

Presented at the FIG e-Working Week 2021,  
21-25 June 2021 in Virtually in the Netherlands

# SMART SURVEYORS FOR LAND AND WATER MANAGEMENT CHALLENGES IN A NEW REALITY



**e** WORKING WEEK 2021  
**20-25 JUNE**

Kelly HENDERSON and John R. PORTER

Paper ID-11009

Joining the Dots: Analysis of the Trigonometrical Survey of the Adelaide Plains 1837-1838

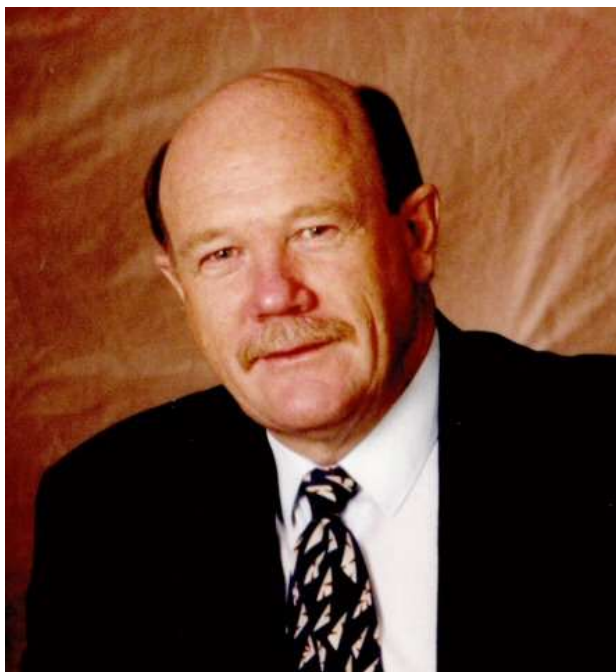
Wednesday 23 June 2021, 15.00-16.30 (CEST)

ORGANISED BY



PLATINUM SPONSORS





**John R. Porter**

18th Surveyor General of South Australia, served as South Australia's Division President and Federal Councillor; while stationed overseas represented Australia in FIG Commission 1.

2007 Light's Survey of Adelaide – facts, fables and fancies  
*South Australian Geographical Journal*, Vol 106, pp 53-83.  
(Royal Geographical Society of South Australia Inc., Adelaide)

2010 South Australia's Shining Light (FIG Sydney Congress 2010)

[www.fig.net/pub/fig2010/papers/hws03/hws03\\_porter\\_4719.pdf](http://www.fig.net/pub/fig2010/papers/hws03/hws03_porter_4719.pdf)

Commencement of Trig Monumentation Project, arising from FIG IHS&M Honorary Director Jan De Graeve's visit to South Australia regarding the potential world heritage values of William Light's plan and survey of the Town, Port and District of Adelaide.

Publication pending (in editing):

South Australia's Cadastral Surveyors, 1836-1986  
- Biographical dictionary of SA Land Surveyors, over 1000 entries



## Monumentation of TRIG STATION A

Placement of plaque marking the District of Adelaide Trigonometrical Survey Master Station, corner of North and West Terraces, on the anniversary of William Light's birth, 27 April 2018.

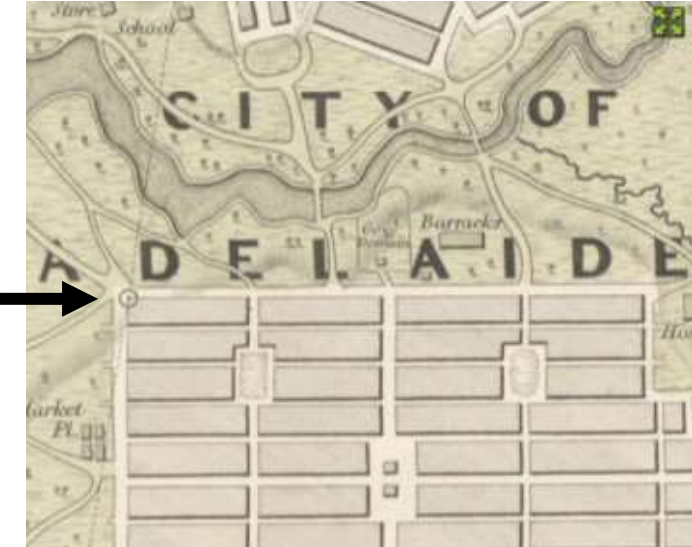
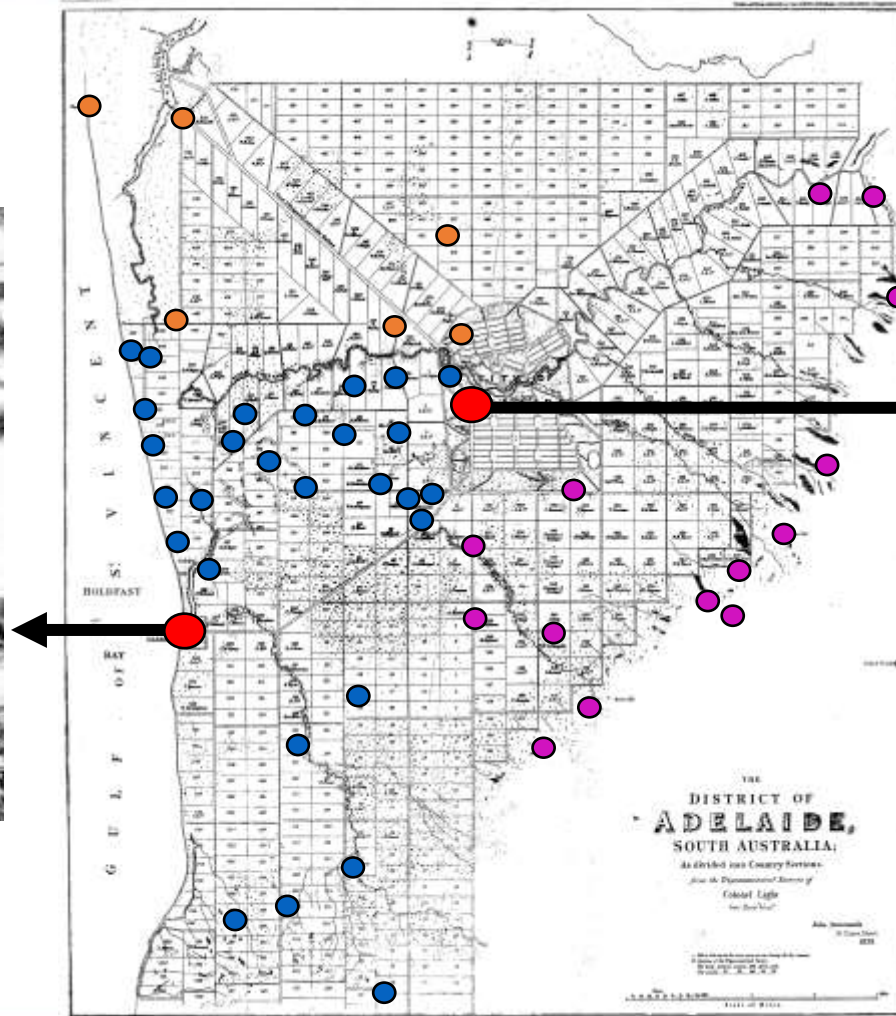
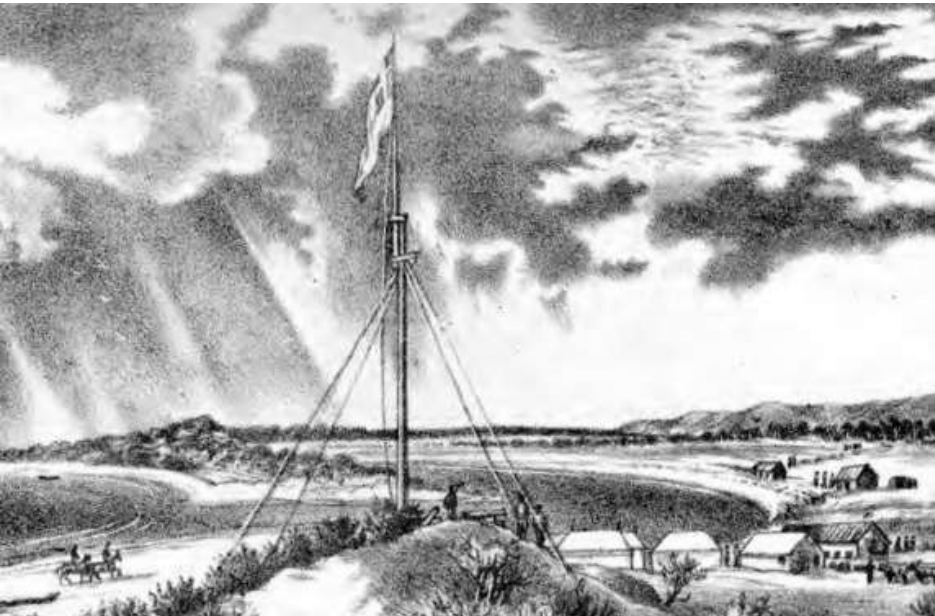
From R-L: The Lady Mayoress of Adelaide Mrs Genevieve Theseira-Haese; Mr Michael Burdett, Surveyor-General of South Australia; Dr Walter Dollman National Trust of South Australia Councillor and Adelaide Branch Chairman; Dr John Ward, Principal of Sundials Australia (monument supplier), The Lord Mayor of Adelaide Martin Haese, and Adelaide City Area Deputy Lord Mayor and Councillor Sandy Wilkinson, who secured Council funding and support.

Unveiling of design on the 180<sup>th</sup> anniversary, 2 May 2017:  
Louise Friis-Hansen, FIG Director, **Adelaide commemoration of the first trigonometric allotment in coordinated system**  
[www.fig.net/news/news\\_2017/05\\_adelaide.asp](http://www.fig.net/news/news_2017/05_adelaide.asp)

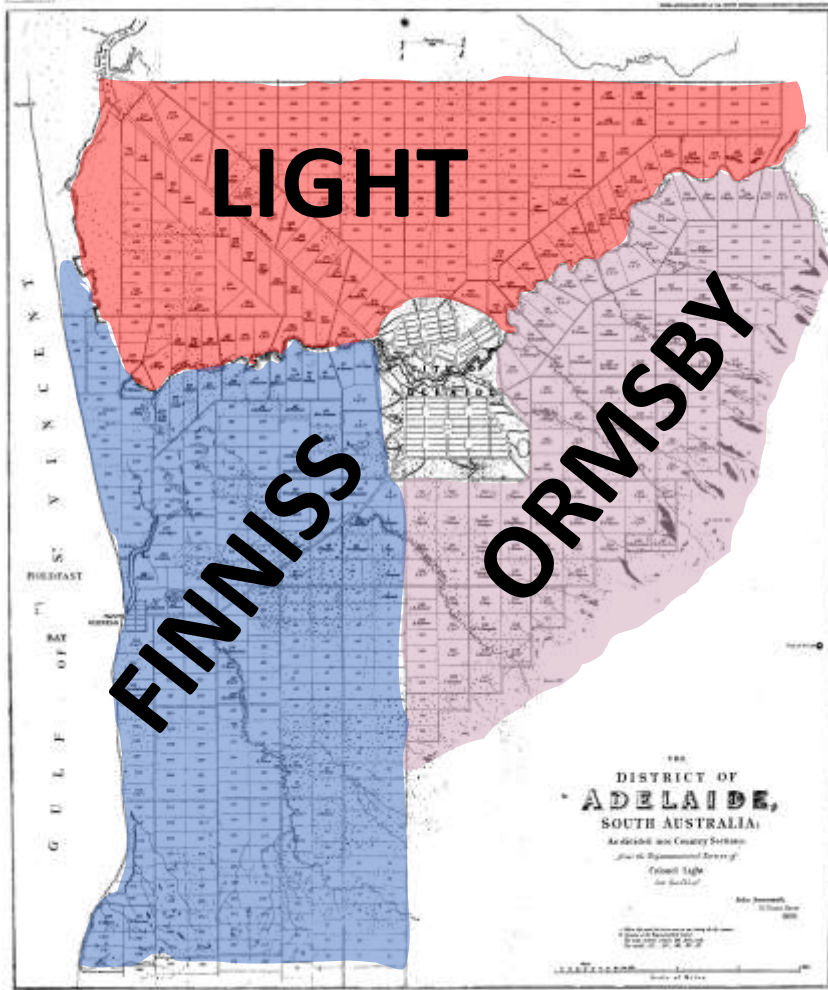




## Holdfast Bay FLAGSTAFF TRIG STATION



### TRIG STATION A Master Station



Adelaide Plain divided into 3 field survey parties

North of the River Torrens

**From Mount Lofty Ranges foothills to coast  
– supervised by Light**

South of the River Torrens

**East of Goodwood Road line to Mount Lofty  
Ranges foothills – supervised by Ormsby**

**West of the baseline to the coast  
– supervised by Finnis**

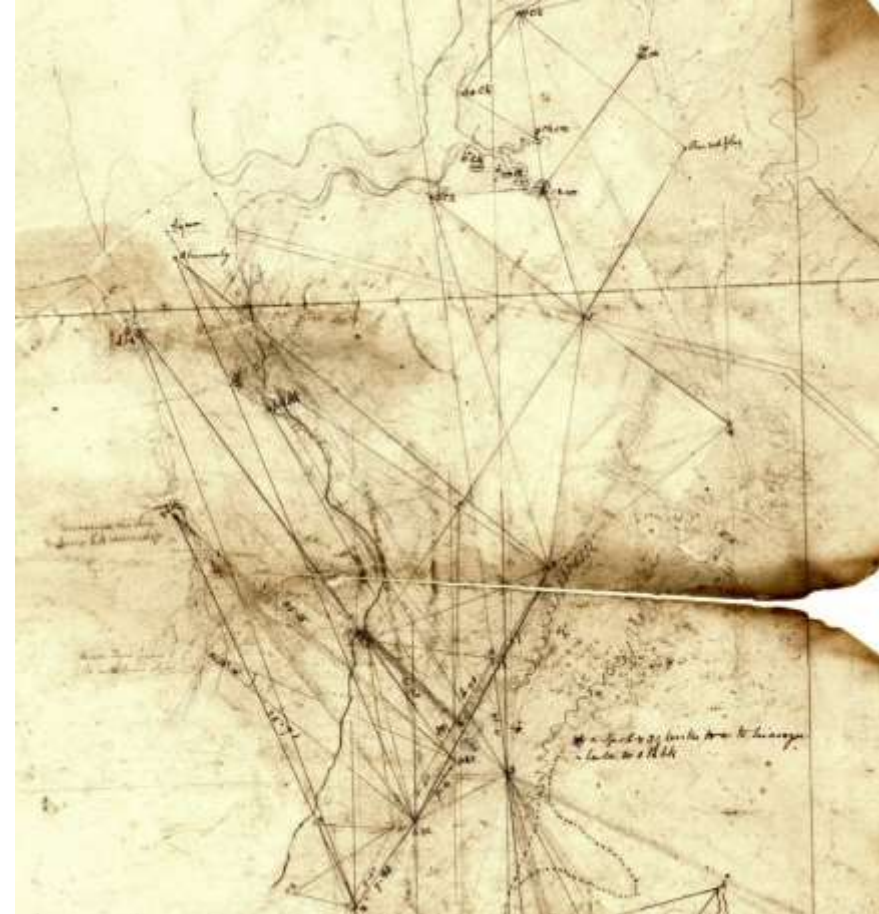
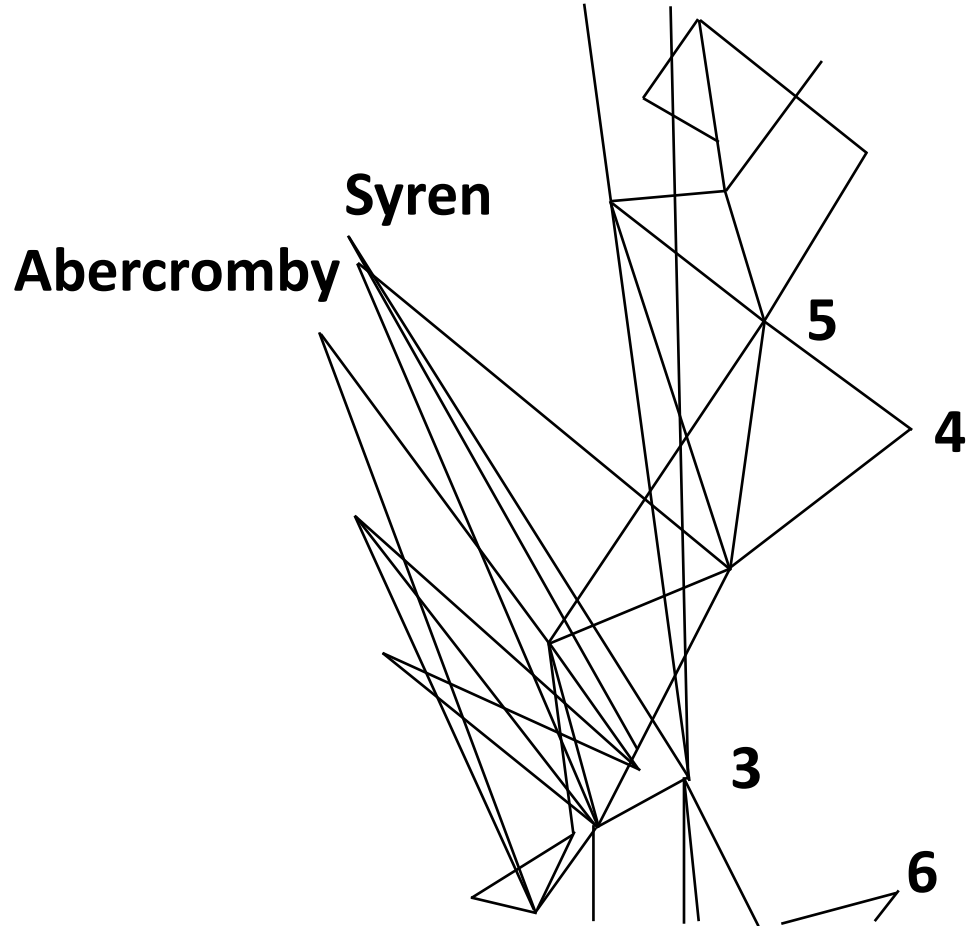


All three sectors were surveyed in the same manner and properly interconnected.

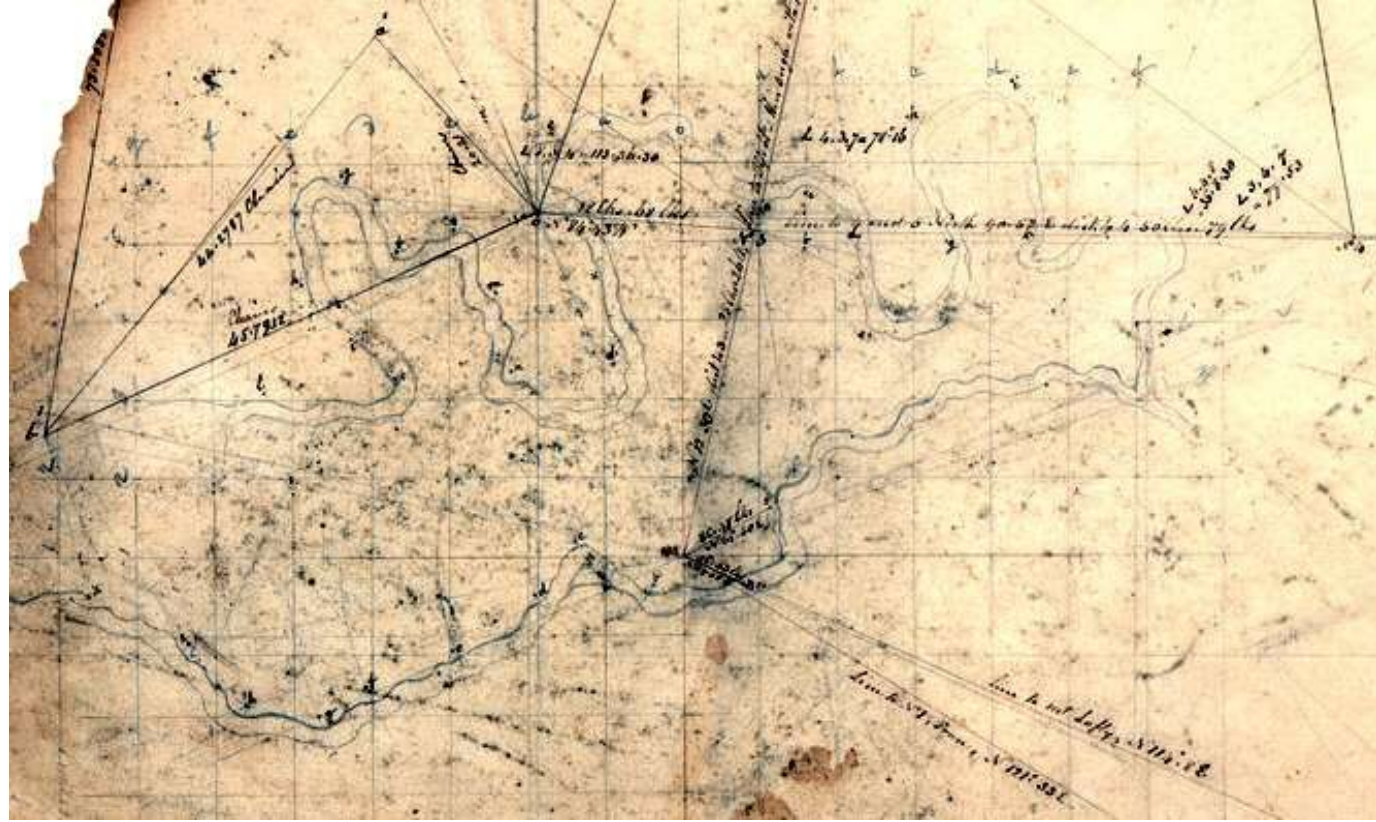
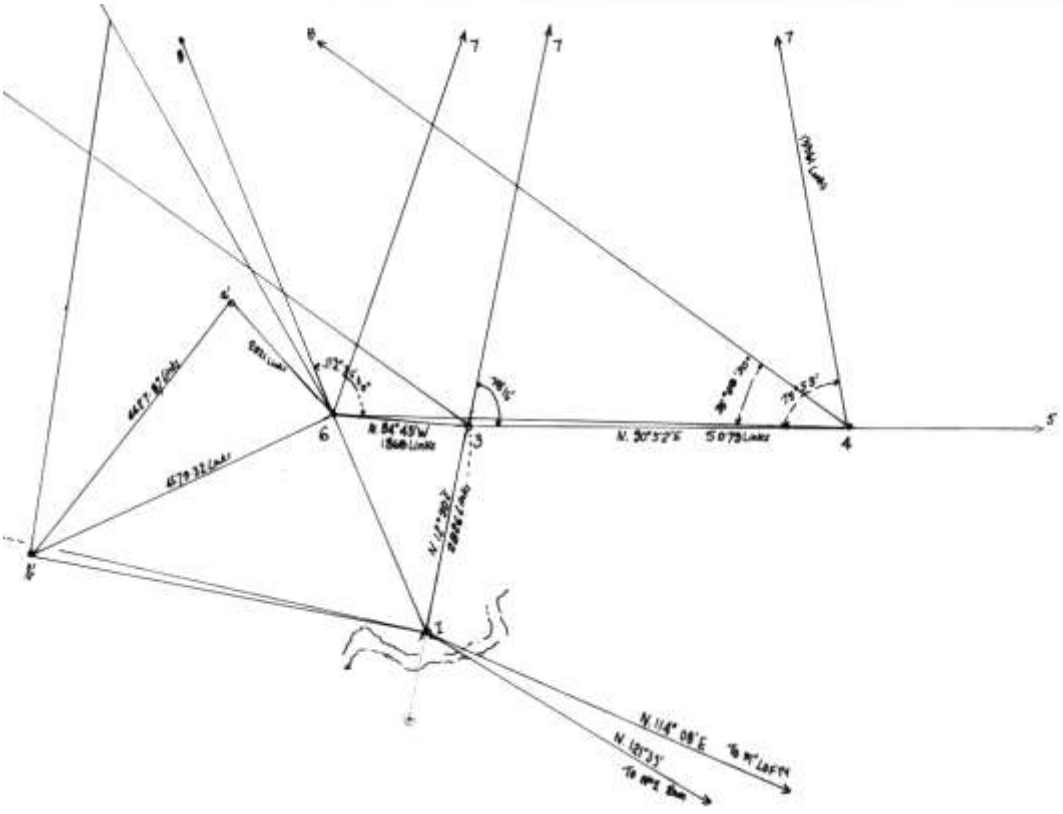
This enabled topographical data collected by all survey parties to be integrated and plotted to form the base plan for the design of the original layout of the rural Sections and road alignments of Light's 'Plan of the Preliminary Country Sections in the District of Adelaide, South Australia' c. May 1838.



Image reproduced by courtesy of The National Archives, London, England, CO700/SOUTH AUSTRALIA-2Pt1 (4). The Public Record Office gives no warranty as to the accuracy, completeness or fitness for the purposes of the information provided. Images may be used only for purposes of research, private study or education. Applications for any other use should be made to the TNA Image Library, Kew, Richmond, Surrey TW9 4DU. Infringement of the above condition may result in legal action.

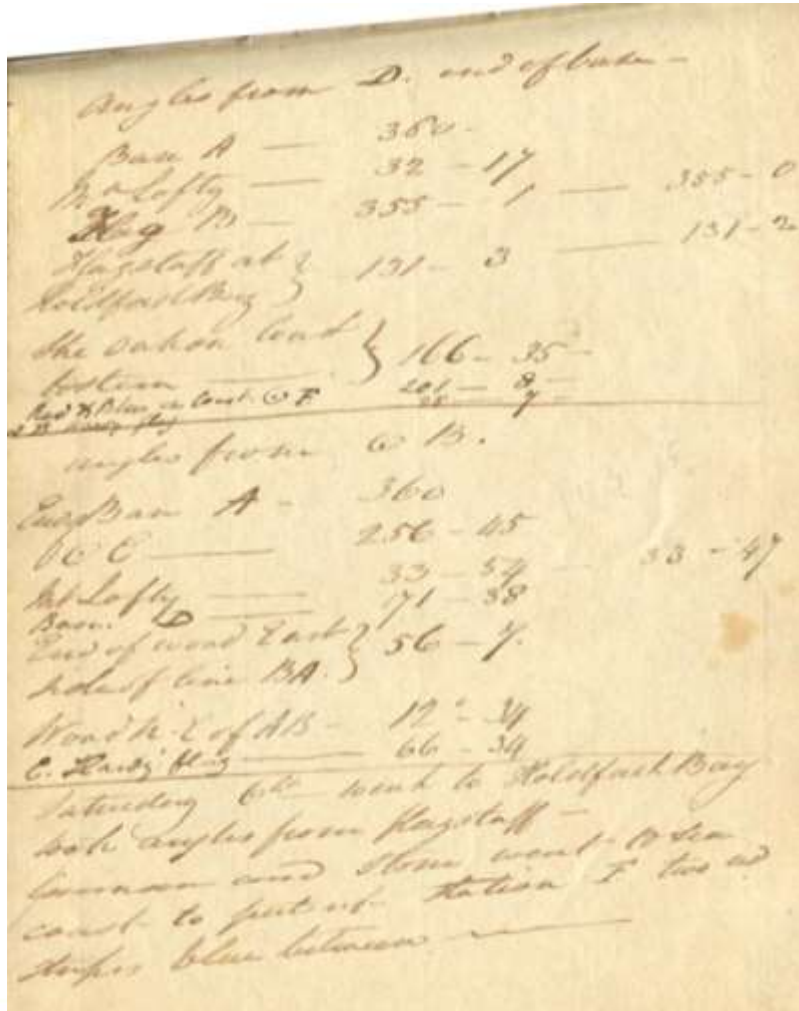


Detail: Light's Port River Trig survey network, circa Nov 1837. State Library of SA PRG1/6/262 [Light Collection].



Above Left: Diagram detail of Light's Traverse and trigonometric network along former river course, north of the River Torrens, bearings to Mt Lofty, N 114° 08' E, and No.1 Town [Station A] N 121° 33' [E].  
 Drawn by J.R. Porter, from State Library of South Australia PRG1/6/261 [Light Collection] (above right).





### Angles from **Station D** end of base

Base <b>A</b>	360°		Mt Lofty.....	32°17'
Flag <b>B</b>	355° [0]1' - 355 [0]0			
<b>Flagstaff</b> at Holdfast Bay	131° [0]3' - 131 [0]2'			
She Oak on Coast to stem	166° 35'			
Red & Blue on Coast. <b>O F</b>	201° 08'		<b>O E Hardy's Flag</b>	25° 07'

### Angles from **O B.**

End of Base <b>A</b>	360°	<b>O C</b>	256° 45'
Mt Lofty	33° 54' - 33° 47'	Base <b>D</b>	171° 38'
End of wood east side of line <b>BA</b>	56° 07'	Wood N.E. of <b>AB</b>	12° 34'
<b>E. Hardy's Flag</b>	66° 34'		

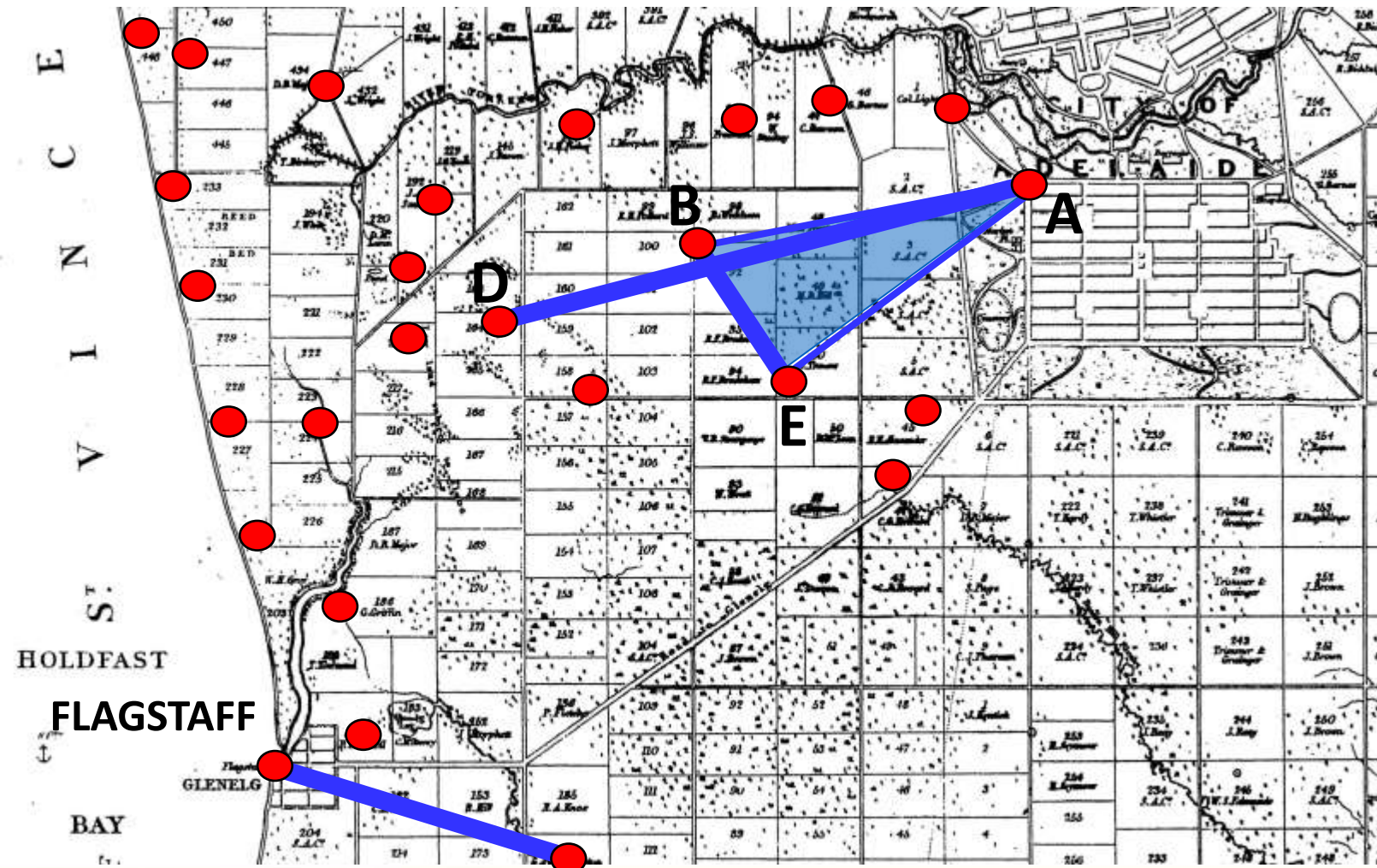
**Saturday 6<sup>th</sup> [MAY 1837]** went to Holdfast Bay took angles from the **flagstaff**. Cannan and Stone went to sea coast to put up **Station F**. two red stripes, blue between.

SA DEPARTMENT OF LANDS FIELD BOOK No. 76  
Journal of BT FINNISS Survey of Adelaide 1837-38, Bases & Angles



DATE	TRIG STATION	LOCATION	DESCRIPTION
Late 1836	<b>Flagstaff</b> , Holdfast Bay	Coast sandhill, south of Patawalonga	Established by Light
January 1837	<b>A</b>	NW corner of Town Acre 1	Starting Point of Town Survey
2 May	<b>A</b>	Country Survey starts from Trig A	Finniss with 4 men: Symonds, Hardy, Finch and Wellman
	<b>B</b>	Country Section 92	By Cannan & Stone
	<b>E</b> (Hardy's Flag)	Country Section 50, on plain	
3 May 1837	<b>D</b>	Country Section 164	Finniss with Cannan & Stone
	<b>A, B and D; Base A-D</b>	Angles taken	
4 May	<b>AD</b> Base line	Base line flagged out; measured 2 miles	Finniss, Cannan, Hardy, Symonds, Finch & Stone
14-15 May	<b>Base AD</b> remeasured and second re-measure		
17 May	<b>Base BE</b> measurement; measured across <b>Base AD</b>		

# SMART SURVEYORS FOR LAND AND WATER MANAGEMENT CHALLENGES IN A NEW REALITY

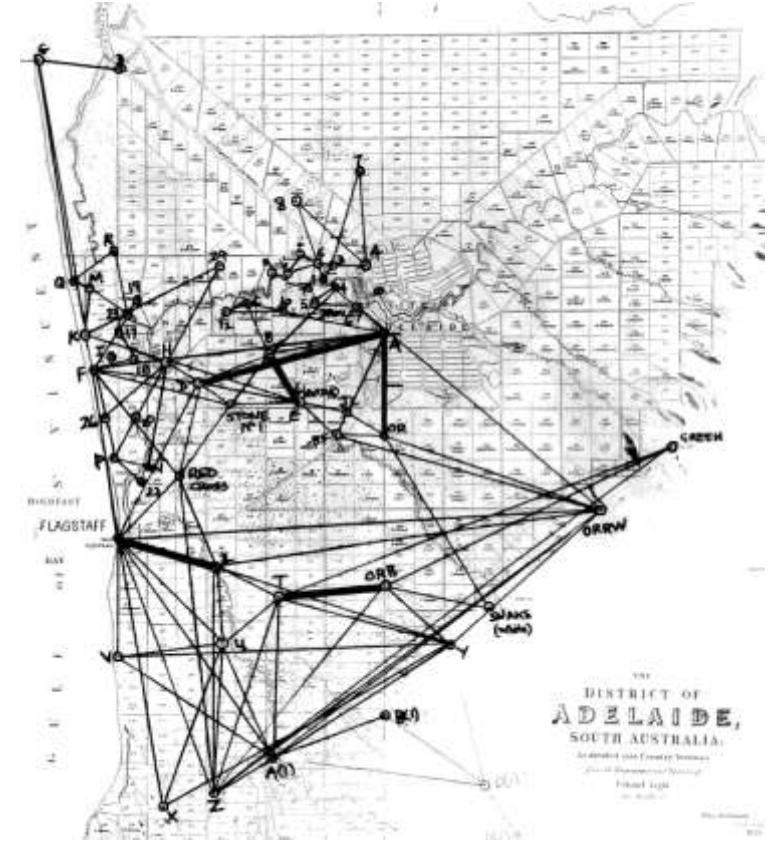
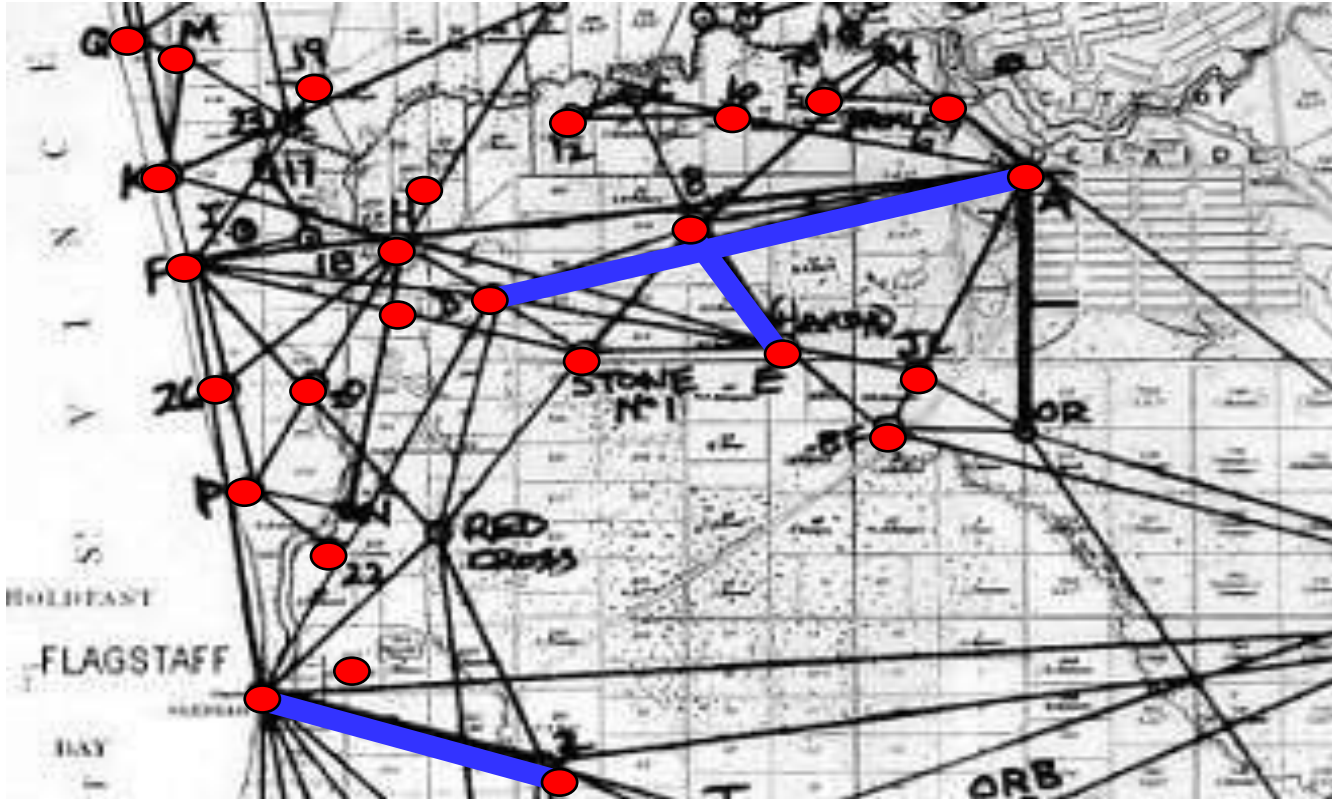


BASELINES

A – D

B – E

Flagstaff – 2



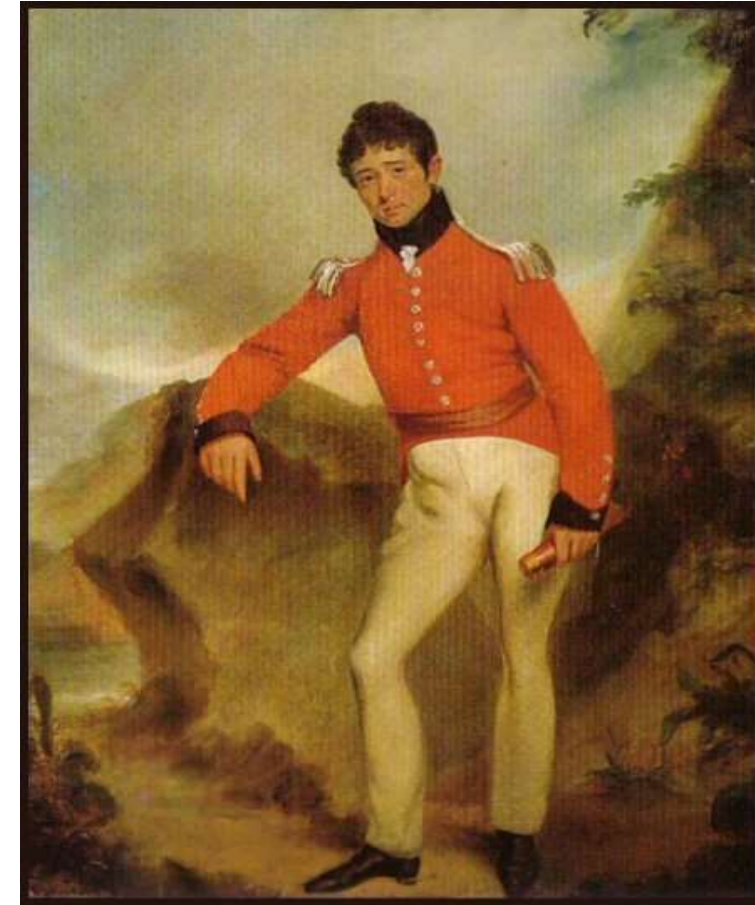
Rough working diagram of original District of Adelaide Trig Stations' names and approximate localities, identified by J.R. Porter and K. Henderson as at end of March 2021.



Detail of Art Gallery of South Australia  
Accession O.668

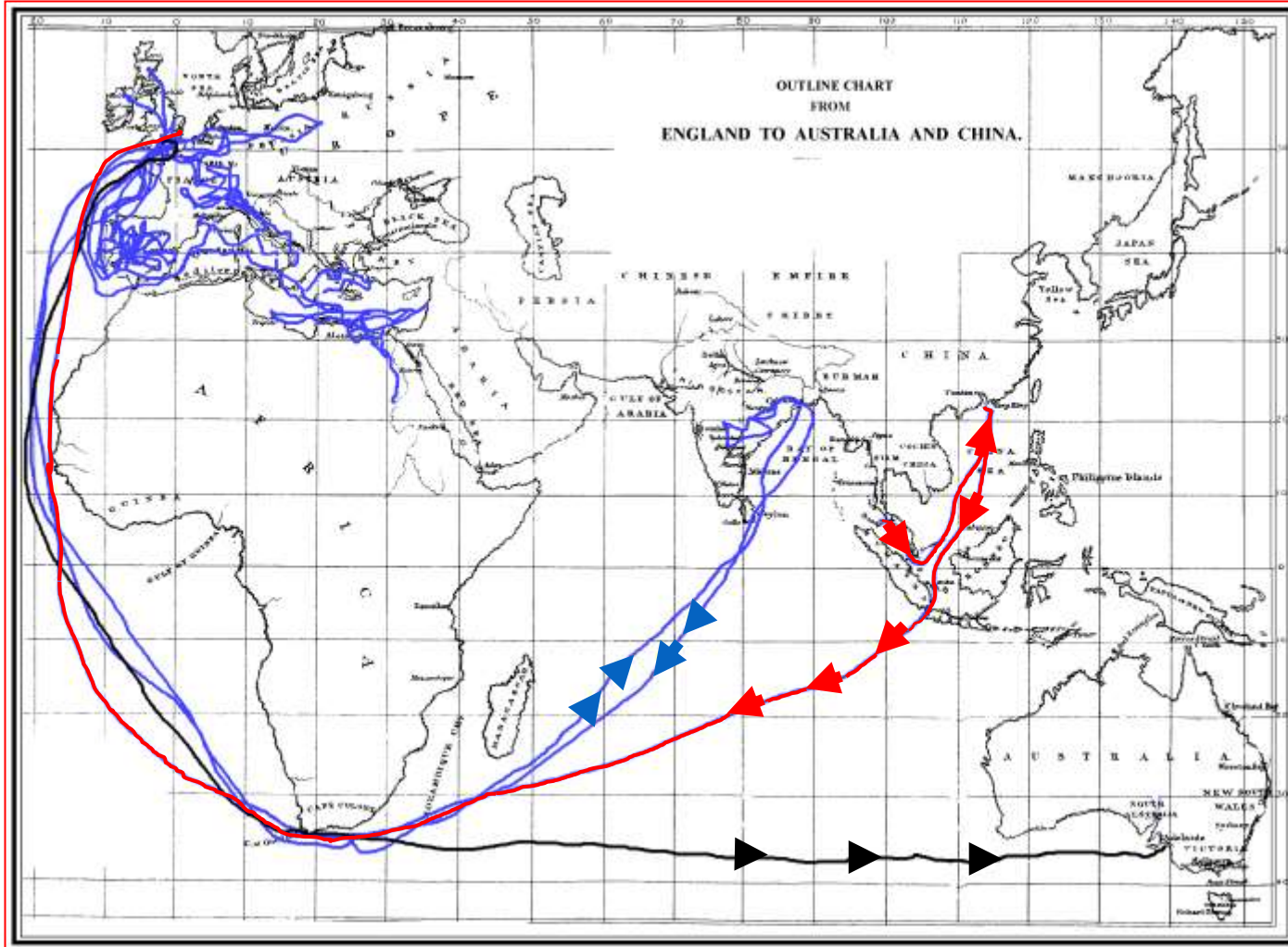
**William Light (1786 – 1839)**  
First Surveyor General  
of South Australia

“... ships can pick off their positions on the globe, and shape their course from one part of the world to the other with great accuracy ... and so could we give over the country sections ... ”



Light, Colonel William (Australia, 1786-1839); oil painting  
Courtesy of the Art Gallery of South Australia, Adelaide

# SMART SURVEYORS FOR LAND AND WATER MANAGEMENT CHALLENGES IN A NEW REALITY

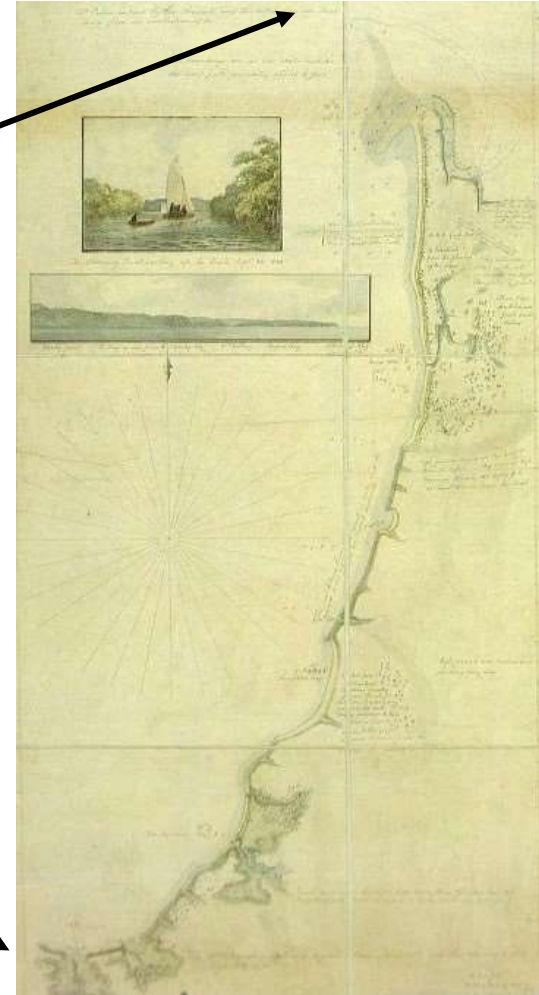
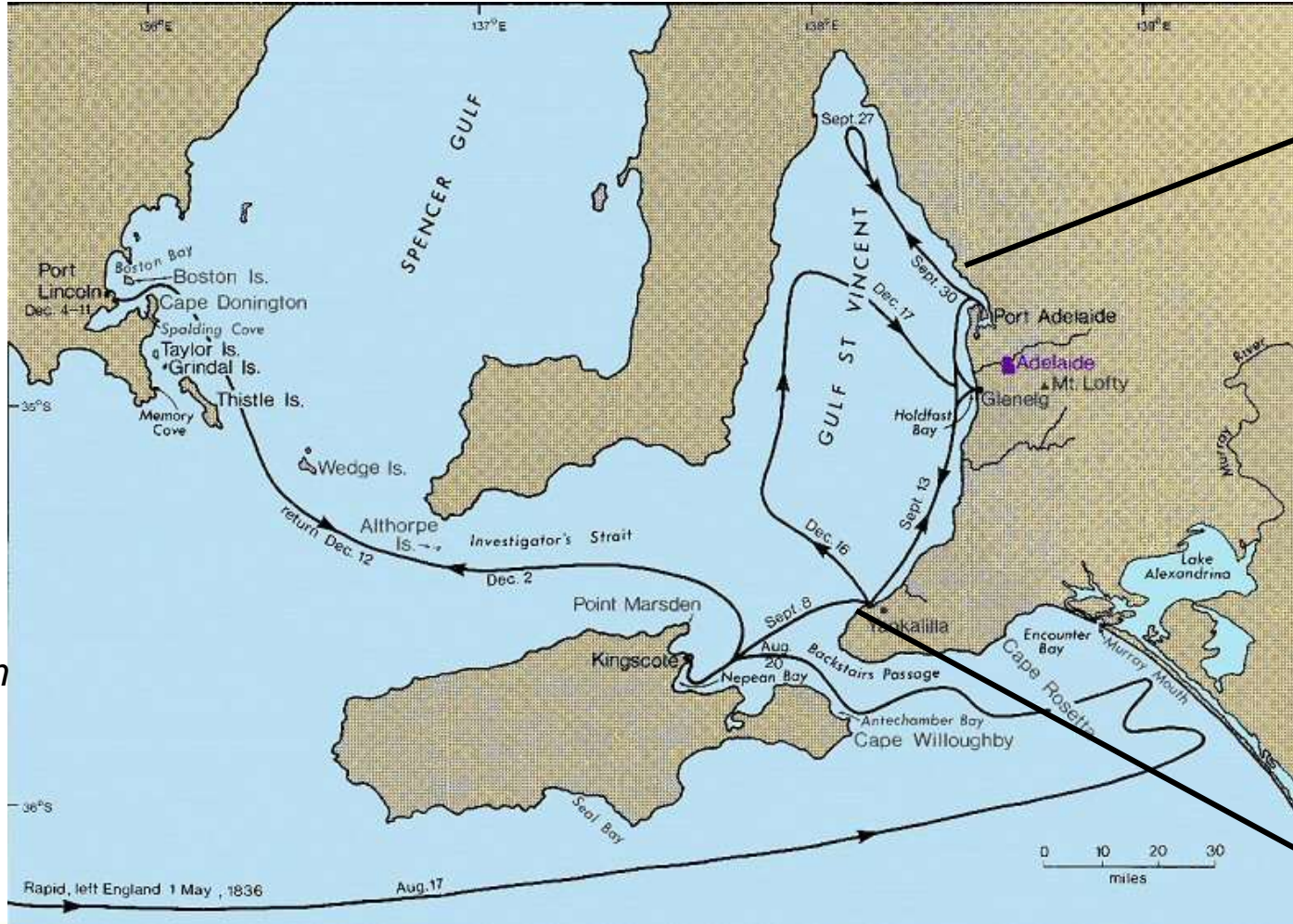


↙ 1792-3 (aged 6 yrs)  
From Penang, via  
Canton, to England

↗ c.1805  
From England to  
India, and return;  
↙ later service in  
Peninsular War and  
Egyptian Navy

→ 1836  
From London  
to South Australia  
(Surveyor General)

# SMART SURVEYORS FOR LAND AND WATER MANAGEMENT CHALLENGES IN A NEW REALITY



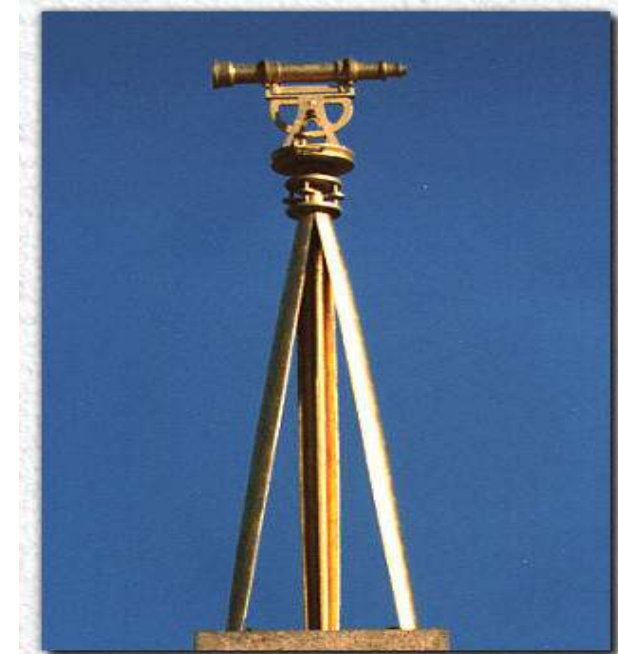
East Coast  
of  
Gulf  
St Vincent  
  
Nov 1836

Source: David F. Elder, *Light's Brief Journal and Australian Diaries*, amended and coloured, KH 2008.



**Survey Brig 'Rapid'**

State of the art survey equipment, despite transport by sailing vessel, on foot, with hand carts, and bullock wagons







## Integrated Land and Water Management

*Evaluation of flood risk, carefully positioning the city on rising ground, deliberately avoiding areas liable to inundation and west of the Mt Lofty Ranges where there was less likelihood of being drought-affected*

### WATER

- Commodious all-seasons mercantile harbour, safe shipping routes and anchorages
- Evaluation of fresh water sources for current & future population
- Coastal and riverbank reserves

### LAND

- Best site for an agrarian settlement and a healthy capital / seat of government, adjacent fertile land
- Open space: squares, gardens and public walks
- Transport network



## Primary advantages sought for the first town:

1. A commodious harbour, safe and accessible at all seasons of the year
2. A considerable tract of fertile land immediately adjoining
3. An abundant supply of water
4. Facilities for internal communication
5. Facilities for communication with other ports
6. Distance from the limits of the colony, as a means of avoiding interference from without in the principle of colonization
7. The neighbourhood of extensive sheepwalks

## Secondary advantages:

8. A supply of building materials, as timber, stone, or brick, earth and lime
9. Facilities for drainage
10. Coal.



## South Australian Commissioners’ instructions to Colonel William Light, March 1836

“You will now proceed to make a careful examination of the coast in the central parts of the colony...”

“Having completed the surveys here indicated ... **you will proceed to determine which of the several sites shall be selected as that of the first town**; a duty which you are hereby fully authorized and required to discharge ... a duty which the prosperity of the colony so greatly depends.”

7: The lands comprised within the site of the first town will be divided into 1,000 sections of an acre each...

17. “When you have determined the site of the first town ... you will make the necessary reserves for squares, public walks and quays.”

18. “ You will next proceed to survey, lay out and map the surrounding district...with a reserved road adjoining each section...”

19. “In all your surveys you will reserve as a public road all land on the coast within not less than 100 feet of the highwater mark, and you will also reserve a road, at least 66 feet wide, along each side of every navigable river...”



“ ...a man that cannot establish a meridian line, that is not capable of finding his latitude or longitude, that cannot determine the variation of the compass or conduct a survey trigonometrically – to be Surveyor-General in a new country is truly laughable ... ”

“...Parallels of latitude and meridians of longitude are imaginary lines, but ships can pick off their positions on the globe, and shape their course from one part of the world to the other with great accuracy by them, and so could we give over the country sections ...”

William Light to Edward Gibbon Wakefield, Adelaide, July 22, 1838

[Source: M. P. Mayo, *The Life and Letters of Col. William Light*, Adelaide, 1937, pp.244-246]



Art Gallery of South Australia

The geographical position of the present site cannot be disputed ...

*Brief Journal, Light, 1837*

My previous observations at sea ... before I saw this country, were that all the vapours from the prevalent south-westerly winds would rest on the mountains here, and that we should *if we could locate this side of the gulf*, be never in dread of those droughts so often experienced on the eastern coast of Australia. (Oct 1836)

*Brief Journal, Light, 1836*



*Colonel William Light*

Art Gallery of South Australia

*'... the obstructions for this work were greater on this particular spot than any other part of the plain.'*

*'Why choose it?' I answer, 'Because it was on a beautiful and gently rising ground, and formed altogether a better connection with the river than any other place.'*

30 Dec 1836: *'On examining ... some distance up and down the river, I saw evident marks of the river overflowing its banks, and this made me resolve upon the first site I had chosen ... the most beautiful position for a town in the country...'*

3-11 Jan 1837: *'I was employed in looking repeatedly over the ground, and devising in my own mind the best method of laying out the town according to the course of the river, and the nature of the ground...'*

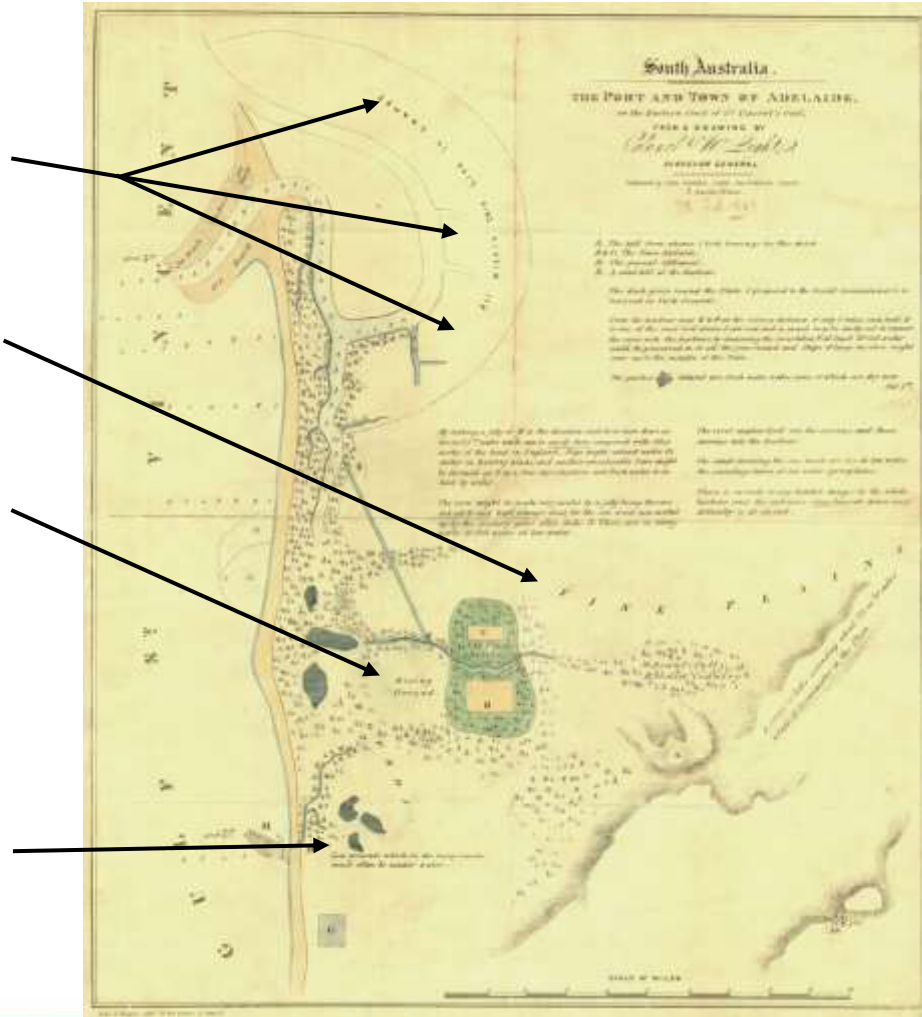


All within this  
Line is swampy

Fine Plains

Rising Ground

Low grounds  
which in the  
rainy season  
must often be  
under water



*South Australia*

*The Port and Town of Adelaide  
on the Eastern Coast of  
St. Vincent's Gulf*

*From a Drawing by Colonel  
W. Light Surveyor General*

State Library of South Australia  
[www.collections.sa.gov.au/  
resource/C+195/2](http://www.collections.sa.gov.au/resource/C+195/2)



Light (and his team) “... *had no common work to achieve;  
... had to perform it under no common circumstances;  
... had done it in no common manner.*

*With limited means, in a limited time, against all the opposition which a jealousy of trust so properly confided to him would provoke in one and all, that bigoted ignorance or personal interest could contrive in others, amidst slanders here, and in spite of complaint sent to England, he has gone steadily on – has give us a spot and a plan for a capital of which we may justly be proud ...*

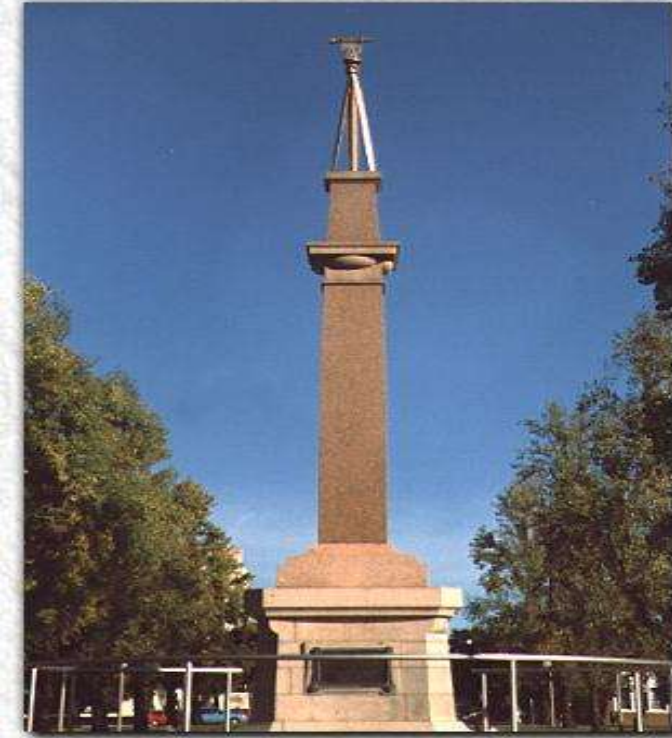
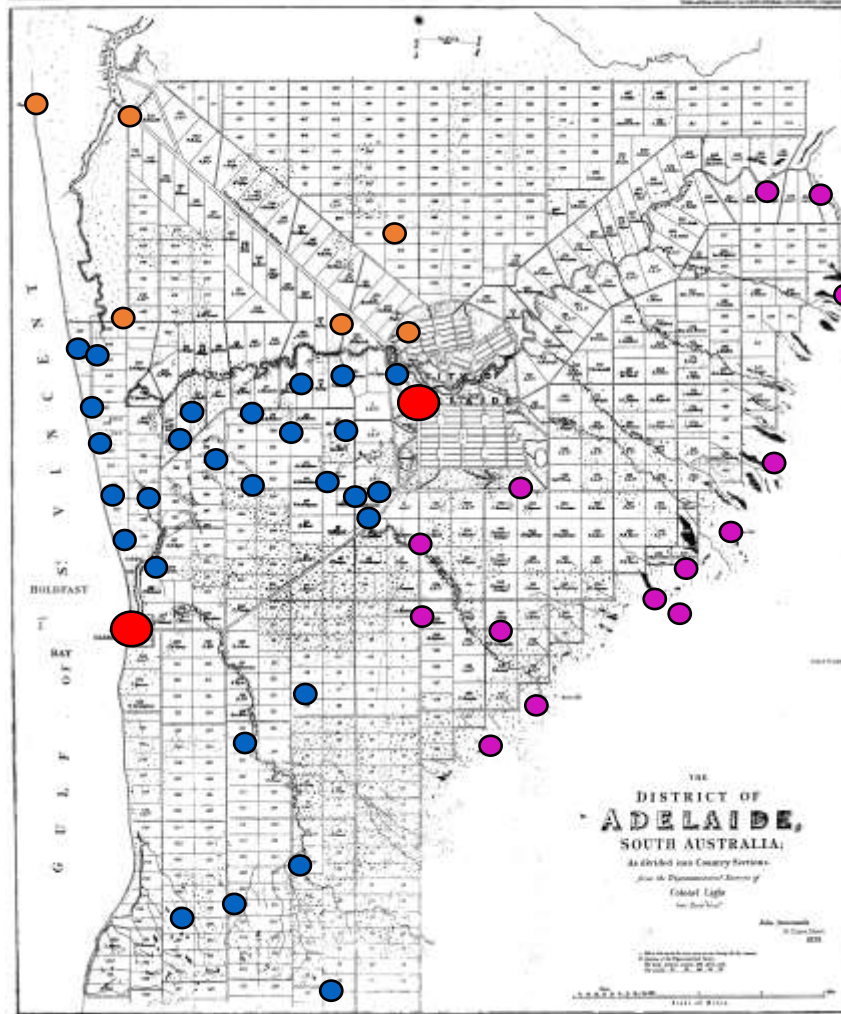
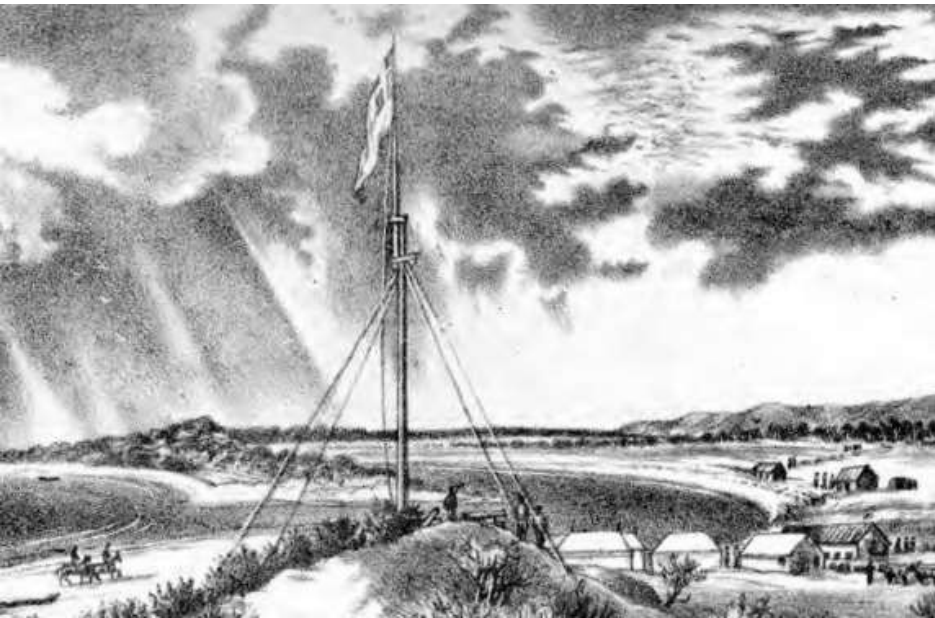
**Light and his survey team had succeeded in building the foundational spatial infrastructure that gave South Australia a chance to have a future.**







## Holdfast Bay FLAGSTAFF TRIG STATION



Light's Monument  
Light Square,  
ADELAIDE