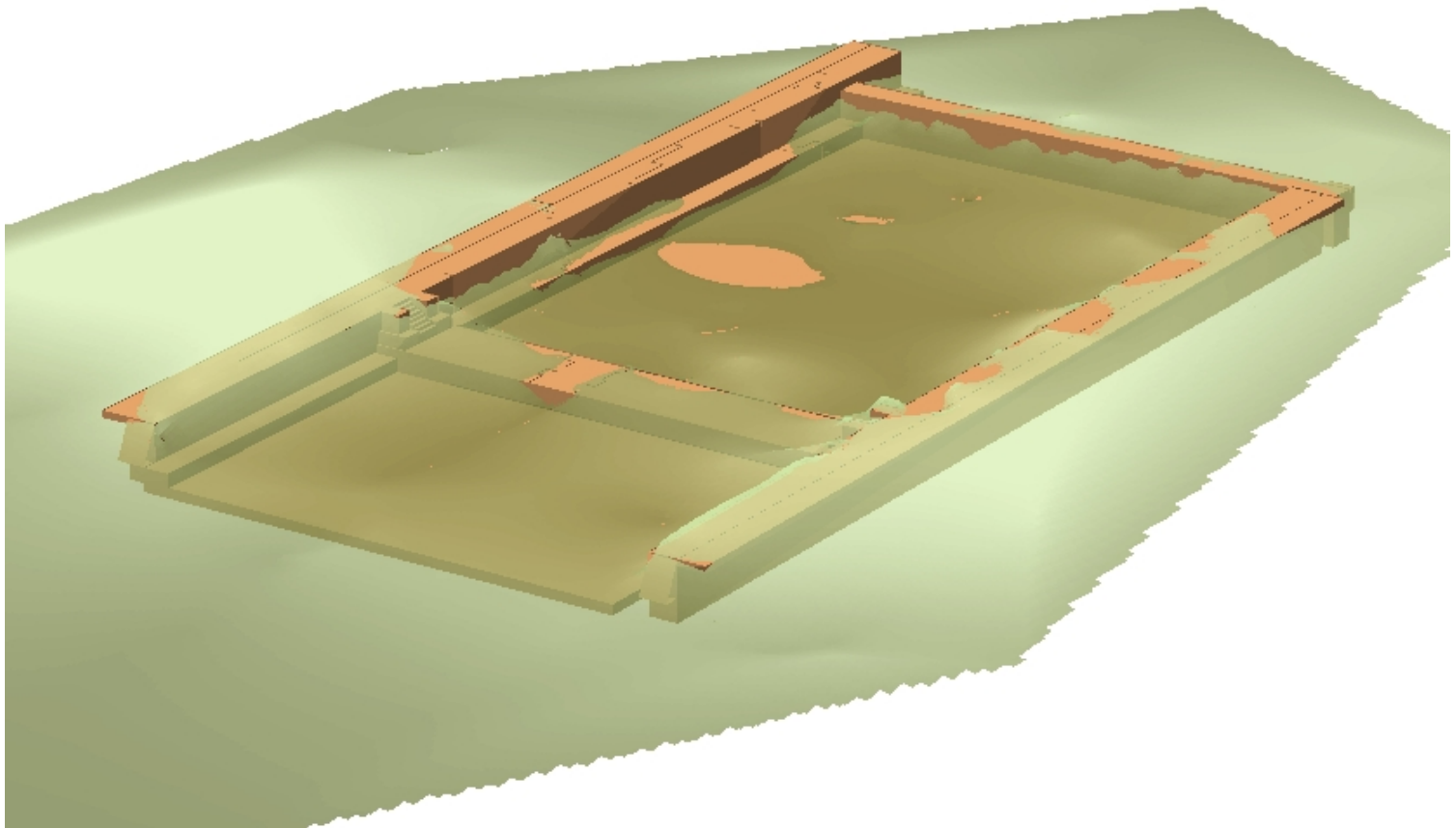
Angkor - Krol Romeas, spillway

Phase 1



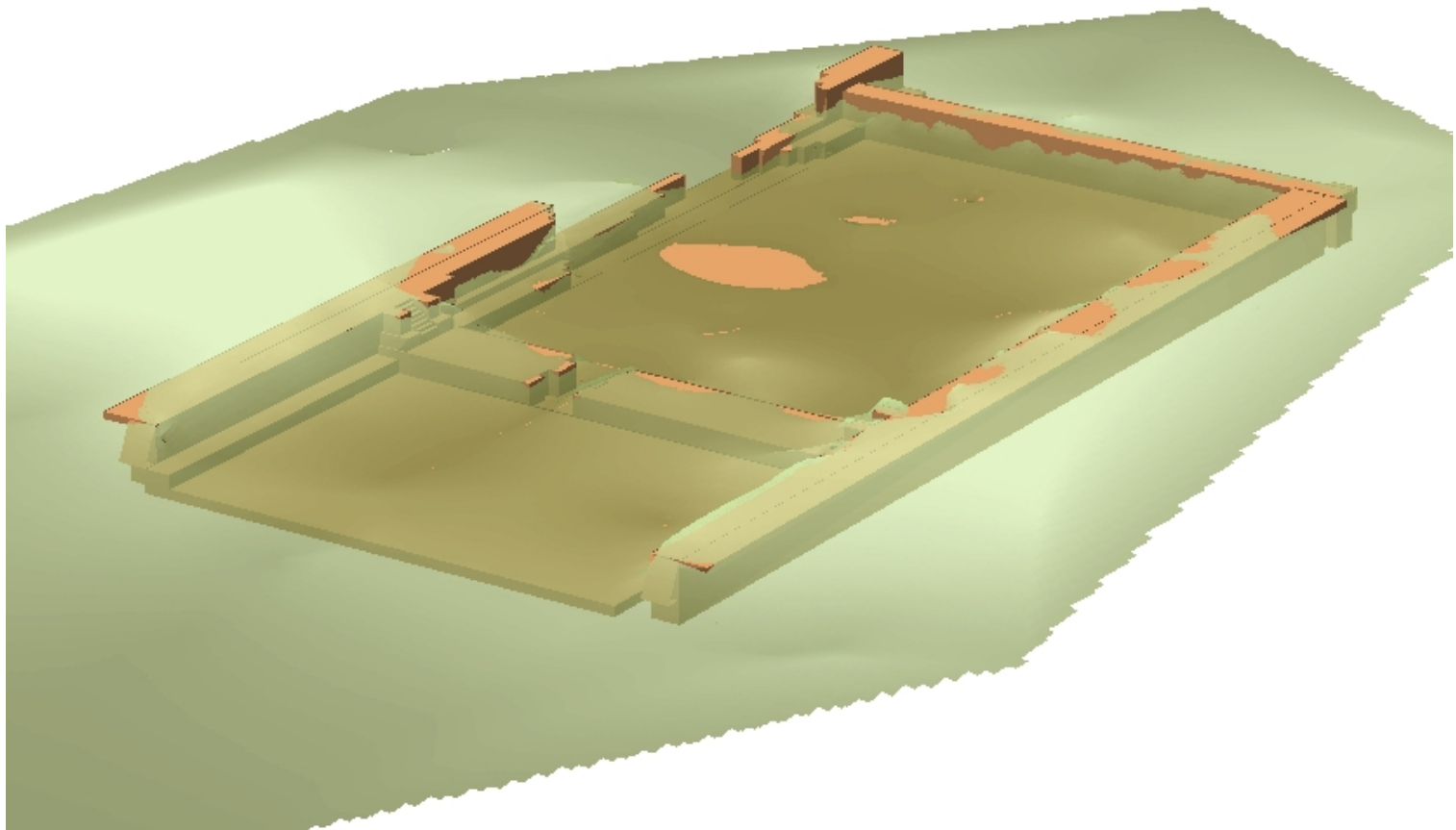
Angkor - Krol Romeas, spillway

Phase 2



Angkor - Krol Romeas, spillway

Phase 3



Angkor – West Mebon - now



Angkor – West Mebon - reconstruction



Angkor – West Mebon - animation





Living with Heritage

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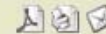


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Welcome



World Heritage conservation in developing countries is challenged by conflicting demands of preservation, economic development and social equity. Managing these demands requires monitoring of the dynamic interaction between natural environment, cultural heritage and contemporary society. Cambodia, epitomises the challenge. A joint Cambodian and international information monitoring system for site management using Angkor past and future research, community values, national policies and management and governance come together to reconcile the complex

The Living with Heritage project is funded to A\$1.2 million over 5 years by the Australian Research Council and our Industry Partners.

Industry Partners

- APSARA Authority
- UNESCO (UNESCO Phnom Penh Office)
- Ecole française d'Extrême-Orient (EFEO) - Angkor
- Horizon Geoscience Consulting P/L
- Department of Environment and Heritage, Australian Government
- Godden Mackay Logan Pty Ltd
- ESRI Australia
- Leica Geosystems
- Finnish Environmental Institute (FEI)

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Angkor – traffic analysis

- (Simulation not present)

Mapping photographs with GPS



Digital camera used to take photographs



GPS continuously records location

Mapping photographs with GPS



Both record time every second

Mapping photographs with GPS



During fieldwork photograph time display on GPS allow for synchronize both clocks

Mapping photographs with GPS



Image	EXIF Time	Latitude	Longitude	Altitude	Direction	Ti
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 3:57:59 PM					
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 3:59:16 PM					
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 4:04:51 PM					
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 4:12:13 PM					
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 4:12:24 PM					
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 4:13:48 PM					
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 4:14:35 PM					
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 5:48:13 PM					
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 5:48:19 PM					
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 5:51:34 PM					
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 5:52:38 PM					
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 5:55:09 PM					
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 5:59:33 PM					
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 6:00:59 PM					
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 6:01:10 PM					
C:\andrew_workspace\Hanzhong_3S_project\pho	16/05/2007 6:03:13 PM					

Images files with time from camera



Offset corrected by camera image of GPS time

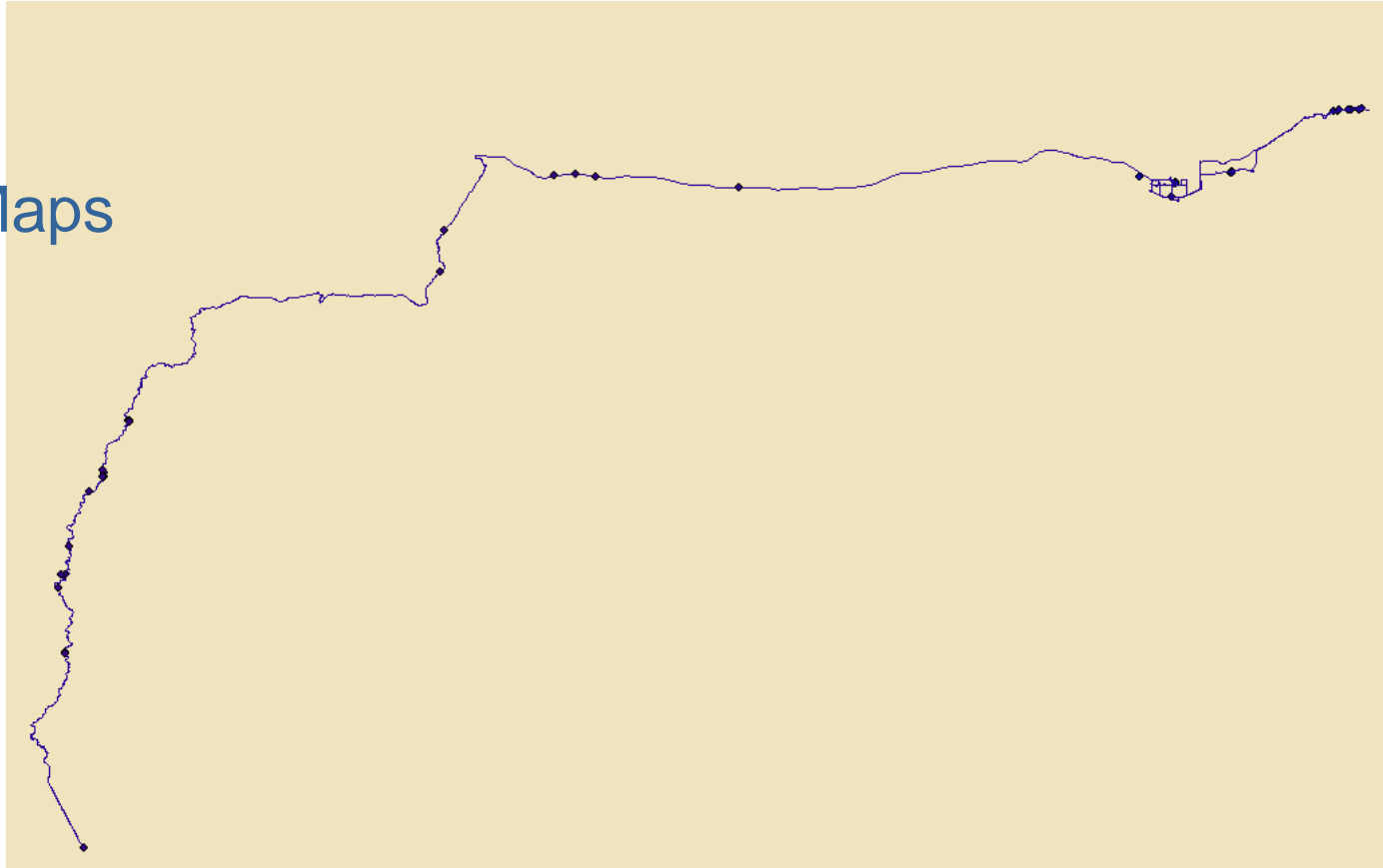
+ or -

Image	EXIF Time	Latitude	Longitude	Altitude	Direction	Ti
C:\andrew_workspace\Hanzhong_3S_project\pho	15/05/2007 9:00:38 AM	33.8358092306	107.102108001	1418.353		
C:\andrew_workspace\Hanzhong_3S_project\pho	15/05/2007 9:00:38 AM	33.8356034896	107.924915991	1539.569		
C:\andrew_workspace\Hanzhong_3S_project\pho	15/05/2007 9:00:38 AM	33.8356034896	107.889362400	1556.691		
C:\andrew_workspace\Hanzhong_3S_project\pho	15/05/2007 9:00:38 AM	33.8356034896	107.2676201233	107.853384010	1581.905	
C:\andrew_workspace\Hanzhong_3S_project\pho	15/05/2007 9:00:38 AM	33.8356034896	107.1711068150	107.657821870	2628.793	
C:\andrew_workspace\Hanzhong_3S_project\pho	15/05/2007 9:00:38 AM	33.8356034896	107.657828710	2624.267		
C:\andrew_workspace\Hanzhong_3S_project\pho	15/05/2007 9:00:38 AM	33.8356034896	107.651896470	2761.310		
C:\andrew_workspace\Hanzhong_3S_project\pho	15/05/2007 1:47:32 PM	33.8358092306	107.102108001	1437.185		
C:\andrew_workspace\Hanzhong_3S_project\pho	15/05/2007 1:48:33 PM	33.8356034896	107.101979250	1436.937		
C:\andrew_workspace\Hanzhong_3S_project\pho	15/05/2007 1:50:26 PM	33.8356161117	107.101964320	1436.659		
C:\andrew_workspace\Hanzhong_3S_project\pho	15/05/2007 1:50:44 PM	33.8356161117	107.101936340	1436.659		
C:\andrew_workspace\Hanzhong_3S_project\pho	15/05/2007 1:50:59 PM	33.8356161117	107.101938590	1436.699		
C:\andrew_workspace\Hanzhong_3S_project\pho	15/05/2007 1:52:16 PM	33.8355528680	107.101946504	1424.956		
C:\andrew_workspace\Hanzhong_3S_project\pho	15/05/2007 1:52:23 PM	33.8355528680	107.101946504	1424.956		

Locations with time from GPS

Mapping photographs with GPS

- Mapping
 - GIS
 - Google Maps
 - *TimeMap*



How do we manage field data?

- In the field
 - After each collection session
 - Completion of fieldwork
- During analysis
 - Integrity original data
 - Updates and changes
 - New data derived from original
- Deposit of data for perpetual access



View of Taibai Mountain
Jai Li AD 1700

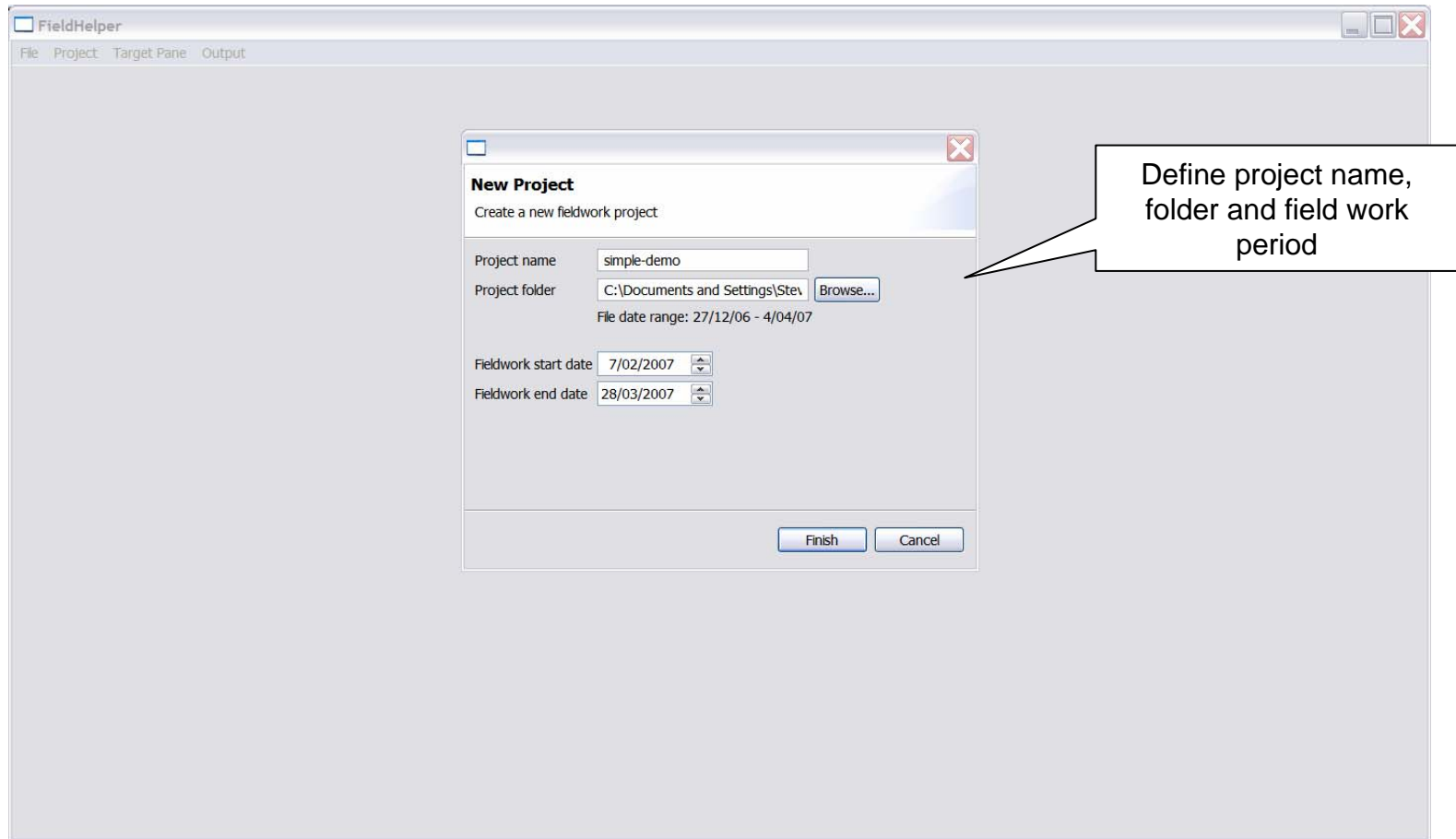
Field Helper

- Simple, desktop tool for organising fieldwork files and creating ingest packages for digital repositories
- Generic nature makes it potentially useful for other data collation tasks
- Cross platform, lightweight Java based. Makes good use of XML technologies
- Developed by the ACL for the Australian Partnership for Sustainable Repositories

Field Helper



Field Helper



Field Helper

The screenshot shows the FieldHelper application window. At the top, there is a menu bar with 'File', 'Project', 'Target Pane', and 'Output'. Below the menu is a calendar view for January 2007, with a yellow highlight on the 16th and 17th. A 'Filter:' section contains a search box and buttons for 'clear filters' and 'show filtered only'. Below the filter is a list of items with dates and file names: .16, .17, .18 (3 IMG_3373.JPG), and .19 (4 IMG_3333.JPG, 5 IMG_3356.JPG). To the right is a grid of colored boxes representing user-defined values for various DC metadata fields: dc:creator (Fred Smith), dc:subject (Tom Jones), dc:publisher (Mary Brown), dc:contributor (Jule White), dc:type (J. White), dc:format (J. White), dc:coverage (J. White), and dc:rights (J. White). Two callout boxes provide instructions: one pointing to the filter section stating 'New values can be added at any time', and another pointing to the grid stating 'Values defined by user with a right click on target area'.

FieldHelper

File Project Target Pane Output

27 29 31 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 2 4

Jan Feb Mar Apr

Filter: [] [clear filters] [show filtered only]

January 2007 [-] [+]

.16 .17 .18 .19

3 IMG_3373.JPG 4 IMG_3333.JPG

5 IMG_3356.JPG

dc:creator dc:subject dc:publisher dc:contributor dc:type dc:format dc:coverage dc:rights

Fred Smith Tom Jones Mary Brown

Jule White J. White J. White J. White

New values can be added at any time

Values defined by user with a right click on target area

Field Helper

The screenshot shows the FieldHelper application window. At the top, there is a menu bar with 'File', 'Project', 'Target Pane', and 'Output'. Below the menu is a timeline from January 27 to April 4, 2007. A yellow highlight is on the 18th of January. Below the timeline is a filter section with a 'Filter:' label, a search box, and buttons for 'clear filters' and 'show filtered only'. The main area is divided into two panes. The left pane shows a calendar view for January 2007, with dates 16, 17, 18, and 19 visible. A yellow arrow points from the 18th to the right pane. The right pane shows a grid of metadata cards for five individuals: Fred Smith, Tom Jones, Mary Brown, Julie White, and John Wild. Each card has a color and a number of files. Fred Smith has 4 files, Tom Jones has 5 files, Mary Brown has 3 files, Julie White has 4 files, and John Wild has 5 files. A yellow arrow points from the 18th of January to the Fred Smith card, and a green arrow points from the Fred Smith card to the Tom Jones card. A text box at the bottom left explains the timeline scrolling, and a text box at the bottom right explains the file dragging and dropping.

FieldHelper

File Project Target Pane Output

27 29 31 2 Jan 4 6 8 10 12 14 16 18 20 22 24 26 28 30 Feb 1 3 5 7 9 11 13 15 17 19 21 23 25 27 Mar 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 2 Apr 4

Filter: [] [clear filters] [show filtered only]

< January 2007 [-] [+] >

16 17 18 19

4 IMG_3333.JPG
5 IMG_3356.JPG

dc:creator dc:subject dc:publisher dc:contributor dc:type dc:format dc:coverage dc:rights

Fred Smith 4 3
Tom Jones 5
Mary Brown
Julie White
John Wild

User scrolls timeline to expose other files for tagging

User drags and drops files onto "target" areas to add value to file metadata

Field Helper

The screenshot displays the Field Helper application interface. On the left, a calendar for February 2007 is visible, with a table of dates. The main window shows an XML editor with the following content:

```
<?xml version="1.0" encoding="UTF-8"?>
<METS:mets LABEL="fndemo" PROFILE="UVA_STD_IMAGE" TYPE="FedoraObject"
  fedoraxsi:schemaLocation="http://www.loc.gov/METS/ http://www.fedora.info/definitions/1/0/mets-fedora-ext.xsd"
  OBJID="simple-demo:IMG_3040" xmlns:xlink="http://www.w3.org/TR/xlink"
  xmlns:audit="info:fedora/fedora-system:def/audit#"
  xmlns:dc="http://dublincore.org/schemas/xmls/qdc/2006/01/06/dc.xsd"
  xmlns:fedoraxsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:METS="http://www.loc.gov/METS/"
  xmlns:oai_dc="http://www.openarchives.org/OAI/2.0/oai_dc.xsd">
  <METS:metsHdr RECORDSTATUS="A">
  <METS:amdSec ID="DC" STATUS="A" xmlns:xlink="http://www.loc.gov/standards/mets/xlink.xsd">
  <METS:techMD ID="DC.0">
  <METS:mdWrap LABEL="Default Dublin Core Record" MDTYPE="OTHER" MIMETYPE="text/xml"
    OTHERMDTYPE="UNSPECIFIED">
  <METS:xmlData>
  <oai_dc:dc>
  <dc:title>simple-demo - IMG_3040.JPG</dc:title>
  <dc:creator>Tom Jones</dc:creator>
  <dc:subject>Flora</dc:subject>
  </oai_dc:dc>
  </METS:xmlData>
  </METS:mdWrap>
  </METS:techMD>
  </METS:amdSec>
  <METS:fileSec>
  <METS:fileGrp ID="DATASTREAMS">
  <METS:file ID="ITEM" MIMETYPE="image/jpeg" OWNERID="M">
  <METS:FLocal LOCTYPE="URL" xlink:href="file:///...collection/fndemo/IMG_2888.JPG">
  </METS:file>
  </METS:fileGrp>
  </METS:fileSec>
</METS:mets>
```

A callout box points to the XML content, stating: "Full object description plus recently added tags described in METS document for each file".



- Archaeological Computing Laboratory team

- Ian Johnson, Director & *TimeMap* concept
- Steven Hayes, FieldHelper
- Programmers
 - Artem Ozmakov
 - Damian Evans
 - Tom Murtagh
 - Kim Jackson
 - Clinton Freeman

www.timemap.net