



Fort Scratchley DTM & Coal River Working Party



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SURVEYING PROJECT 2006



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1. EXECUTIVE SUMMARY

Within this student project many various aspects of the knowledge gained by the surveying degree were applied. This included various levels of topographic data management, investigations into related deposited plans, historical plans and documents, as well as the incorporation of new skills acquired with relation to digital terrain modelling.

The project was found to be of great benefit to the wider community through the Coal River venture and to the students involved. This can be seen through the creation of the digital terrain model to be placed on the Coal River website at a later date. The fix of the 1830 Plan as well as some relevant conclusions relating to the scope of the 1804 convict coal mines plan.

2. INTRODUCTION

At the request of the Coal River Working Party (a special interests group formed by the University of Newcastle) University of Newcastle students John Wilson and Alex Widgery, studying Bachelor of Surveying and Bachelor of Civil Engineering/Surveying respectively, undertook a project to create a Digital Terrain Model (DTM) of Newcastle's Coal River Precinct.

The DTM was to comprise chiefly of the hill at Fort Scratchley, formerly known as Flagstaff or Signal Hill and Colliers Point. It was also hoped to incorporate the old convict coal mines as they were at the start of the 19th Century, at what was then known as Flagstaff Hill. This entailed an initial analysis of an 1804 plan made by Lieutenant Menzies displaying the drives, headings and crosscuts made of the coalmine made by the convicts. The examined plan was entitled:

"A Plan of His Majesty's Coal Mine at King's Town New Castle District County of Northumberland New South Wales in its present Situation of working, July 1804."

Throughout the investigation of the Coal River Precinct other areas of exploration were requested by Coal River Working Party Members, Gionni Di Gravio and Dr Erik Eklund. This entailed an analysis of an 1830 plan by John Armstrong entitled:

"Plan of the Town of Newcastle New South Wales shewing it's present actual state with part of the adjoining Country, and the coal works of The Australian Agricultural Company from a Careful Survey."

This study was conducted by John Wilson in order to account for his extra 10 Credit Points.

3. BACKGROUND TO THE COAL RIVER WORKING PARTY

The Coal River Working Party (CRWP) is a community action group formed by The University of Newcastle in 2003, from the combined resources of special interest groups, of heritage and history, commercial partners from industry and professions, and Local Government in order to protect Newcastle's important landmarks.

The overall vision of the CRWP *“was to create an interpretative centre to express Newcastle's unique Aboriginal, convict and industrial heritage and a management plan for the entire site by the 200th anniversary of the permanent settlement at 'Coal River' 2004.”* (Coal River website)

Newcastle is a town “entrenched” in mining history and it could be said that it was the lifeblood of the blue collar town for many years. It is easy to understand the natural obsession the people have with the existence of old mine warrens throughout Newcastle and therefore of the level of interest the Coal River Working Party has gained within the town.

The Nobby's Coal River Heritage Park is:

“A significant historical place that gives a tangible expression to Newcastle's Aboriginal & European Heritage. A distinctive area of public land at the mouth of the Hunter River encompassing Nobby's Headland, Macquarie Pier, The Convict Lumber Yard, The Cornish Dock and the original convict coal mine workings at Colliers Point beneath Signal Hill.

Potentially one of Australia's most significant sites: It is a place of Aboriginal heritage. It is the location of Shortland's discovery of a Coal River (named Hunter River) and of winnable coal. It is the historic focus of the official founding of Newcastle 30/3/1804 and of the beginning of convict coal mining, port development and maritime heritage. It is also a place of later military heritage.” (Coal River Website)

The CRWP group has received contributions from Local, State and Federal Governments as well as the University of Newcastle and the involved commercial companies.

4. NSW AWARD FOR EXCELLENCE IN SURVEYING AND SPATIAL INFORMATION



One of the companies that has been prominent in offering their services pro bono is Monteath & Powys Pty Ltd Surveyors of which both students are currently employed.

The progress made by the CRWP has been demonstrated by the successful recent re-discovery of convict coal mines under Signal Hill in Newcastle by Monteath & Powys Pty Ltd.

Our involvement entailed the writing of the report to the Institution of Surveyors for the NSW Award for Excellence in Surveying and Spatial Information and participation in the previous field work. The writing of the report entailed a full analysis of all the work done to date, which had to be analysed in order to appreciate and get an understanding of the full scope and history of the works. This included a comprehensive review of all fieldwork undertaken and of all historical documents that had provided information or clues as to the exact location and state of the mines. Consultations with previously involved Monteath & Powys Pty Ltd personnel further enhanced our understanding.

4.1. Summary of the report to the Institution of Surveyors and Previous Work Done

Monteath & Powys Pty Ltd were able to fix the mine drifts or entrances as depicted on an 1854 stratigraphic sketch entitled: *“Stratigraphic sketch from Nobby's Island Newcastle to Burwood, showing coal seams and their Order of Superposition”* by the then Surveyor and Examiner of the Coal Fields, William Keene. The 1854 Plan is contained in Figure 1 below. The sketch only shows two of the three official government workings or “drifts” **Error! Reference source not found.** on the ocean side of the hill.

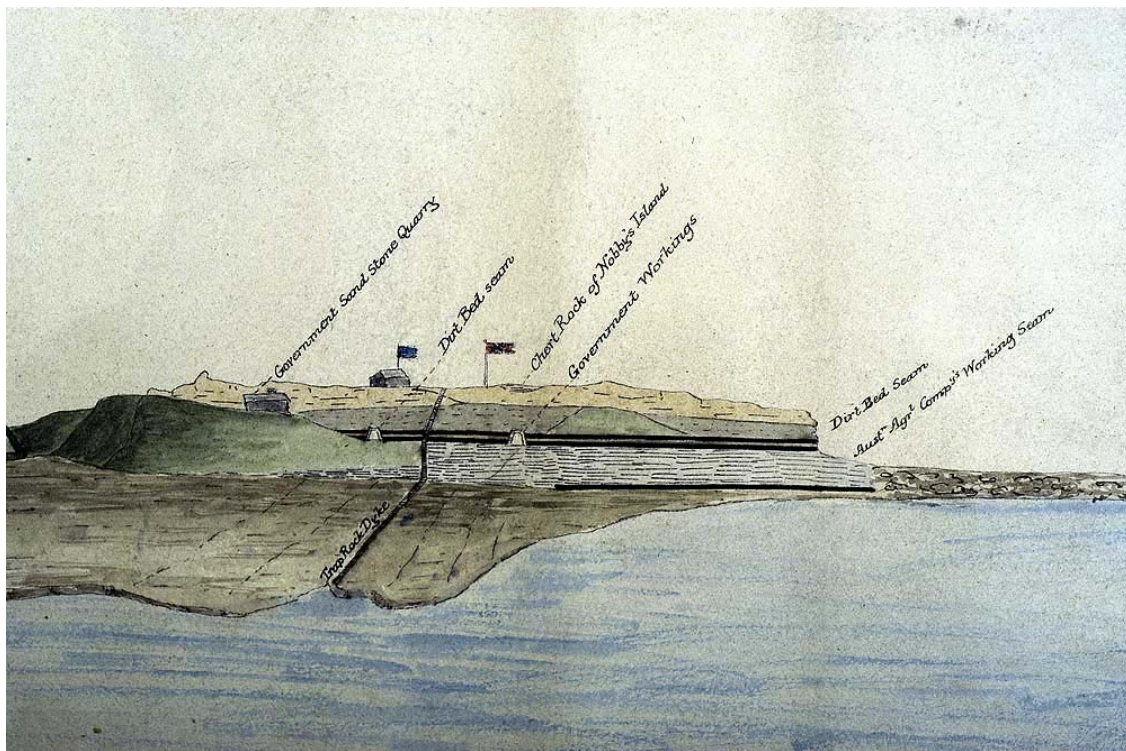


Figure 1: 1854 Stratigraphic Sketch by William Keene

There were three drifts in total and these are depicted on an 1856 survey plan by the surveyor P.Francis Adams entitled *“Plan of Flag Staff Hill, Newcastle.”* The 1856 Plan is contained in Figure 2.

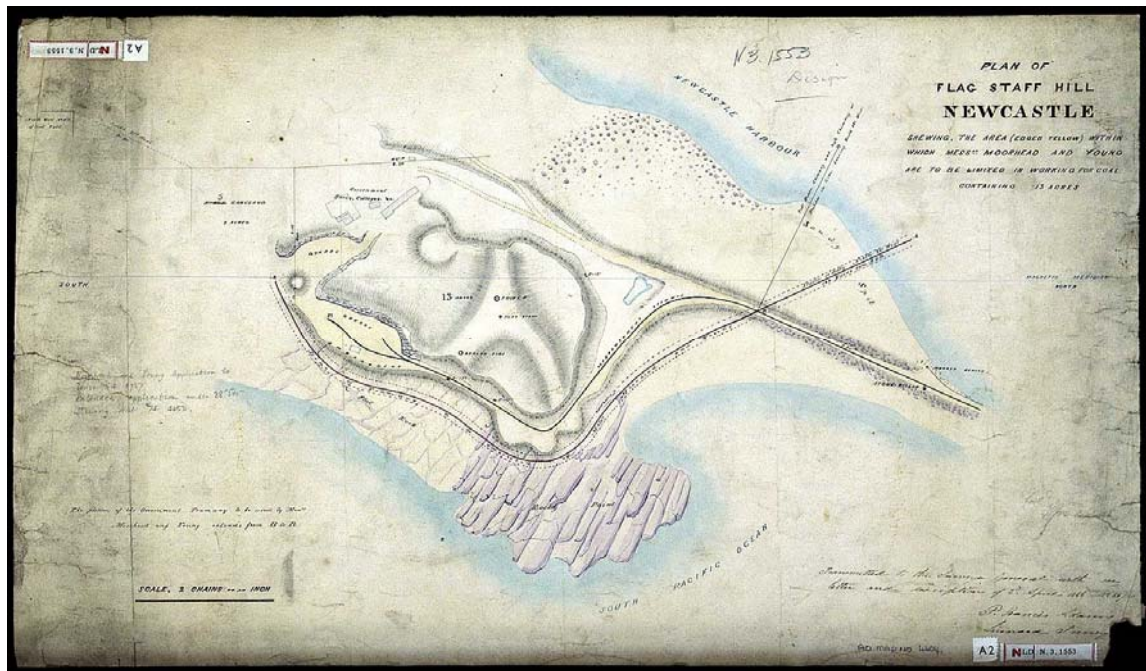


Figure 2: 1856 Plan of Flagstaff Hill by Armstrong

The three drifts were fixed by overlaying the 1856 Plan onto an aerial photograph of Newcastle today. By doing this, common features were able to be identified. These included Susan Ranclaud's parcel of land, and topographical features such as the surrounding ridgeline location and also the bearing of the breakwater. Following this these features were aligned with current topographic work. **Error! Reference source not found.** shows the areas which enabled the plan to be fixed, with the located areas highlighted in red.

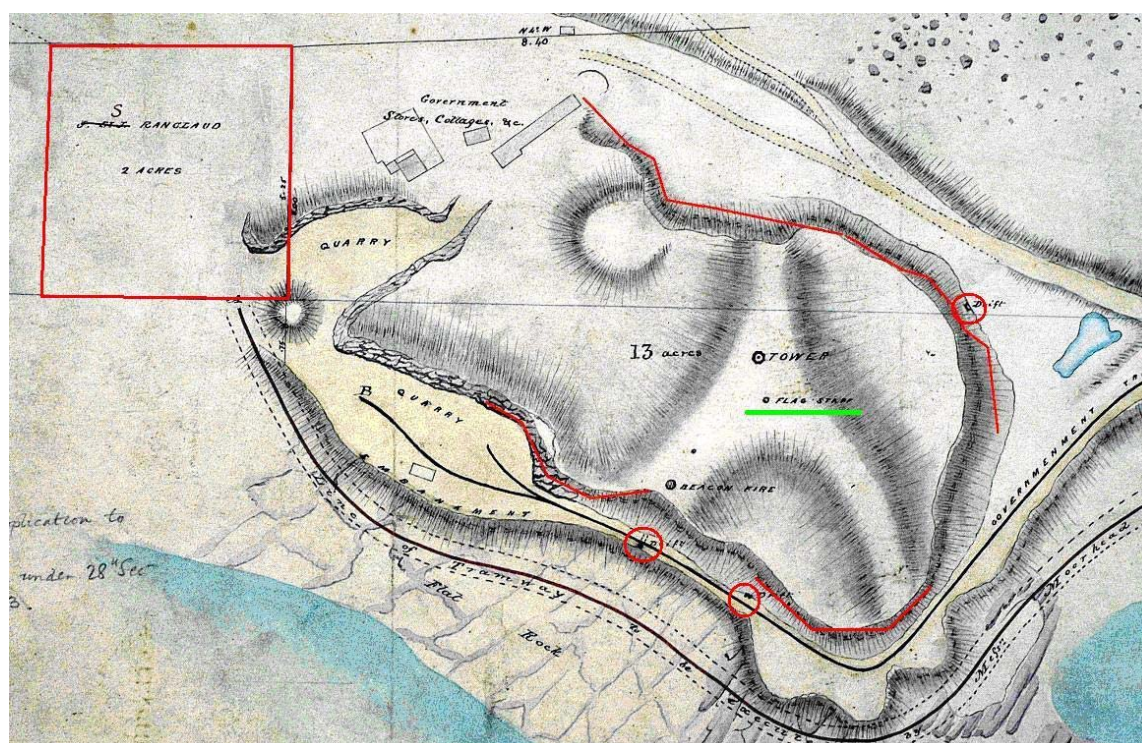


Figure 3: Correlating features between 1856 and today

The importance of the work conducted by the CRWP was highlighted when Monteath & Powys Pty Ltd won the NSW Award for Excellence in Surveying and Spatial Information in the category of People and Community. Figure 4 shows the relevant excerpt from the awards booklet. The full written report to the Institution of Surveyors is contained in Appendix A.



WINNER

Peter Sherlock - Monteath & Powys Pty Ltd

Nobby's Coal River Heritage Park

The recent 200th anniversary of the official establishment of Newcastle as a Government settlement was the catalyst for the greater community involvement by Monteath & Powys Pty Ltd. A community action group titled "The Coal River Working Party" was formed from the combined resources of special interest groups of heritage and history, commercial partners from industry and professions, Local Government and the University of Newcastle. The overall vision was to create an interpretative centre to express Newcastle's unique Aboriginal, convict and industrial heritage and a management plan for the entire site by the 200th anniversary of the permanent settlement at "Coal River" 2004. The project received contributions from Local, State and Federal Governments as well as the University of Newcastle and the involved commercial companies.

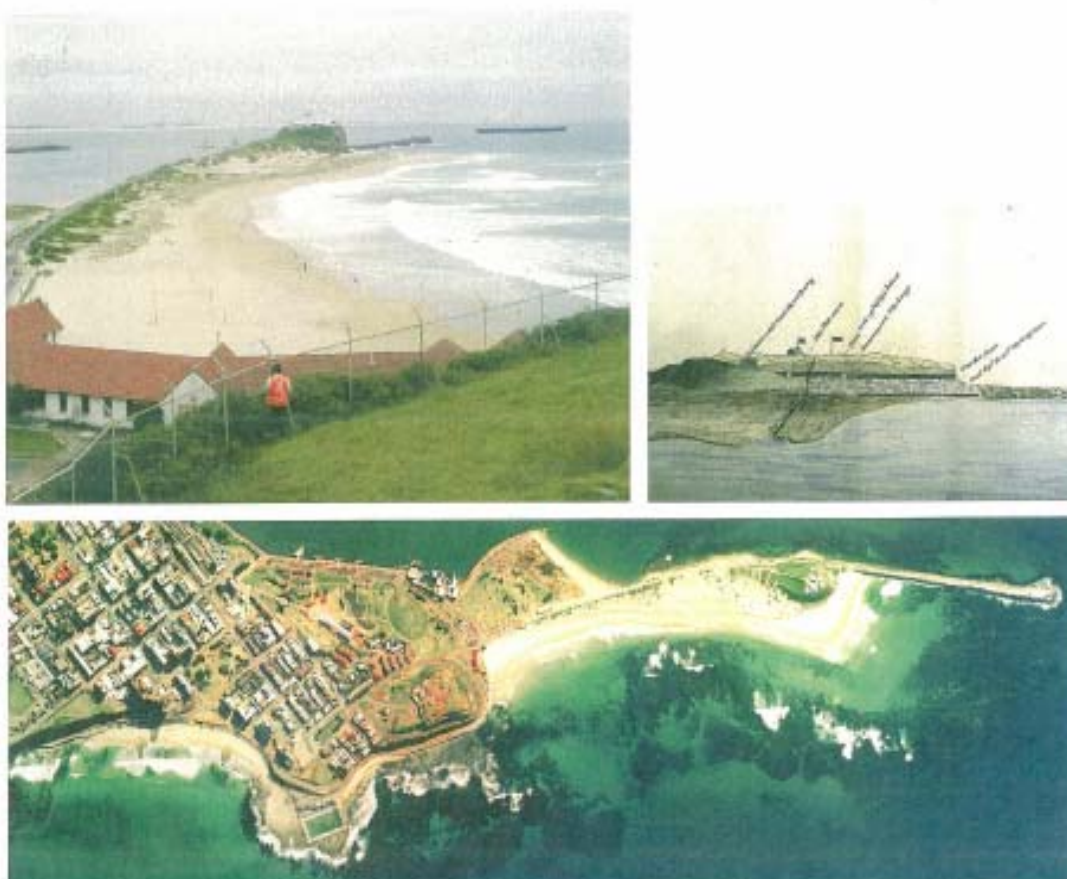


Figure 4: Excerpt from Surveyors Excellence Awards

5. FIELDWORK

5.1. Introduction

In order to produce a realistic Digital Terrain Model (DTM) of Fort Scratchley for our major student project as requested by the Coal River Working Party, topographic data was required encompassing the entire area. It was aware to both students of the existing detail survey carried out by Monteath & Powys Pty Ltd encompassing primarily the summit of the Fort, as both been involved with the job as survey assistants. We were also aware of surrounding Newcastle City Council topographic data which Monteath & Powys Pty Ltd had access to. Figure 5 displays a cropped image taken from the *GeoSurvey* file after both sets of data had been combined and merged via the use of the “append” function in *GeoSurvey*.



Figure 5: Topographic data

The Monteath & Powys Pty Ltd data can be viewed within the red contour boundary string in the centre of the above Figure. The surrounding topographic data is that produced by surveyors from Newcastle City Council. It was apparent that a substantial amount of area was required to be detail surveyed between the two sets of data to generate a complete and accurate DTM. The only survey

Within the area required the only data that could be found is the one top of kerb string that can be seen in Figure 6 as the single grey string in the centre of the required data. This string was located on its own purely for scaling purposes of the *“1856 Plan of Flagstaff Hill”*, in order to assist in the fix of the 1856 mine drift locations.

During the course of all fieldwork, “Surveyor on road” signs were set up on both sides of the road along with safety cones around all sets of legs. In addition, high visibility safety vests were worn at all times.

The field notes for each section of fieldwork are contained in Appendix B.

5.2. Site Reconnaissance

Before any survey work could be carried out a site reconnaissance of control marks was undertaken. This involved familiarisation of each survey control point by travelling to and locating each major control mark. It was ensured that each control point was accessible and had not been destroyed for whatever reason, such as by a major construction or by road works. The existing field notes were used to locate the position of each survey control point. No privately owned property was needed to be entered upon and the time it took to travel between each site was no greater than five minutes.



Figure 6: Photograph of two used control stations

5.3. Control Placement

Based on the analysis of the existing field notes and reconnaissance of the available control stations at Fort Scratchley, it was decided that more survey stations were necessary to locate the specific areas that were required. Therefore control was established based on connecting and obtaining an azimuth from the existing Monteath & Powys Pty Ltd control. Figure 6 displays both the existing and added control stations.

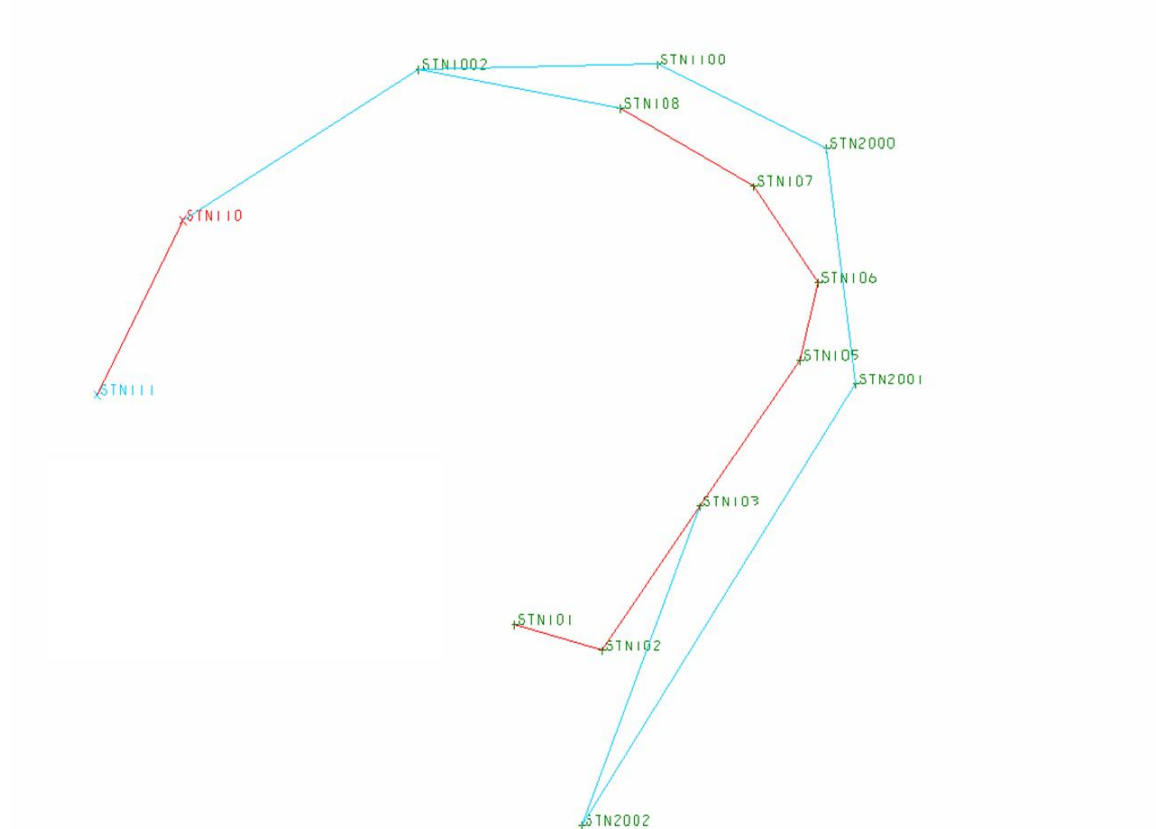


Figure 7: Control Layout

The existing Monteath & Powys Pty Ltd control can be seen in red in Figure 6 with the additional control included shown in blue. The control was extended from Fort Drive down onto Shortland Esplanade. The control placed consisted primarily of gins in the expansion joints of concrete and drill holes.

5.4. Levelling

Following the placement of the required additional control stations, the loop was levelled by the convenient use of a digital level from which a 3mm misclose was attained.

Table 1 shows the final reduced levels for both the newly obtained and the existing stations that were used in the survey.

Table 1: Reduced Levels of Control Stations

Station	Height (AHD)	Type	Comments
101	24.290	DH	Existing
102	15.180	DH	Existing
103	12.550	DH	Existing
105	12.032	DH	Existing
106	12.130	DH	Existing
107	12.238	DH	Existing
108	11.622	DH	Existing
1002	8.427	Gin	Added
1100	6.121	Gin	Added
2000	3.922	Gin	Added
2001	4.174	Gin	Added
2002	3.863	DH	Added

5.5.Traversing

As previously stated the azimuth of our control loop was derived from the coordinates of the existing control stations. Therefore, the traverse was undertaken from the line between Station 105 and 103 with a bearing value of $217^{\circ}15'11''$. The following Table displays the coordinates of the existing stations and the calculated coordinates of the additional stations.

Table 2: Control Station Coordinates

Station	Easting	Northing
101	373910.953	1355147.910
102	373944.794	1355138.760
103	373982.405	1355189.130
105	374021.117	1355240.040
106	374028.021	1355266.980
107	374003.300	1355300.510
108	373951.825	1355327.860
1002	373874.004	1355341.330
1100	373965.975	1355343.000
2000	374031.426	1355313.870
2001	374042.703	1355231.650
2002	373936.881	1355077.950

The loop was also closed back onto this original starting line obtaining a precise misclose of 0". Due to the accurate nature of the misclose, there was no need for a Bowditch adjustment. Two of the control stations located on Fort Drive that were used in the traverse are shown in Figure 7.

5.6. Detail Work

Once the control had been coordinated and the heights reduced (to AHD), the detail work was commenced. The majority of the points located were taken using a reflectorless instrument in reflectorless mode. This was due to safety reasons concerned to the majority of the required shots being located on the cliff faces divided by Fort Drive. However top of kerb shots, location of car barriers, light poles and natural surfaces were all located conventionally using a reflector mounted on a survey pole. To complete the necessary task three days of detail work was undertaken.

5.7. Data Processing

Following each day in the field, the topographic work was downloaded into *GeoSurvey* via the “Menu option – Data recorder – Read from data recorder.” During this process it was ensured that the data recorder baud rate correlated to the same settings within *GeoSurvey*, allowing a smooth transition of data.

At which time the stadia files were analysed and corrected for errors and subsequently reduced. This involved editing 27 point information cards into 23 station information cards to allow the program to recognise station setup information, i.e. coordinates, RLs and to check that it conforms with backsight station observation reading tolerances. Within the reduction, 5 errors were found, 4 of which pertained to a mistake in editing the above mentioned 27 cards. This was the result of a mistake in transposing a station RL causing the quality assurance checks to that station to fail. After resolving this error only 1 problem remained. This was the result of a quality assurance check being outside of the allowed 25mm vertical tolerance by 1mm. This point was deemed acceptable taking into consideration the purpose of the fieldwork being for the creation of a DTM which did not require pinpoint accuracy. A copy of the reduced stadia file output is contained in Appendix C. Figure 8 shows the stadia reduction window within *GeoSurvey*.

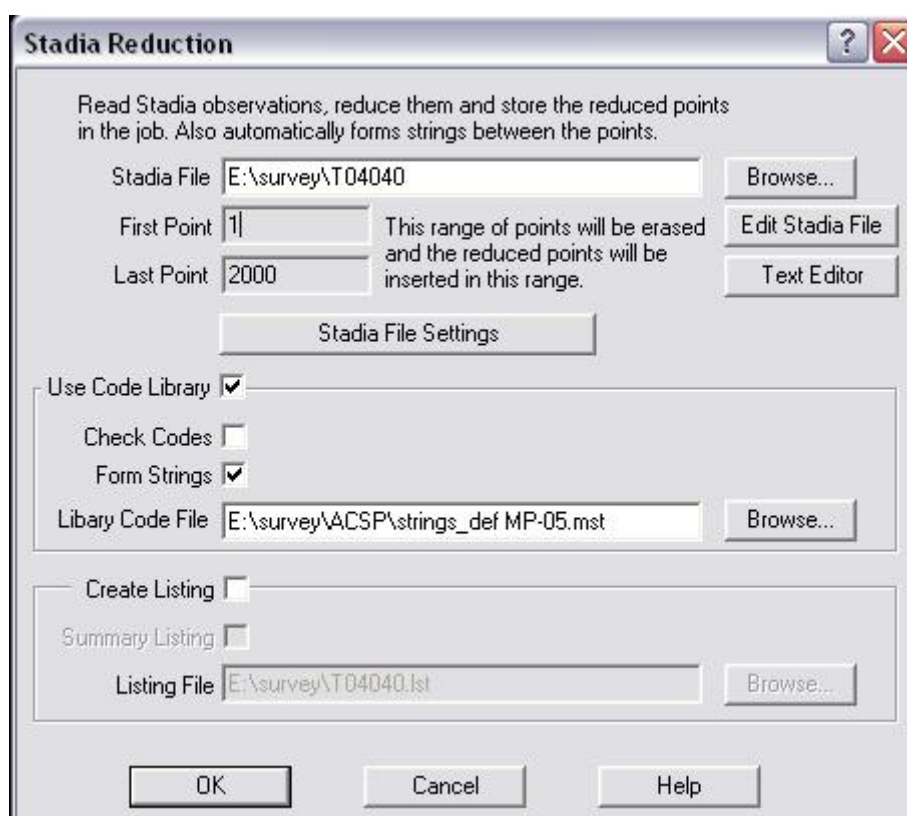


Figure 8: Stadia reduction

Finally this allowed the data to be appended into a master file containing the existing Monteath & Powys Pty Ltd and Newcastle City Council data. This was achieved by the use of the *GeoSurvey* "File-Append" function in which care was taken to ensure that point numbers were not overwritten. This was done by analysing the job statistics for each data file and finding an open point range for the appended data.

6. 1804 PLAN

6.1. Background to the 1804 Plan

The 1804 Plan entitled: “A plan of His Majesty's Coal Mine in Kings Town Newcastle District County of Northumberland New South Wales in its present situation of working July 1804”, was made by Lieutenant Menzies and sent by Governor King to Lord Hobart in England. The plan was rediscovered by Doug Lithgow from a microfilm copy in Sydney, with the original found in the British National Archives after an extensive search. The 1804 Plan is contained in **Error! Reference source not found.** Figure 9 below.

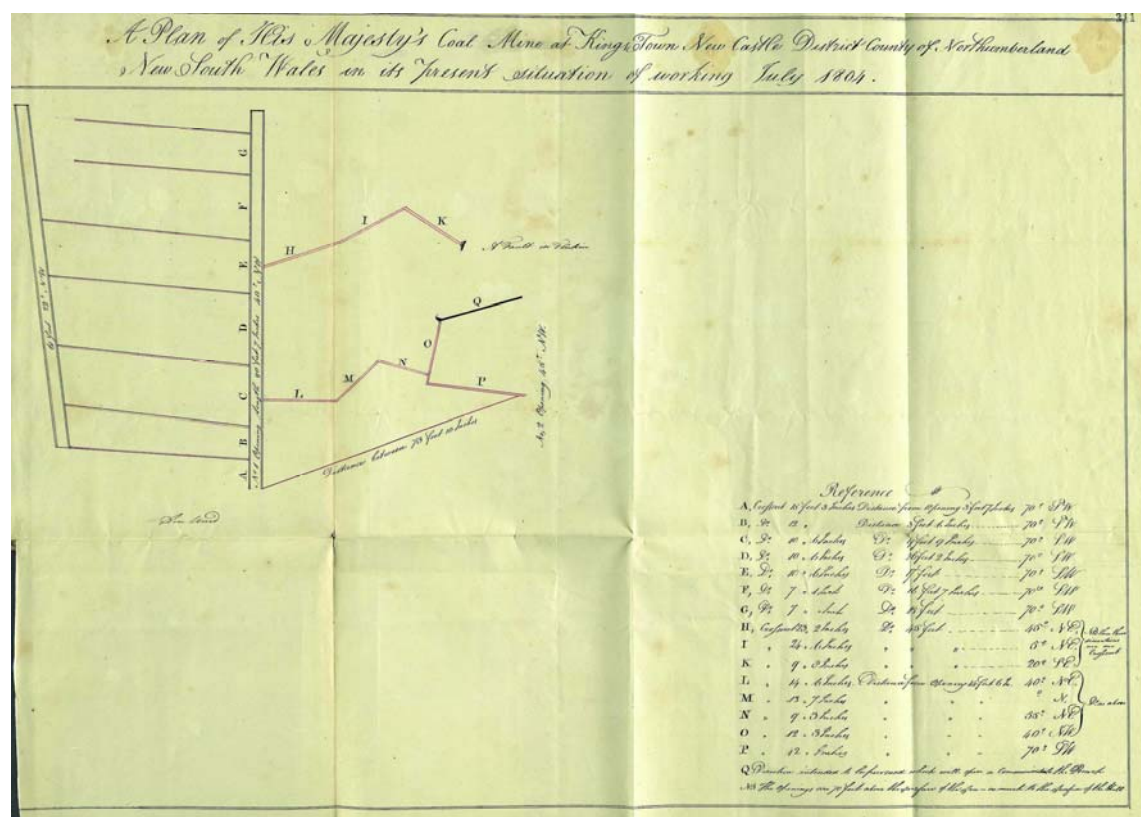


Figure 9: The 1804 Plan by Lieutenant Menzies

The Plan is proof that the convict coal mines beneath Fort Scratchley are the first coal mines to be worked in the Southern Hemisphere, over 30 years before those in South Africa. The 1804 Plan depicts the drives, crosscuts and headings of the coal mine.

6.2. Scope of Work Entailing the 1804 Plan

As part of the DTM model it was asked if it was possible to:

- fix the 1804 Plan within itself
- fix 1804 Plan with respect to Fort Scratchley
- model 1804 Plan as part of the Fort Scratchley DTM
- attempt to prove the relationship between the 1804, 1854 and 1856 Plans

6.3. Results of the 1804 Plan

6.3.1. Fixing the 1804 Plan within itself

Attempt 1:

On the initial analysis of the 1804 Plan it was found that it was very difficult to read what was written on the plan and in the reference table. Initial analysis revealed that multiple distances and bearings were missing from the plan. In regard to the reference table, it was not apparent or understood how the numerical figures exactly related to the plan itself. An attempt was made to input the data via direct entry of the mine workings table of data into the program *GeoSurvey*. Therefore, the initial attempt to fix the 1804 Plan involved using the clearly discernible compass bearings and distances on the plan itself. However, this initial attempt proved to be unsuccessful.

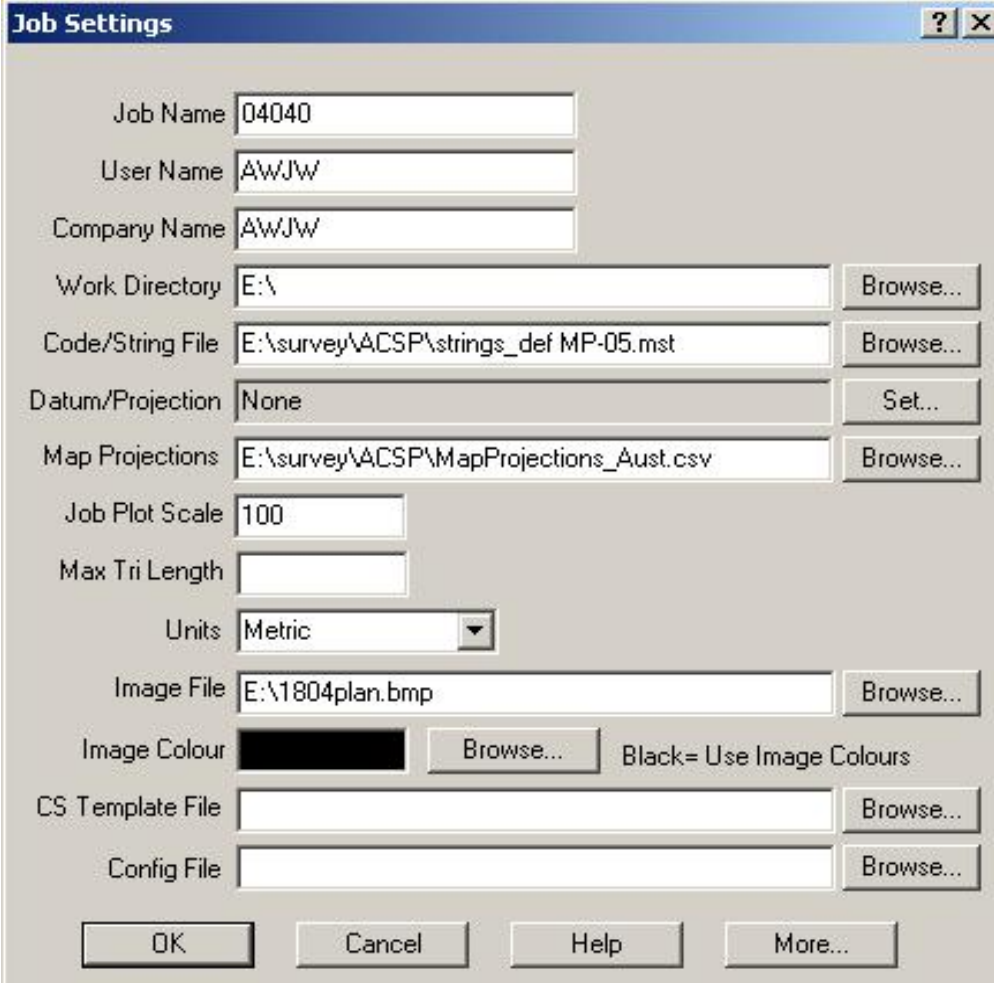
Although some results were obtained the validity of the results could not be guaranteed. Problems were encountered in this attempt primarily due to a lack of understanding of the terminology used, such as “crosscuts.” In addition, difficulties were encountered in reading what the plan actually said and mistaking what numbers were written. An example of this was mistaking 1's for 4's and 6's for 10's. Figure 10 displays the reference table from the plan. From Figure 10 it can be seen that for say crosscuts “L” and “M”, the way in which the number 1 is written varies quite considerably. For “M” it appears as if the crosscut is 43 inches where in fact it is only 13 inches.

Reference				
A, Crosscut	15 Feet 3 Inches	Distance from Opening	3 Feet 7 Inches	70° SW
B, D ^o	12 "	Distance	3 Feet 6 Inches	70° SW
C, D ^o	10 " 6 Inches	D ^o	4 Feet 9 Inches	70° SW
D, D ^o	10 " 6 Inches	D ^o	26 Feet 2 Inches	70° SW
E, D ^o	10 " 6 Inches	D ^o	17 Feet	70° SW
F, D ^o	7 " 1 Inch	D ^o	16 Feet 7 Inches	70° SW
G, D ^o	7 " 1 Inch	D ^o	15 Feet	70° SW
H, Crosscut	23 " 2 Inches	D ^o	45 Feet	45° NE
I "	24 " 6 Inches	" "	" "	5° NE
K "	9 " 3 Inches	" "	" "	20° SE
L "	14 " 6 Inches	Distance from Opening	16 Feet 6 In.	40° NE
M "	13 " 7 Inches	" "	" "	" N
N "	9 " 3 Inches	" "	" "	55° NE
O "	12 " 3 Inches	" "	" "	40° NW
P "	42 " Inches	" "	" "	70° SW
Q Direction intended to be pursued which will open a Communication to the Beach				
NB The Openings are 70 Feet above the surface of the Sea - as much to the surface of the Hill				

Figure 10: Enlarged View of 1804 Reference Table

Attempt 2:

The second attempt involved scaling the 1804 Plan by inserting the image into GeoSurvey and fixing it by two major discernible points. This involved using the "image overlay" function in GeoSurvey and assumed that the drawing was made to scale. Figure 11 displays how a background image can be inserted into GeoSurvey, via browsing for the relevant bitmap file within the "Image File" directory.



The image shows a 'Job Settings' dialog box with the following fields and controls:

- Job Name: 04040
- User Name: AwJw
- Company Name: AwJw
- Work Directory: E:\ (with a 'Browse...' button)
- Code/String File: E:\survey\ACSP\strings_def MP-05.mst (with a 'Browse...' button)
- Datum/Projection: None (with a 'Set...' button)
- Map Projections: E:\survey\ACSP\MapProjections_Aust.csv (with a 'Browse...' button)
- Job Plot Scale: 100
- Max Tri Length: (empty field)
- Units: Metric (dropdown menu)
- Image File: E:\1804plan.bmp (with a 'Browse...' button)
- Image Colour: (black color swatch) (with a 'Browse...' button) Black= Use Image Colours
- CS Template File: (empty field) (with a 'Browse...' button)
- Config File: (empty field) (with a 'Browse...' button)

At the bottom are four buttons: OK, Cancel, Help, and More...

Figure 11: Selected 1804 Plan Bitmap File

The points that were used to achieve this were the end points on the line between the No.1 and No.2 openings. The results of this are shown in **Error! Reference source not found.12.**

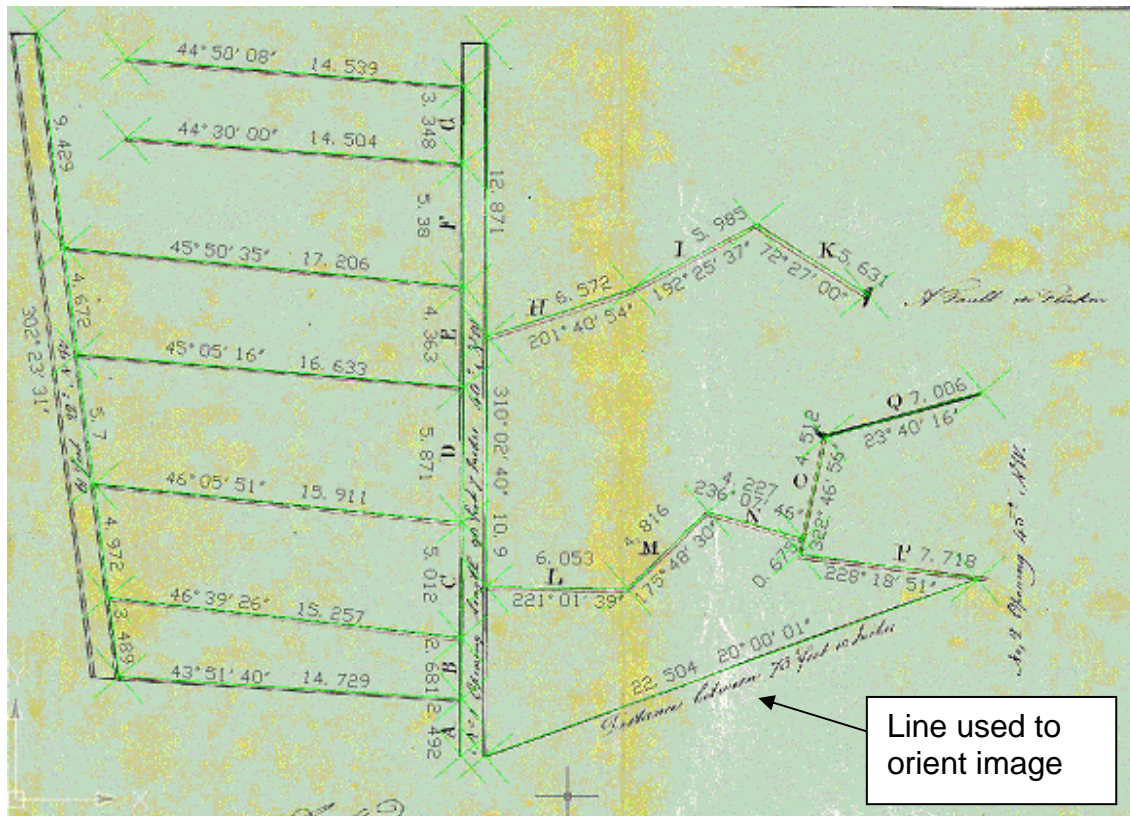


Figure 12: 1804 Plan scale overlay within GeoSurvey

This process was repeated twice again using different points to hold the image fixed. The No. 1 opening and the drive on the far left hand side of the plan annotated as “61 feet 22° NW” were used in these attempts.

The results proved that the drawing was not done to scale, as those distances that were clearly visible on the plan varied from their written values extensively.

The results on an individual level showed that scaling by this method caused the other known lengths to diverge from their true values. In comparison of the three overlay attempts, it could be seen that the distances and bearings varied significantly. In later correlation with the reference table, it was also found that the values for the crosscuts obtained varied extensively with their true values. Therefore fixing the 1804 Plan by this method was deemed unacceptable considering the plan was not drawn to scale.

It was also noted that the bearing of north was not towards the top of the page but at an approximate 45 degree angle. In addition, it was found that on other later plans that the practice of plotting the plan according to the bearing of north being up the page was not adhered to at that time period.

Attempt 3:

At this stage the investigation into the 1804 Plan was becoming too time consuming. Therefore it was decided that Alex Widgery would continue the investigations while John Wilson began work on the 1830 Plan.

Following the second series of unsuccessful attempts to fix the plan a careful scrutiny and analysis of the reference table was undertaken. This allowed distances from the reference table to be understood regarding their meaning and how they correlated onto the plan. Each crosscut and distance measurement was converted from the then used feet and inches into metres, with the compass recordings were converted into bearings in degrees. The conversions of which are contained within Table 4

Table 3: 1804 Reference table conversions

REFERENCE				
Line	Crosscut (m)	Distance from opening (m)	Cumulative distance (m)	Bearing (°)
A	4.648	1.092	1.092	250
B	3.658	1.067	2.159	250
C	3.200	2.972	5.131	250
D	3.200	7.976	13.106	250
E	3.200	5.182	18.288	250
F	2.159	5.055	23.343	250
G	2.159	4.572	27.915	250
H	7.061	13.716	13.716	45
I	7.468	13.716	13.716	5
K	2.946	13.716	13.716	110
L	4.420	4.420	4.420	40
M	4.140	4.420	4.420	0
N	2.819	4.420	4.420	55
O	3.734	4.420	4.420	310
P	12.802	4.420	4.420	250
Q	Direction intended to be pursued which will open a Communication to the Beach			
NB	the openings are 21.336m above the surface of the Sea - as much to the surface of the Hill			

The values from the reference table were entered into *GeoSurvey* and the plan was reproduced to a scaled plot. However there remained a number of deficiencies within the plan in order to reproduce it as it was then and obtain a complete fix. These included:

- No bearing for the given distance line between openings No.1 and No.2.
- No given distance for the area extending past the line segment G on No.1 opening to the end of the drive
- No distance given for the step on line O between lines N and P.

- The exact location of the No.2 opening was also indeterminate or undefined by the plan.
- Only a general direction was given for line Q, with no indicative distances. Furthermore as the plan is not to scale, the assumption of a bearing for this line using the direction given from the plan varies extensively due to this fact.
- No widths of the drives and crosscuts were given. For illustrative purposes the No.1 opening was assigned a width of 1 metre.

Points of concern with respect to accuracy:

- No.1 Opening was written as having a length of 90 feet 7 inches but the addition of the distances along lines A-G was found to be 91 feet 7 inches, or being in excess by exactly 1 foot. This is shown by the highlighted box in the cumulative distance for line G in Table 4.
- The accuracy of which the compass measurement for the far left hand drive was made. The drive has a recorded compass bearing of 22° , when all other bearings were taken to the nearest 5° .
- No distances were given for the segment lengths opposite the given segments B, C, D and E. This was needed to provide a check for these loops as the far left hand drive was not parallel to the No.1 opening (bearing difference of 18°)
- Furthermore, the far left hand drive could not be plotted to connect with the crosscuts at B, C, D and E using the given data. For illustrative purposes this drive was made so as to connect with the ends of the crosscuts. This is shown by the blue string segment on the *GeoSurvey* plots, which are detailed later.

The way in which the actual compass measurements were taken was also of concern. It was assumed that all compass measurements were taken in a clockwise direction from north. For example, a compass bearing of 40° NW was assumed to be taken clockwise from north, therefore making it 310° . The other possibility was that it was meant to be 40° from north in an anticlockwise direction, resulting in a bearing of 320° .

It must also be noted that the creator of the plan, Lieutenant Menzies, was not a surveyor or miner. From obtained historical documents it was shown that Lieutenant Menzies was there to be the officer in command of the convict settlement at Newcastle or what was then known as Kings Town.

In order to fix the 1804 Plan, the bearing of line A-P and the distance of the step on line O needed to be ascertained. As these required measurements were not relating to the same segment line a simple missing bearing missing distance calculation could not be performed.

However by the use of mathematical geometry principles the bearing of the line A-P could be found to have one exact solution given the proviso that the loop did not have a misclose. An arc was taken from the start of the No.1 opening using the given distance of 22.504m as the radius. This is shown in Figure 13 below.

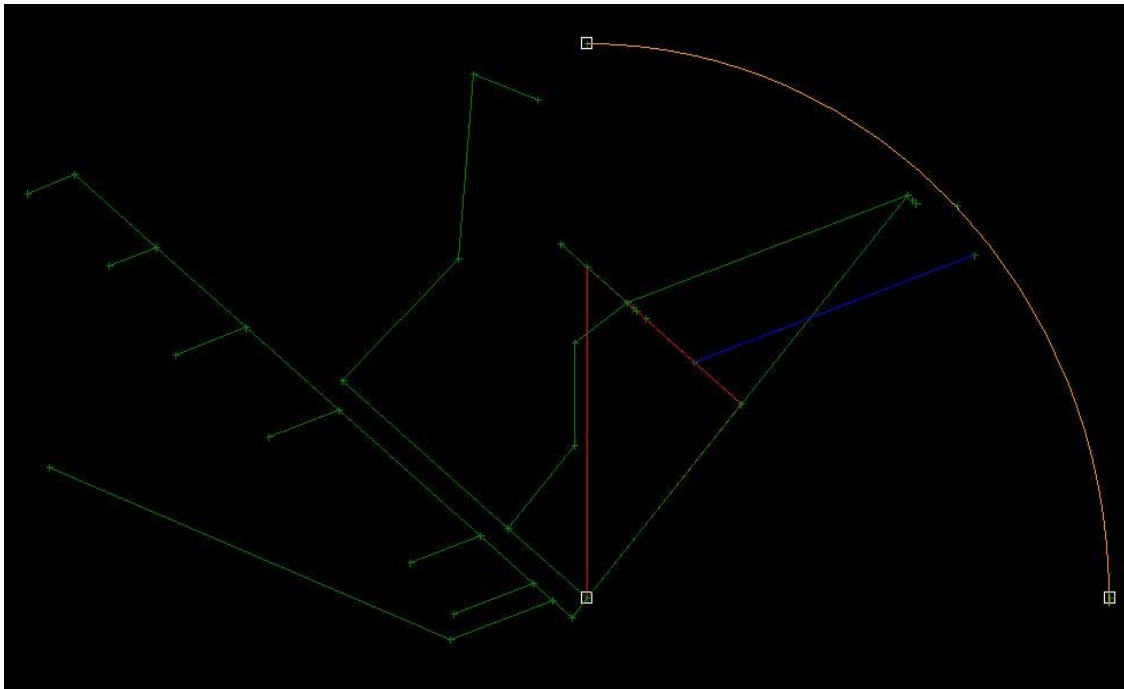


Figure 13: Misclose determination attempt by geometry

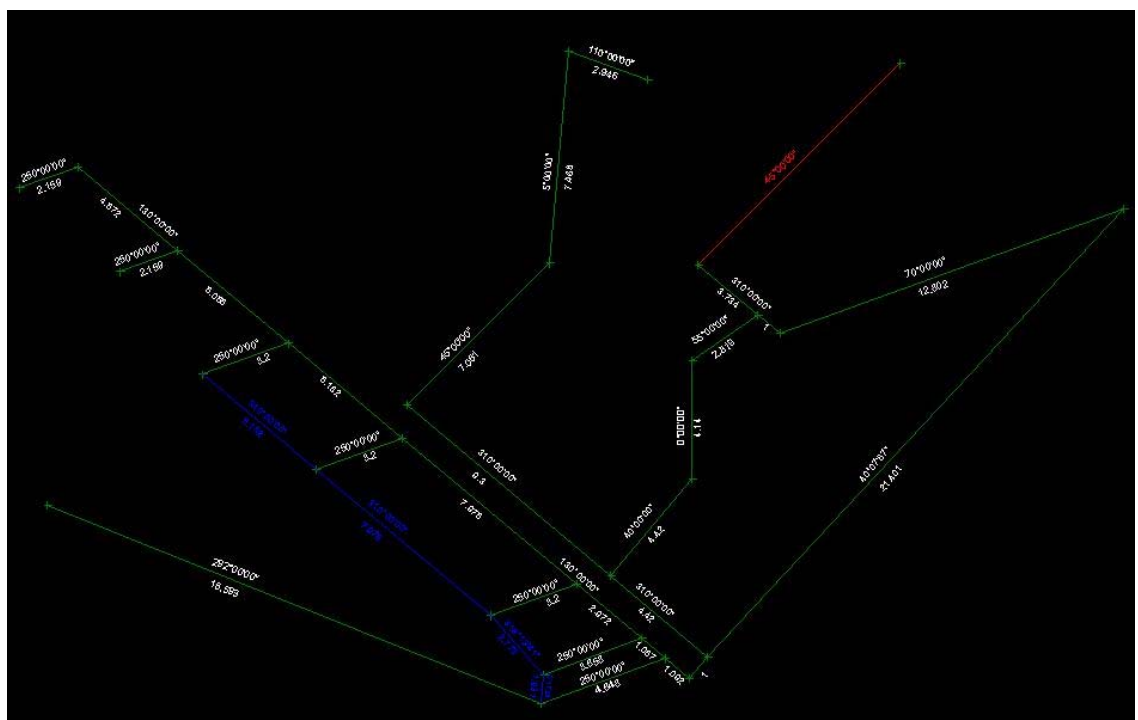


Figure 15: Loop with a 1m step

Consultations with Registered Mining and Cadastral Surveyor, Mark Avery of Energy Australia, confirmed our investigations and conclusion that 1804 Plan could not be confidently fixed within itself.

6.3.2. Fixing the 1804 Plan with respect to Fort Scratchley

In the quest for finding a fix on the coal mine as depicted on the 1804 Plan, a wide array of sources was required to be analysed. These included not only a recently re-discovered map from 1801, but due to the lack of plans made around that time the investigation relied heavily on historical documents and illustrations.

The 1804 Plan itself provided only a few clues as to its location. The information that was given on the 1804 Plan was:

- the coal mine was located in Kings Town, Newcastle District County of Northumberland, New South Wales
- the mine was excavated towards the north west with the ocean to the south of the opening
- the mine was located in near vicinity of a beach. This is evident by line Q on the plan having the accompanying description stating that it was the “direction intended to be pursued which will open a communication to the beach.” This is evident in Figure 16 below.

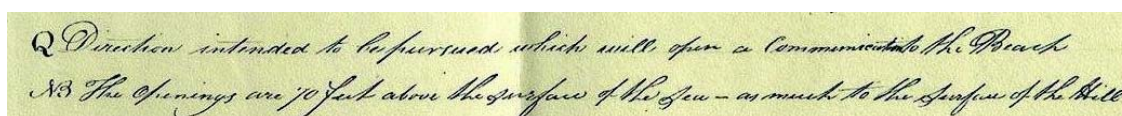


Figure 16: Information regarding 1804 Plan

- also shown in Figure 16 is the location of the mines with respect to height. The writing states: “The openings are 70 feet above the surface of the sea – as much to the surface of the Hill.” The “Hill” referred to suggests that it is located somewhere on what was then known as Flagstaff Hill.

However other areas were analysed to see if the plan could be pertaining to a different area of land. This was done so as to eliminate any arguments or doubts that the mines could be located elsewhere.

The other areas of interest had to be within the immediate Kings Town or Newcastle City/East precinct in order to meet the above required criteria. The only other area that could possibly conform to the evidence stated was the easternmost area of King Edward Park.

If so, the mine would have passed beneath what is now the Newcastle Sports and Recreation Club located on the corner of Watt Street and Ordinance Street with the intention of opening up onto Newcastle Beach. Figure 17 shows an overlay of the 1804 Plan that was earlier created in *GeoSurvey*, over a satellite image of the relevant area.

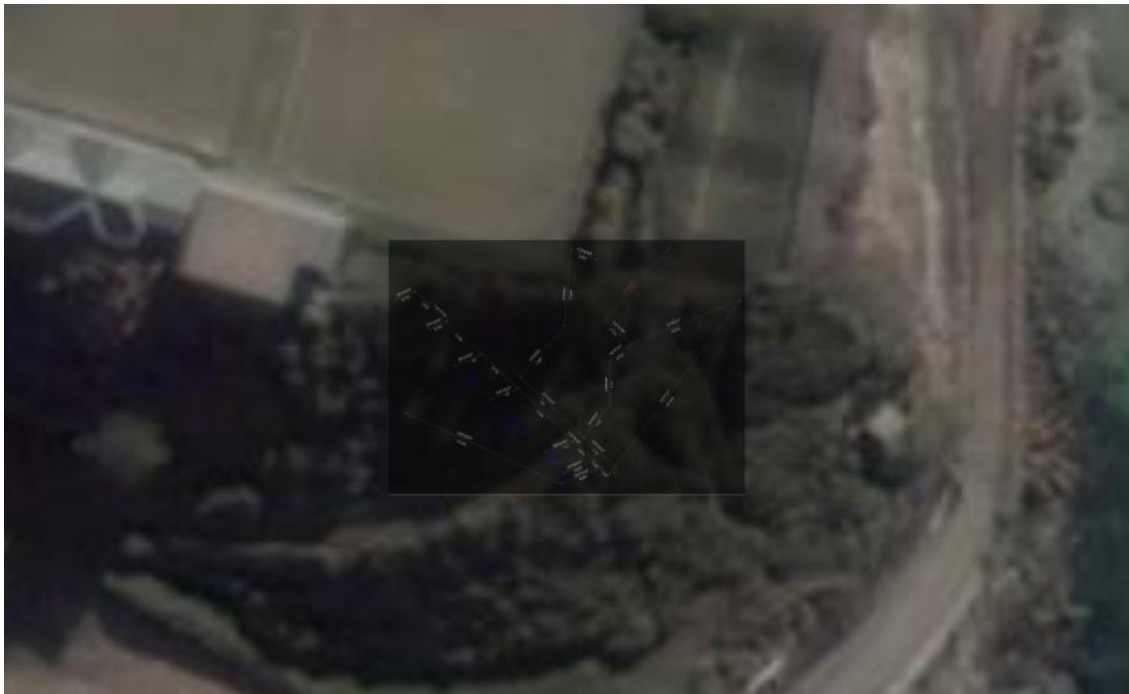


Figure 17: Google Earth image with overlay of 1804 Plan

However it wasn't until 1817, when a coal shaft was made at the Watt St Hospital that mining occurred in this area. (p 19 Turner) Other historical documents also disproved this theory.

6.4. Evidence of coal mines within Flagstaff Hill apart from the 1804, 1854 + 1856 Plans

Historical Documents in Chronological Order

The historical documents looked at to assist in determining the location of the convict coal mines encompassed a wide variety of sources. These included written correspondence between officers and their superiors and vice versa, diary entries, newspaper articles and a commissioned inquiry report. The full articles from where the following excerpts have been derived are contained within Appendix D.

6.4.1. Lieutenant James Grant's Diary Entries, June 1801

Tuesday, 16 June, 1801

On June 16, 1801, Lieutenant James Grant wrote in his diary that the coal mines they had been working on were located at the base of Fort Scratchley on a stratum that was 22 inches or about 0.56m thick. The coal was accessible at low tide and was of high quality. Grant's diary entry was as follows:

"Colonel Paterson and I went on shore to examine the coals ; took the miner with us. At the place where he had been before at work on, we found a strata of coal 22 inches thick, and of good quality. As this was on an elevated situation, and not very easy of access, we found at the foot of the hill and on the reef at low water, plenty of excellent coals in beds of different thickness." (pps. 404-409, Historical Records of New South Wales. Vol. IV. Hunter and King)

Monday, 22 June, 1801

"Colonel Paterson wishing to examine the island in the entrance, as from its appearance he expected to find coal in greater plenty, and perhaps superior quality, Mr. Barallier and myself wishing to ascertain the soundings in the entrance, the weather being favourable for that purpose, we went together, taking the miner with us, and while the Colonel and miner examined the island, I sounded the entrance of this harbour. The strata which appeared like coal on the island proved to be of much inferior quality to those on the main which we had been digging, though at the foot of the island and on the reef were several

beds of good coals ; but these were covered with large stones which the flood and tide had rolled up and were overflowed every tide; therefore, however well it may appear to some that coals may be more easily got, and more expeditiously shipped from this spot” (pps. 404-409, Historical Records of New South Wales. Vol. IV. Hunter and King)

6.4.2. Barallier's Map

Ensign Francis Barallier wrote to Governor King on the 24th of June 1801 with respect to his assessment of the entrance to the Hunter River and of the coal mines at the Fort Scratchley area. Accompanying Ensign Barallier's correspondence (originally written in French with a translation by Emeritus Professor Ken Dutton) was a map that he had made of the entrance to the Hunter River. The full transcript of Ensign Barallier's letter is contained in Appendix D with an excerpt of his correspondence given below:

“I have the honour to send you via the schooner [a map of] the entrance to the river, and some of the adjacent parts, which I have drawn up since we arrived, with the relevant depths, rocks, sandbanks and its various coal mines that have been discovered to date” (p413, Historical Records of New South Wales. Vol IV. Hunter and King 1800, 1801, 1802)

The map that Ensign Barallier refers to was thought to be “lost”, according to the editor of the Historical Records of New South Wales, until in August of this year when Doug Lithgow re-discovered the map on a microcard (BT36 Image 0072) in the Mitchell Library, Sydney. Ensign Barallier's re-discovered 1801 map is displayed in Figure 18.

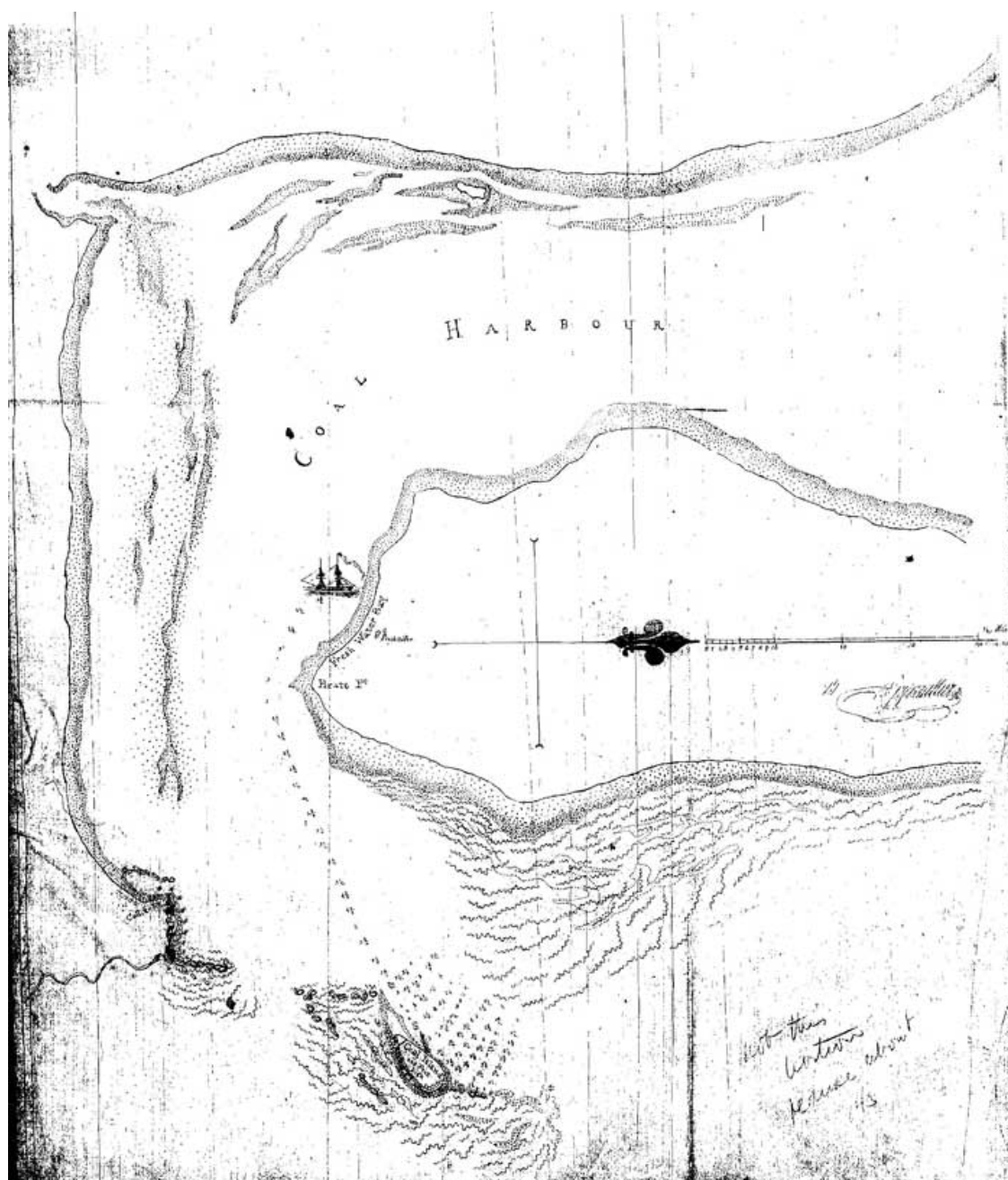


Figure 18: Barallier's map, 1801

Ensign Barallier's map shows evidence of numerous coal excavations, with 4 excavations on the sea/eastern side of the Fort Scratchley hill and up to 10 coal workings on the northern side of the hill. Consultations with Coal River Working Party member and University archivist Gionni Di Gravio confirmed that the black dots around the Fort Scratchley hill were the coal workings Ensign Barallier had referred to. The coal mine workings in question are displayed more visibly in Figure 19 with an enlarged view of the relevant area.

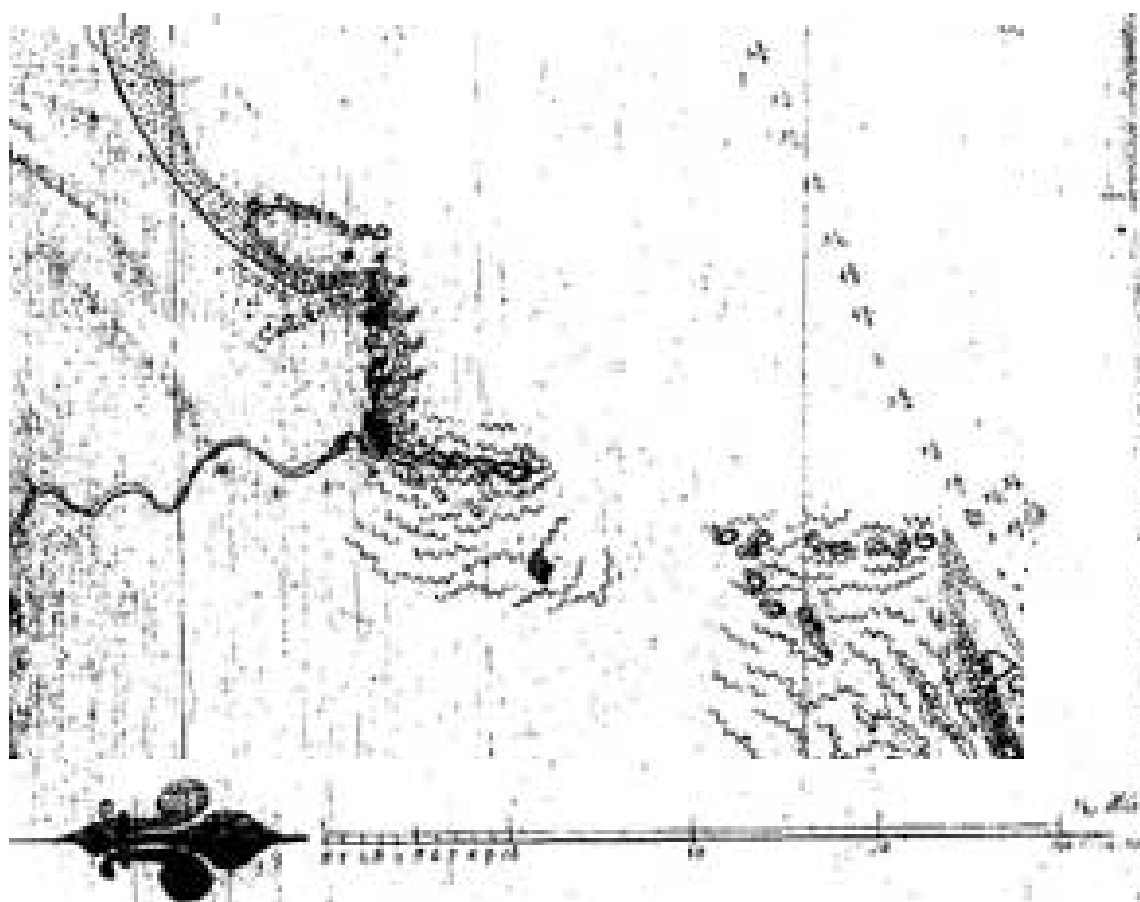


Figure 19: Enlarged view of Barallier's Map showing the coal mines

6.4.3. Lieutenant-Colonel Paterson to Governor King, June 1801

On June 25, 1801 Lieutenant-Colonel Paterson wrote to Governor King of the coal at Colliers Point. His description was similar to Lieutenant Grants' earlier account and is as follows:

"The northern point of land, which I have call'd "Colliers' Point," is composed of two stratas in sight and one which is bare at low-water mark only. This is by much the best coal, which you will see by the speciman I desired might be kept apart from the other, which is the middle strata, about 16 in. deep ; that below is 22 in. ; the distance between them is about 20 ft. The upper strata is too near the surface to be worth working. Upon the island, which I have named "Coal Island," the stratas are the same as on the mainland. The bed of coal at low-water mark is rather better than at Colliers' Point, and might be got very quick,

as the anchoring place is close to the coal ; but, if the coal work is to be permanent, I should suggest the mines to be on the main, which might be sunk with very little trouble, and I have no doubt but that in a very short time Government would find their advantage in it.” (pps. 414-416, Historical Records of New South Wales. Vol. IV. Hunter and King. 1801, 1802)

6.4.4. Lieutenant James Grant's Diary, July 1801

Lieutenant James Grant recorded in his journal on July 4, 1801 of a coal seam that was prime for mining at Collier's Point:

“I this day visited the coal miners, and found them hard at work. They had found a strata of coals nearly four feet in thickness and of excellent kind. It was entirely from side to side through the hill – that is to say, from the harbour side to the sea on the opposite side; and on the low side which faces the harbour the miner informed me they were not above ten yards down. This consequently will yield a supply of coals for a great length of time. The miner informed they were equal to any bed of coals he had ever seen in England. I saw a lump of them. It was clear and transparent, free from earth and smut, and no doubt will answer for any use whatever.” (p409, Historical Records of New South Wales. Vol. IV. Hunter and King)

6.4.5. Mr M. Mason to Governor King, November 1801

Mason lists four mines as being worked in his letter to Governor King on November 21, 1801. The mines were 31.1, 28.3, 24.7 and 9.1 metres underground respectively with the coal strata being worked 9.1m high. This included about 560mm of “neat coal” with a further 450mm of “good coal.” Mason's correspondence was as follows:

“With three minors and three carriers I raise 180 baskets, or 9 tons a day. They can do this in five hours. One mine is 34 yards under ground ; one do., 31 ; one do., 27 ; one do., 10. I can set nine more minors to work immediately, and with one drawer for each can raise 190 tons per week. The strata of coal we are now working is 30 foot high, out of which there is 14 inches of clay and other rubbish, so we have but 22 inches of neat coal ; over this there is a strata of 18

inches good coal. In Fresh Water Bay I can open a mine where there is a strata of 3 foot neat coal under the above two stratas ; the coals are of supereor quality." (pps. 627-628, Historical Records of New South Wales. Vol. IV. Hunter and King. 1800, 1801, 1802)

6.4.6. Sydney Gazette, May 1803

The Sydney Gazette wrote on May 8 1803 of a new found mine on the Hunter River by Platt. However the whereabouts of this mine is unknown.

"A new Mine has been found at Hunter's River, which is likely to yield an abundance of the finest coal that has ever been witnessed. The discovery was made by J. Platt, a miner in the employ of J. Palmer, Esq. and a quantity of the coal brought round by the Edwin. A sample will be sent home by His Excellency, in His Majesty's Ship Glatton, and from the accounts given of the mine, we have every reason to affirm, that it will prove highly beneficial to the general interests of the Colony. The coal resembles that found in the Colony at Leith, near Edinburg, but more flexible, is of a rich appearance, and easy to be worked." (1803, May 8 Sydney Gazette, 3a)

The author of *"Geology and Coal Mining in the Hunter Valley 1791-1861"*, David Branagan, suggests that this might not even be in the Newcastle area but as far upstream of the Hunter River as Morpeth.

6.4.7. Lt Menzies to Governor King, 19th April 1804

In 1802, Governor King withdrew the troops and convicts from Newcastle abandoning the settlement until the reopening of the area in 1804. However during this time, private traders were to continue to excavate the coal from the mines at Colliers Point.

On the 30th of March, 1804, the Lady Nelson arrived off of Newcastle with the new Commandant for the area, Lieutenant Menzies, who established the new settlement at: *"a most delightful valley, about a quarter of a mile from the entrance and South Head, and close to the mines."*

Menzies, with the experienced miner Platt faced a difficult prospect since:

“The mines have hitherto been dug by individuals in a most shameful manner. Never have they been at the trouble of leaving proper supports, leaving them to fall in any way but until I receive Your Excellency’s commands on this head the Chief Miner [John Platt] shall take care that this is not done in future.”

Lieutenant Menzies wrote of a new mine being opened while restructuring and alterations were made to the old damaged mines:

“An excellent mine has been opened, the strata of which continued a yard six inches thick. This shall be worked in a regular manner, so as to enable us, at a future period, to carry it on in most extensive manner.” (p.367, Historical Records of New South Wales, vol.V, Lt Menzies to Governor King, 19th April 1804)

The geologist David Branagan suggests that this was probably a part of the Dudley Seam. (p23, Geology and Coal Mining in the Hunter Valley 1791-1861)

6.4.8. Sydney Gazette, May 1805

On May 5 1805, the coal miner John Platt gave an account of the coal mines on or near the coast on the eastern side of Watt St at Newcastle. The original article is shown in Figure 20.

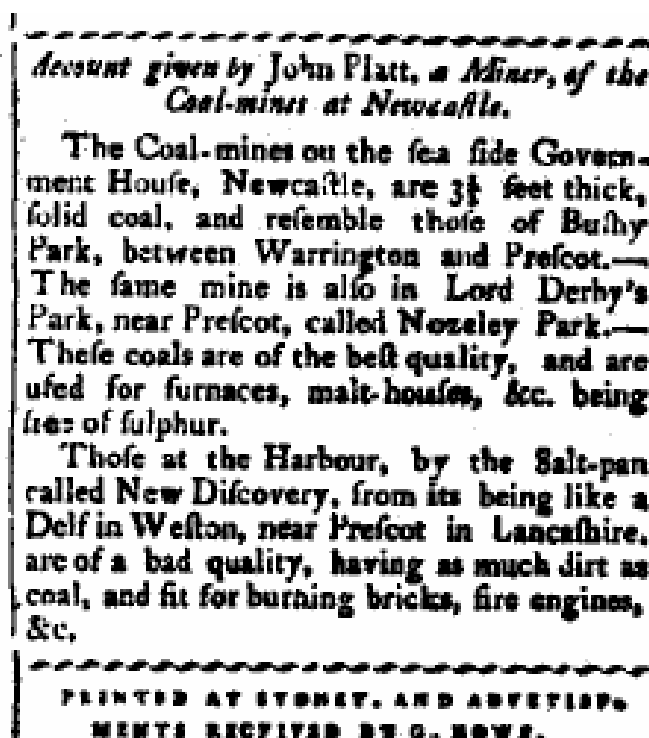


Figure 20: Original Sydney Gazette Article, 1805 (Coal River Website)

6.4.9. Bigge Inquiry, January 1820

The oral evidence of Benjamin Grainger, the then Superintendent of Coal Mines, gave an account as to the coal mines on January 23 1820, to Commissioner John Thomas Bigge during an inquiry into administration of the colonies:

Commissioner Bigge: Did you sink the colliery at Hunter's River?

Grainger: I did about two years and a half ago.

Bigge: Where did you get the coals before and how?

Grainger: Down by the sea shore at the bottom of the cliff, by a drift made at the level of the shore, where the seam of coal appeared at the day. [i.e. when the coal seam was exposed]

Bigge: Is it the same seam that you are now working?

Grainger: It is.

Bigge: What is the depth of the seam?

Grainger: Three foot and an inch. [hence the name, Yard Seam]" (pps 138-142, Turner Bonwick transcripts, Box 1, pps 496-500)

Commissioner Bigge concluded in his report from Grainger's evidence and with confirmation from other personnel concerned with the mines that

"Until the year 1817, coal was obtained at this settlement by a drift made on the sea shore, and level with it, penetrating a seam of coal that showed itself under the large mass of superincumbent sandstone that forms the south headland of the entrance to Hunter's River. The depth of the seam is three feet and one inch." (p284, Newcastle as a Convict Settlement: The Evidence Before J.T.Bigge in 1819-1821)

6.4.10. Newcastle Morning Herald and Miners Advocate Articles, 1880s

The Newcastle Morning Herald and Miners Advocate recorded the construction of the fortifications at Fort Scratchley in the 1880s. The articles display evidence that there were numerous drives and cuttings in the hill with *"the whole base of the hill perforated with about twenty different holes"* and that the hill was *"formerly riddled with broad drives... honey-combed with old workings underneath."* In addition to the previous workings, new longitudinal cuttings and drives into the hill-side had to be made to properly assess the site.

1881, May 7th. Newcastle Morning Herald & Miners Advocate, p.8

The Fortification Works and the Old Coal Workings under Flagstaff Hill

"...an unexpected cause for alarm as to the future progress of the work seems to have recently cropped up. We allude to the early-days tunnels and drives for coal under the basement of the hill, which some half a century ago were carried out by the then authorities with convict labour. Of late it has been evident, during the act of blasting at sundry times, that something was wrong with the understructure. This having led to enquiry, the fact of the hill being honey-combed with old workings underneath has brought to mind. In order to examine into their condition, numerous longitudinal cuttings and drives into the hill-side

have been made; cutting rectangularly into a series of chambers – propped and beamed.”

1881, May 20th. Newcastle Morning Herald & Miners Advocate, p.2

The Coal Workings Under Flagstaff Hill

“The whole base of the hill is now perforated with about twenty different holes, and the former workings are now fairly well traceable. Many of them are completely choked up with debris, and no little danger is experienced by the falling of stones from the roofs.”

1885, January 1st Newcastle Morning Herald & Miners Advocate, p.2

The Fortifications Wall

“...the foot of the hill was formerly riddled with broad drives, which had been put in to admit of examination being made of the old coal workings underneath the hill, with a view to ascertain whether existence was likely to prove prejudicial in [after?] days to the heavy fortification works and masonry overhead. All necessary precautions having been taken, by means of filling in or roofing the many underground passages and chambers, their entrances were finally blotted out of sight forever by a deep thick wall of solid concrete and masonry.”

These many historical quotes are evidence of the vast workings within the strata. With so many cuttings into the hill, and with too little evidence, the fix of the 1804 mines could be any one of the numerous drives located at different heights ranging from the workings at sea level to the seam described by Menzies as being 70 feet above sea level.

6.5. Historical Illustrations Depicting the Changing Face of Colliers Point

As shown by the following illustrations of Colliers Point, or Fort Scratchley, the face of the hill was not sloped as is the case today but was a shear vertical cliff wall. The progressive nature of the images depicts through time the changing cliff face.

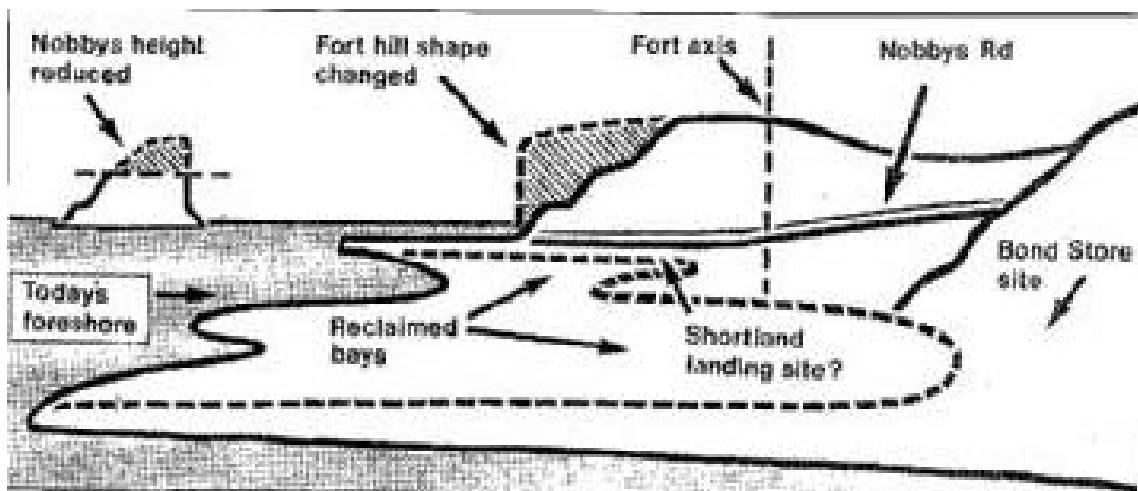


Figure 21: Illustration of Newcastle foreshore showing a before and after image of land reclamation (p81, Comerford)

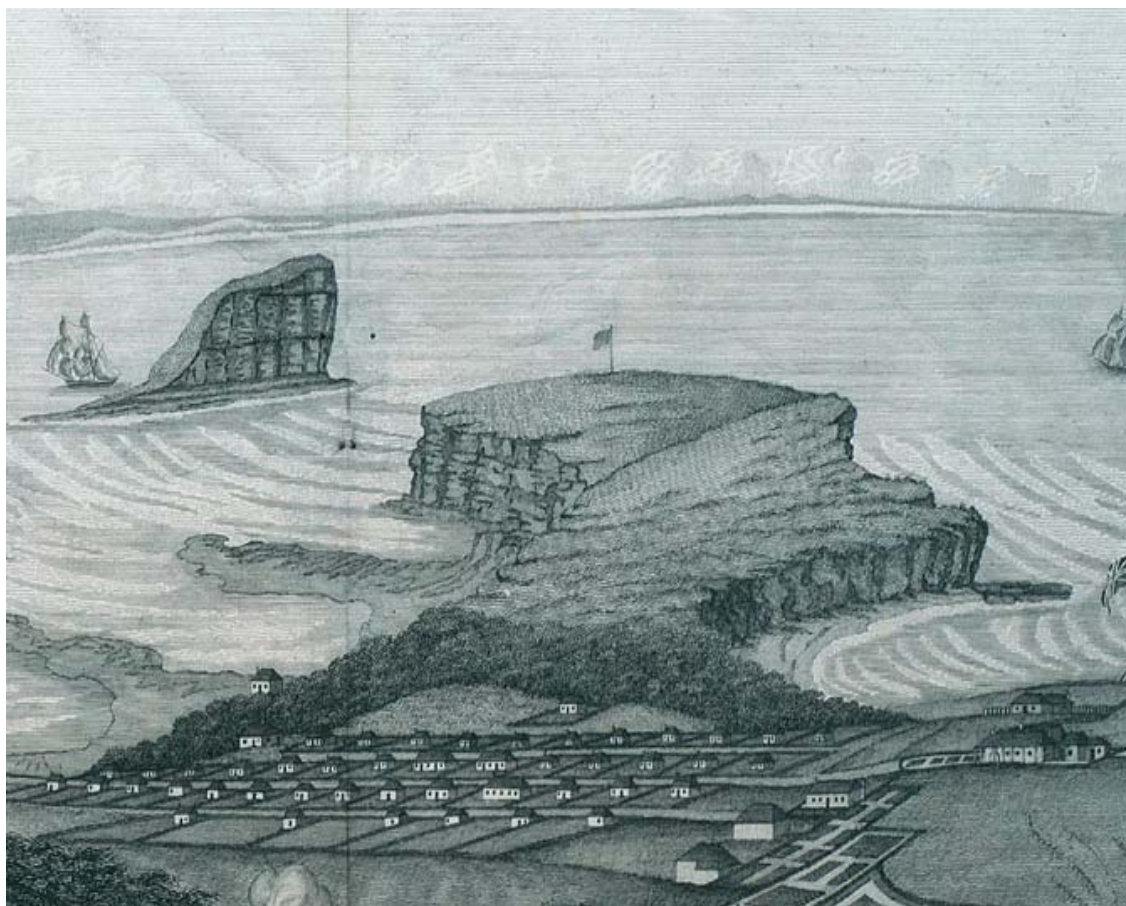


Figure 22: Newcastle in New South Wales with a distant view of Point Stephen, taken from Prospect Hill by Walter Preston, November. 30, 1812. (National Library of Australia)

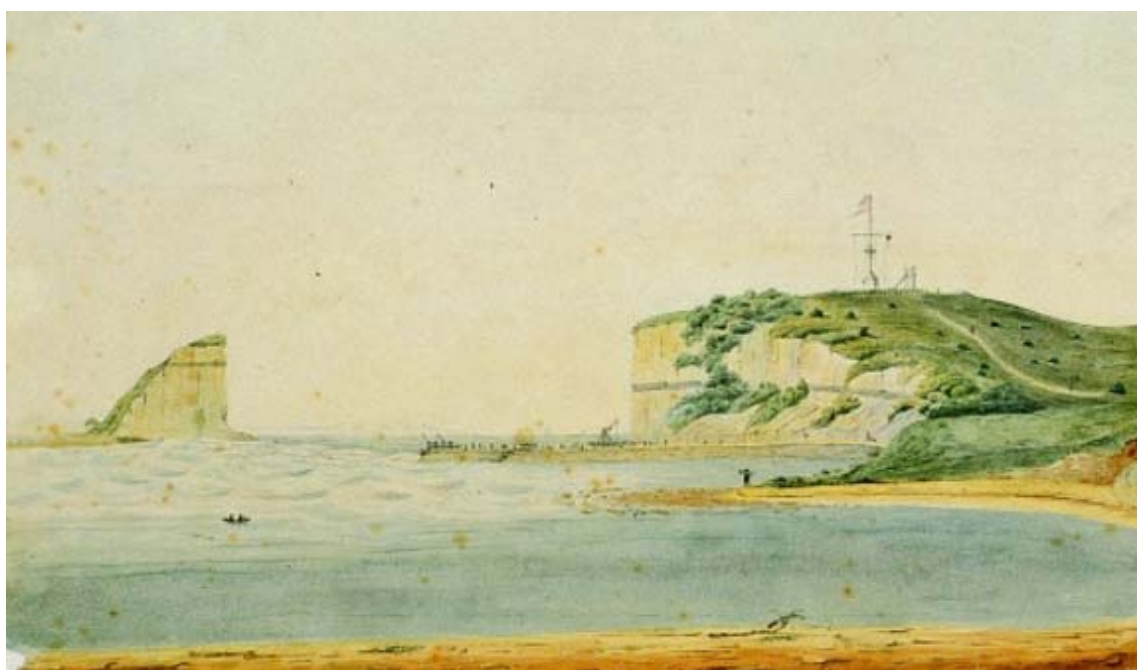


Figure 23: Artist unknown. Nobbys Island and Pier, Newcastle 23 January 1820. (State Library of New South Wales.)



Figure 24: The Nobbies from Newcastle, 1853, John Turner Papers University of Newcastle



Figure 25: Nobbys circa 1890s (Coal River website)

It can be seen through the illustrations that the cliff face at Collier's Point or Fort Scratchley has changed dramatically since European settlement of the area. This fact compounds the difficulties in trying to fix the 1804 coal mines with respect to the hill as the very openings of the original workings could have been completely cut back.

6.6. The Coffeys Geotechnics Pty Ltd Report

Are the 1804 mine workings No.1 and/or No.2 openings (1856 Plan of Flagstaff Hill) positioned at any of the three recently rediscovered drift locations?

The drillings and subsequent report produced by Coffey Geotechnics Pty Ltd was analysed in relation to whether the 1804 Plan could fit in with the location of the three recently rediscovered drift openings.

From the northwest direction of the 1804 mines this automatically eliminates Drift 3 and hence Drifts 1 and 2 were analysed. In order to locate the 1856 mine workings, Coffey's Pty Ltd made three boreholes, with one at the position of the Drift 1 entrance and two at the site of Drift 2. These can be seen on a locality map prepared by Coffey's Pty Ltd (annotations BH1, BH2, BH3), which is reproduced below. The relevant sections from the Coffey's Pty Ltd report are available in Appendix E. Figure 26 shows the location of the boreholes around Fort Drive.

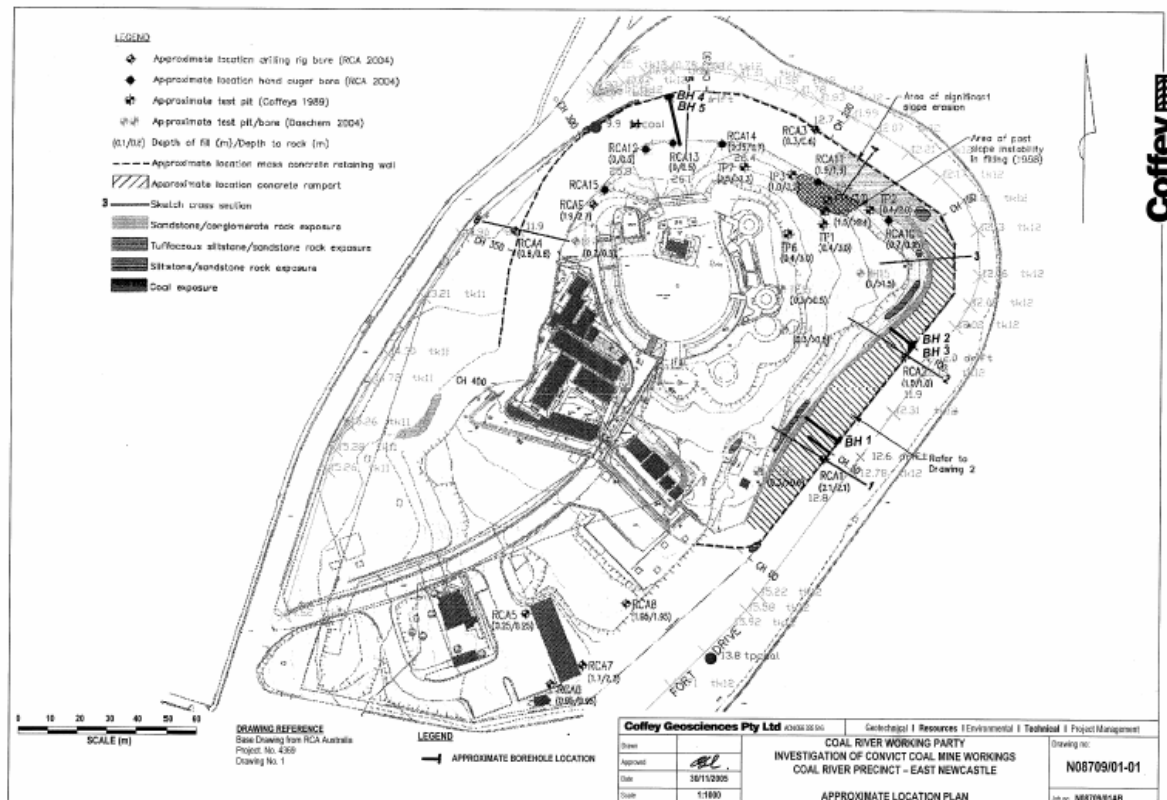


Figure 20: Correy's borehole locations

The stratigraphic cross sections of Drifts 1 and 2 were created from the borehole results and are displayed in Figures 27 and 28 respectively.



It can be seen from the above Figures and the related Coffey's report that the coal seam was generally about 2m thick with the lower 1.4m of coal excavated and the above 0.6m left alone (most likely due to its inferior quality).

The results for Drift 1 showed that the coal began at a reduced level of 12.9m and extended down to an RL of 10.7m. For Drift 2 the coal seam was evident at an RL of 12.2m and continued to an RL of 10.2. At this height, the coal seam located is part of the Upper Split of the Dudley Seam. However the drifts displayed on the 1856 Plan are described as being 70 feet above sea level equating to 21.34m. This information also contradicts the possibility that the 1804 workings are those displayed later in the 1856 Plan.

However this is not to say that the mines depicted on the 1856 plan did not connect to the original 1804 workings. Benjamin Grainger, the former Superintendent of Coal Mines, gave evidence in the Bigge Inquiry that the seam they were working in 1820 was the same seam as had previously been worked at Collier's Point. This however was through the use of a 111 foot shaft that possibly extended down into the original 1804 drives.

Conclusion

7. 1830 PLAN

7.1. Introduction

At the request of Dr Erik Eklund and Gionni Di Gravio as part of our student project commitment to Coal River, we were requested to fix by coordinates John Armstrong's 1830 'careful survey' of Newcastle and the coal workings of the Australian agricultural company within it. Considering this would be quite a time consuming investigation, it was decided that John Wilson would undertake this aspect of the project on his own as the additional 10 credit points required for his project component. The below Figure is a reduced copy of the plan followed by its title, survey date, author and location sourced by the Coal River website.

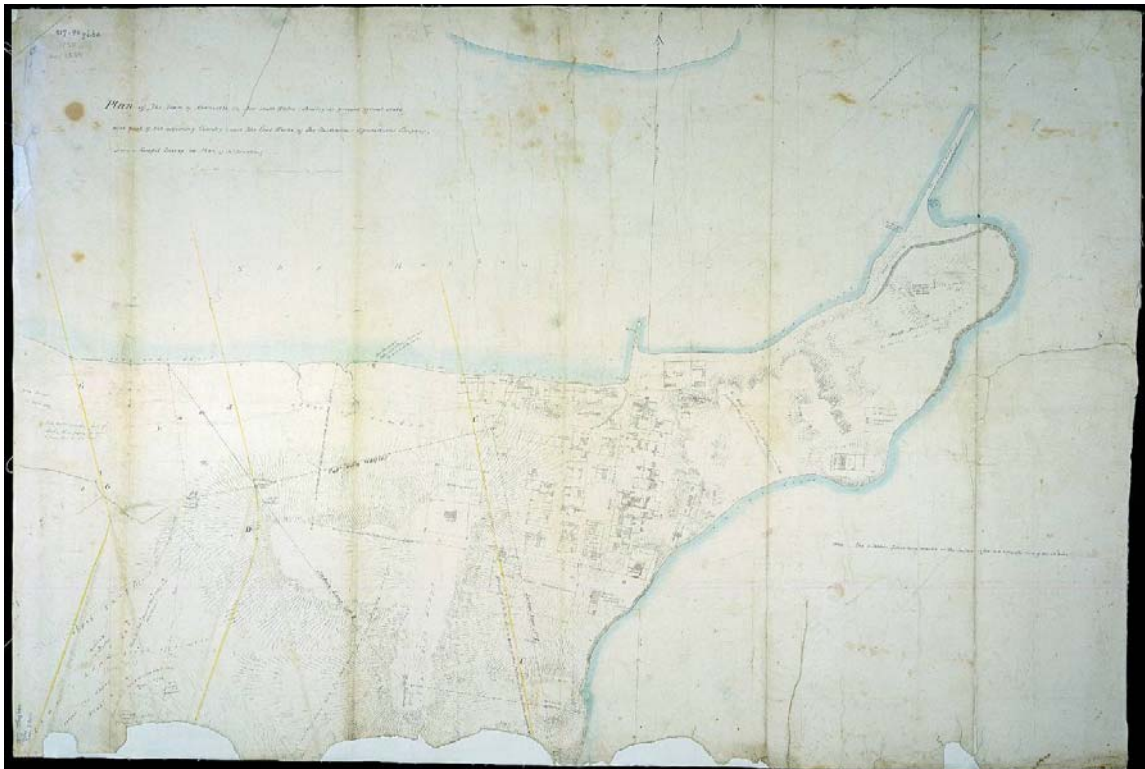


Figure 29: "Plan of the Town of Newcastle New South Wales shewing it's present actual state with part of the adjoining Country, and the coal works of The Australian Agricultural Company from a Careful Survey in 1830 by John. Armstrong" (Alexander Turnbull Library, National Library of New Zealand)

7.2. Orientation of the 1830 Plan

To enable the 1830 plan of Newcastle to be oriented to the layout of Newcastle today, common points that could be traced from 1830 to present needed to be identified on John Armstrong's plan. Initially the main discernible features were the alignment of the break wall, Watt St, the cliff face around flagstaff hill, the flagstaff itself, the old windmill and a number of potential boundary parcels scattered across the plan.

7.2.1. The Flagstaff/Signal Staff

The flagstaff atop flagstaff hill has been a prominent feature since early in Newcastle's history. The flagstaff has had many purposes from a shipping guiding point to a weather indicator and of course flying the Australian flag. Figure 30 displays examples of the flagstaff's use.

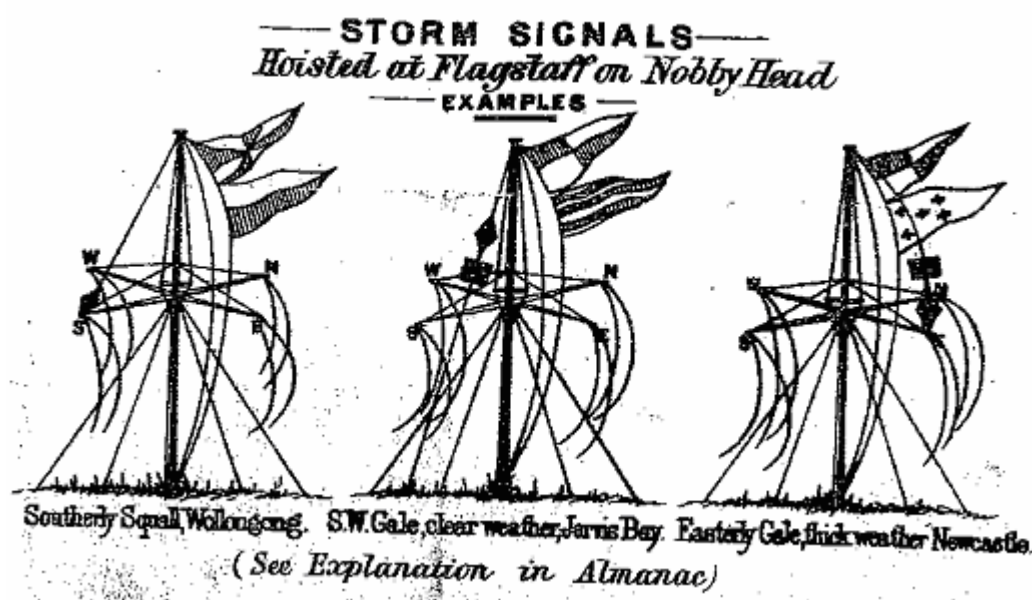


Figure 30: The flagstaff as depicted on the 1886 nautical plan of Newcastle

The 1856 plan used by Monteath & Powys Pty Ltd to fix the drift locations around Fort Scratchley, also had the flagstaff plotted on it. As this plan had already been coordinated, the position of the flagstaff was scaled off to the nearest metre and adopted for the 1830 plan. Within fixing the 1856 plan of flagstaff hill, the cliff face around Fort Scratchley and the Newcastle break wall had been located and aligned with that depicted on the plan.

Therefore making the flagstaff's derived position purely dependent on the position of the cliff face and the Newcastle breakwall. For this reason the cliff face and the breakwall weren't required within the Armstrong 1830 plan fix, considering the use of the flagstaff. (see survey investigation).

Following is Figure 31 taken from the 1856 Plan of Flag Staff Hill, depicting the three coordinated mine drifts from which the flag staff's position was scaled. Figure 32 was enlarged from Armstrong's 1830 plan depicting the Signal Staff. The Signal Staff was expected to have been replaced, on the same position by the flag staff some time between the two plans i.e. 1830-1856, this was assumed because their primary functions were as guiding points for mariners and therefore the position was important.

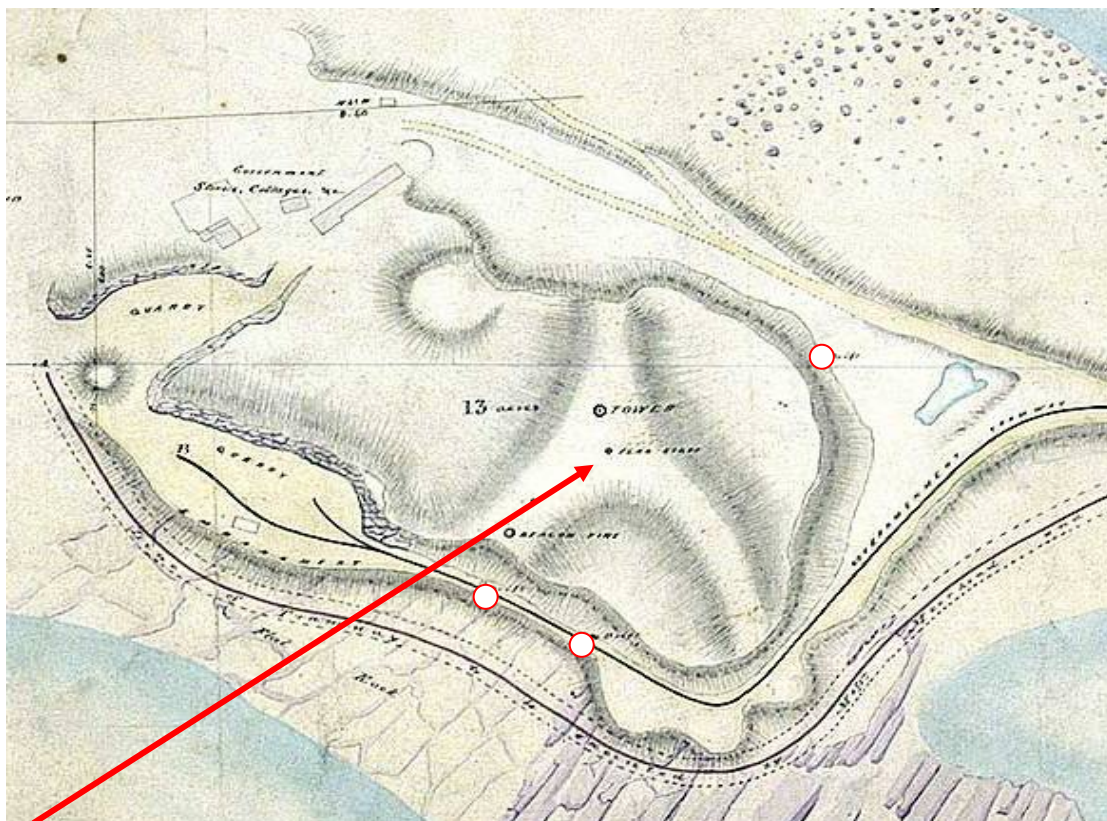


Figure 31: The flag staff as shown on the 1856 plan along with the three drift locations coordinated by Monteath & Powys Pty Ltd



Figure 32: The signal staff as surveyed and plotted by Armstrong's in 1830, adopted as the same position.

Table 4 displays the scaled flagstaff position calculated from the 1856 Plan of Flag Staff hill, as seen in Figure 31.

Table 4: Flagstaff MGA coordinates

Point	Easting (m)	Northing (m)
Flagstaff	387095.8	6356299.8

7.2.2. The Obelisk

In 1819, the Commandant of the settlement at Newcastle, Colonel Morisett, requested permission to erect a windmill for the purpose of grinding flour for the settlement. By February 1820, the stone and brickwork had been completed, and during April and May the necessary ironwork arrived from Sydney. Figure 4 is cropped from Armstrong's 1830 plan depicting the brick windmill.



Figure 33: Armstrong's depiction of the windmill on his 1830 plan

By the end of 1820, the mill was completed and was known as the Government Flour Mill. However the windmill soon became noted for another function. Situated as it was upon a prominent hill, it was visible for many miles up and

down the coast, and was a guiding mark for the mariners approaching the port of Newcastle.

In 1847 the Government decided to get rid of Government Mill at Newcastle, as it fell into disuse. The mill was submitted to auction for demolition and was purchased by a Newcastle resident.

The action started a storm of protest in shipping quarters, where it was claimed that the old windmill was a guiding mark for masters of sailing ships entering the harbour. Petitions were at once directed to the Governor, but the buyer speeded up his demolishing work and had the building down before the Government could cancel the sale.

However, continued protest by the sailors compelled the Government to act, and in 1850 the Obelisk was erected on the spot where the old windmill stood. So on June 12th 1850, the Government Gazette reported:

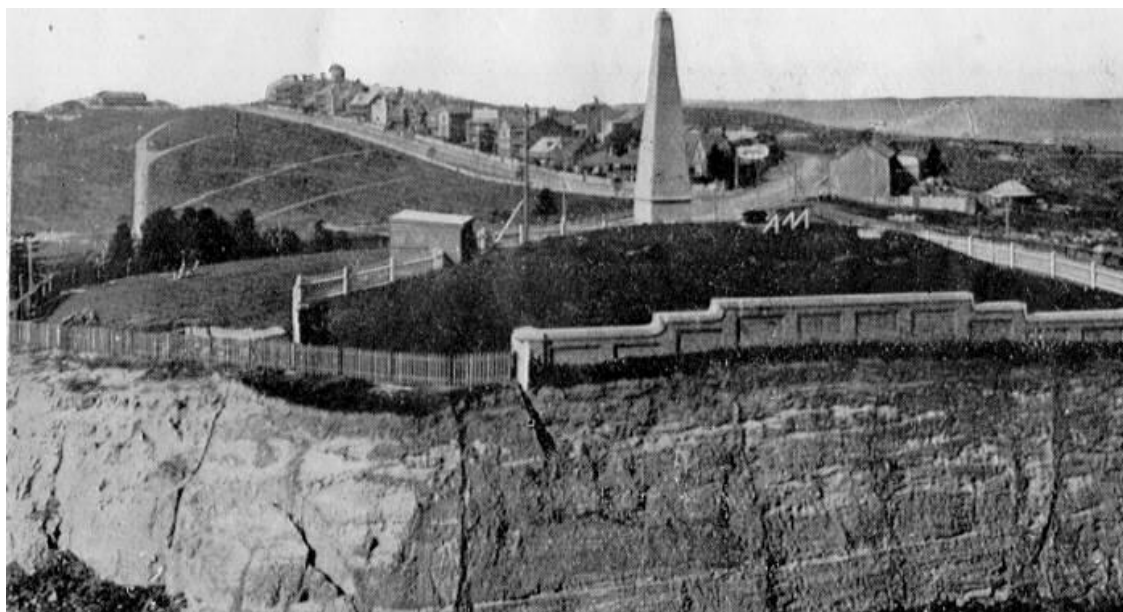
DIRECTIONS FOR ENTERING THE PORT OF NEWCASTLE

"When the Obelisk is in with the tower by the light you are nearly off the rocks east-southerly of the Nobby's; and when the Nobby's is in with the same you are off the rocks north-west of the same.

"The Obelisk open to the west of the Queen's Wharf will head you clear off the rock on the port land going in.

"The Obelisk open to the eastward of the Wesleyan Chapel will clear the Oyster Bank and the North Bank, and will lead in from twenty-four to fourteen feet of water as you approach the Oyster Bank on the starboard side going in, and from eighteen to twelve feet as you approach the North Bank, also on the starboard side.

MERION MORIATY, Port Master."



**Figure 34: View of the Obelisk in 1908 from Jesmond House, looking Northwest.
(Newcastle City Council website)**

Based on these historic records (Newcastle City Council website) it was adopted that the windmill was where the obelisk is today, and therefore the coordinates of the obelisk were used to hold the windmill fixed on the 1830 plan. The following table displays the adopted MGA coordinates.

Table 5: Obelisk MGA coordinates

Easting	Northing
385833.166	6355594.025

7.2.3. North/West Corner of the Burial Ground

The Cathedral and the burial ground are prominent boundary parcels on Armstrong's 1830 Plan of Newcastle. A cadastral boundary search was undertaken for these allotments to ascertain a connection to the same allotment today. Figure 35 displays the burial ground and the cathedral allotments enlarged from Armstrong's 1830 plan.



Figure 35: North Western Corner of Burial ground, as depicted by  in the following plans.

Initially Deposited Plan (D.P) 76185 was found depicting the North West corner of the burial ground surveyed in 1923 as shown in the following figure. However a wider departmental plan was required covering the whole block to try and identify an agreement in the shape of the parcel. A scanned version of DP 76185 can be seen in Figure 36.

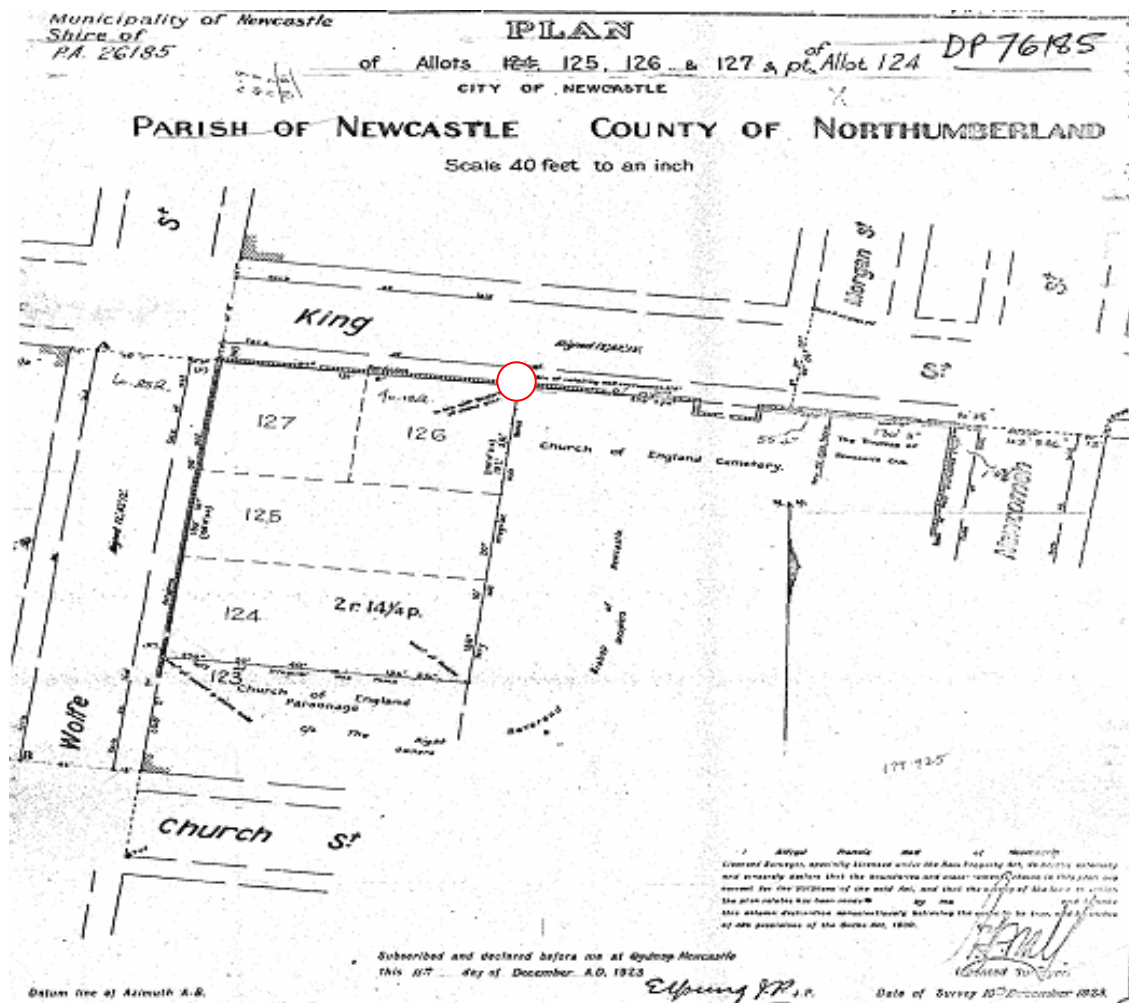


Figure 36: DP 76185

Secondly DP 5420 was found as seen in Figure 37, which had been approved on the 13th of September 1858. Although the departmental plan depicted both the Cathedral and burial allotments, the boundary shape on the eastern side showed no relevance to the boundary as surveyed by Armstrong in 1830. Therefore, it could still not be decided with any confidence that the boundary is that surveyed by Armstrong.

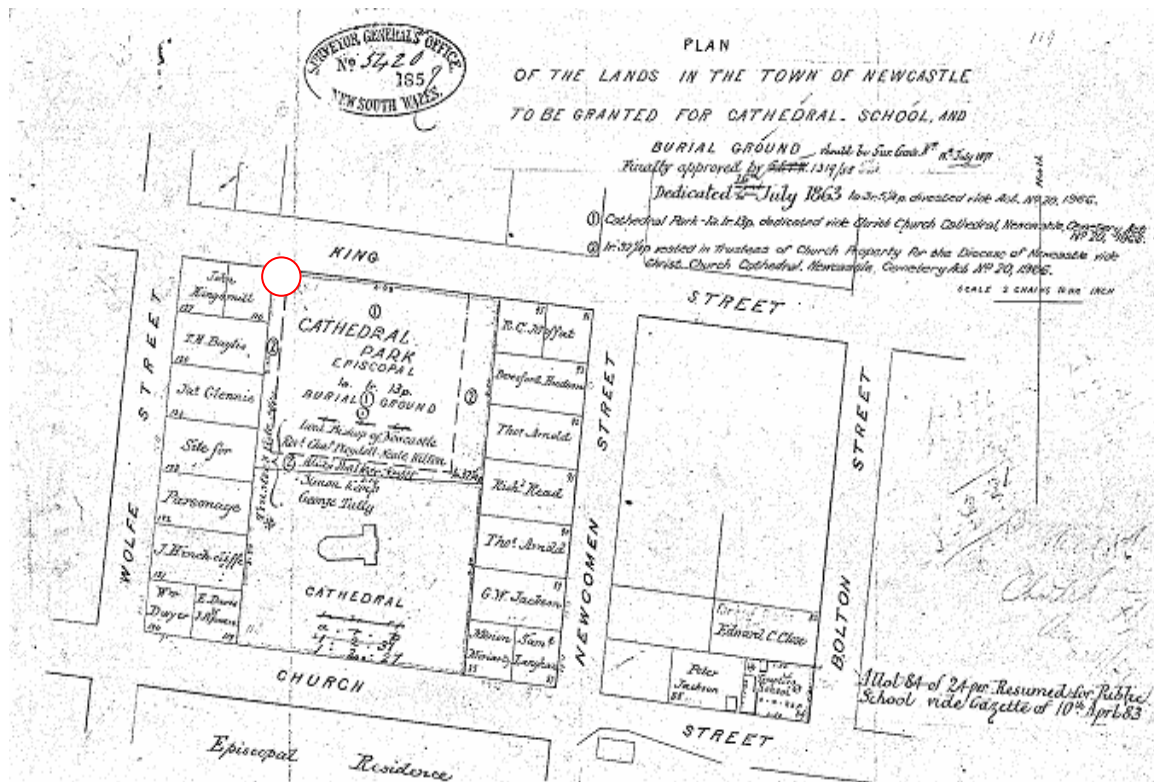


Figure 37: DP 5420

Finally the following departmental plan was found. This plan was deposited in 1834 and was the main source of confidence in fixing the North Western corner of the burial ground. It can be seen that the D.P shows the same boundary shape and scale as that depicted on the Armstrong 1830 Plan. Importantly including the trapezium shape of the Cathedral parcel before additional land was granted to square off the allotment, as viewed in Figure 38.

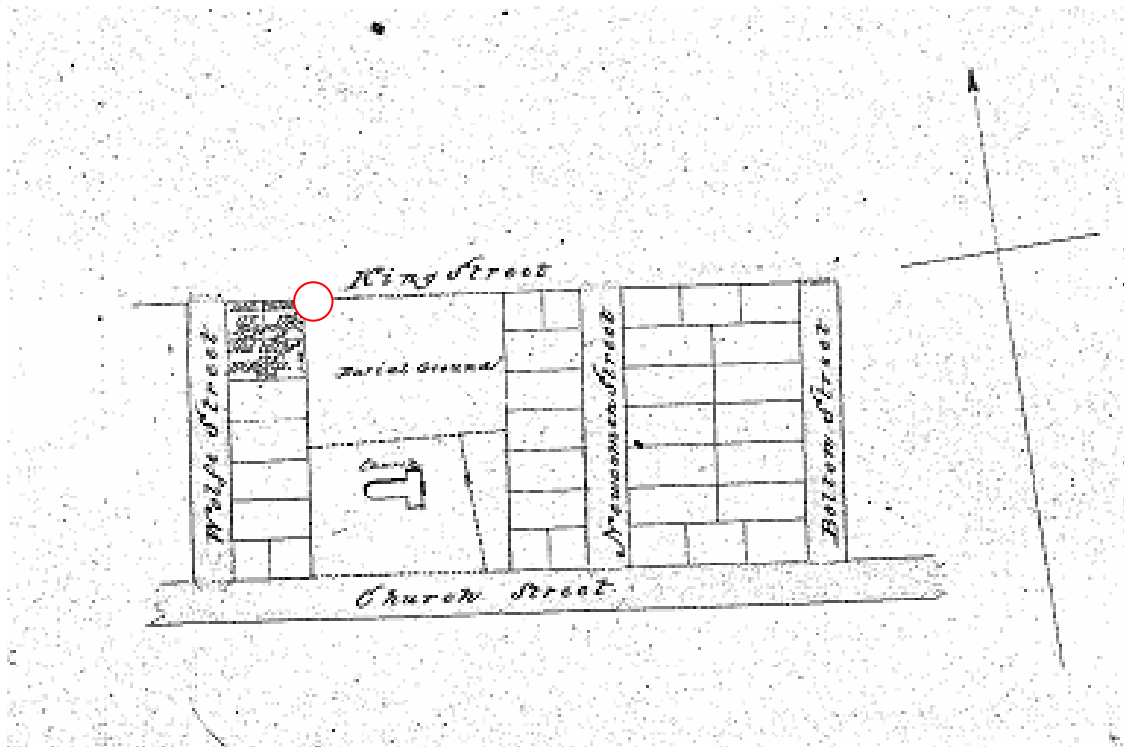


Figure 38: 1834 cadastral boundary plan

Following the positive identification of the North Western boundary of the burial ground being displayed on DP 76185, the below deposited plan created by Palmer Bruyn and Parker on the 29th of November 2004 was found. Importantly Permanent Mark (PM) 30040 is situated on this corner with a connection to the boundary on the Western side of Wolfe St., as shown on the calculation page contained in Appendix F. This allowed coordination of the relevant corner of the burial ground via using the information shown for the road width of Wolfe Street below in Figure 39 and the lot dimensions taken from DP76185.

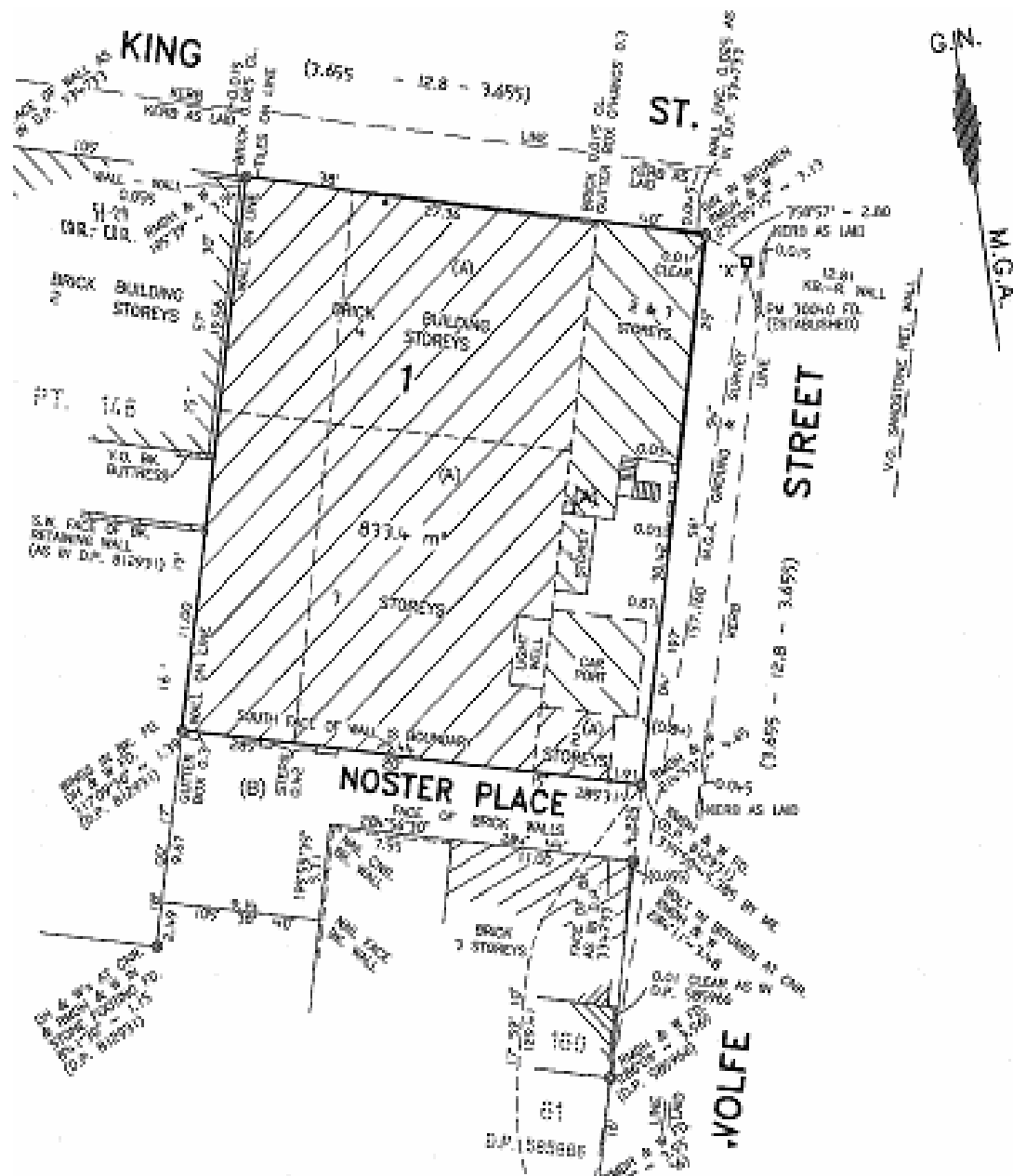


Figure 39: DP76185

Table 6 contains the MGA coordinates calculated for the north-western corner of the burial ground

Table 6: NW corner of burial ground MGA coordinates

Point	Easting (m)	Northing (m)
PM 30040	385892.516	6356053.224
NW Corner of burial ground	385950.475	6356039.778

7.2.4. North Western Corner of the Ships Inn (Today's Great Northern)

The Ship Inn was surveyed and plotted by Armstrong in 1830, as can be seen in Figure 40 below, enlarged from the full image.

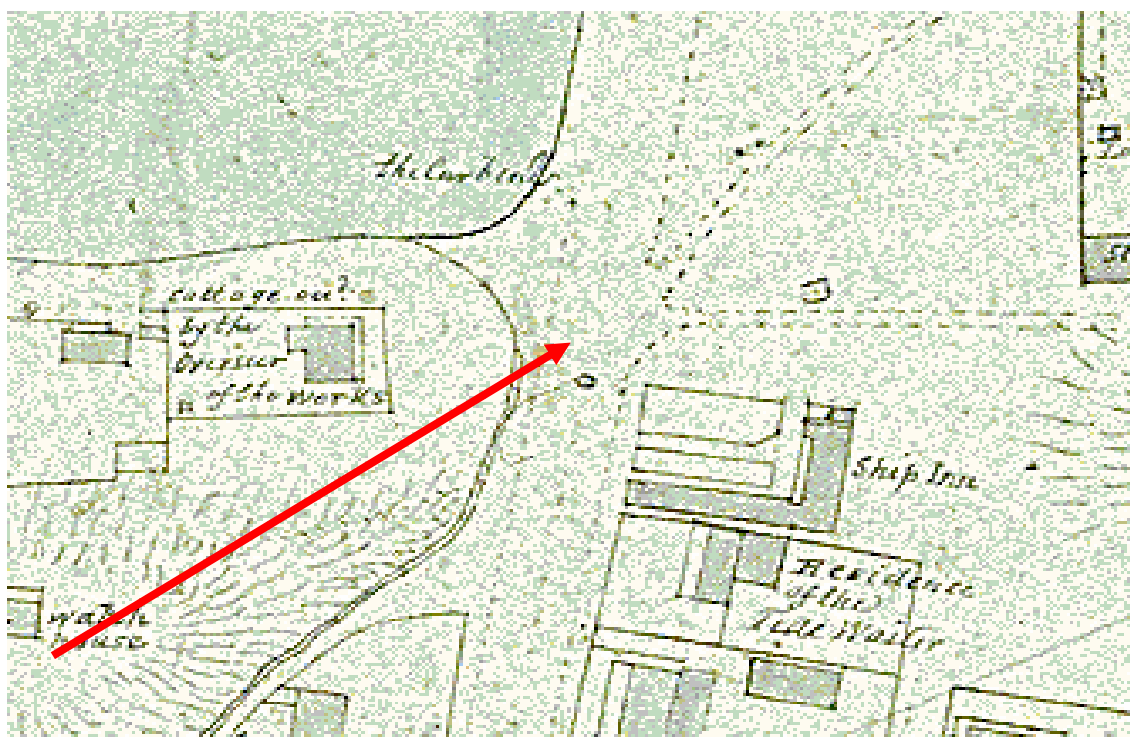


Figure 40: North Western Corner of the Ships Inn

The Ship's Inn was aligned on Watt Street, which is shown as being formed on the 1830 plan, along with the proposed Scott Street alignment. Based on this a cadastral boundary search was undertaken for the North Western corner of today's Great Northern Hotel (GNH) being lot 100 in DP834251 created by Palmer Bruyn and Parker on the 28th of October 1993. Following in Figure 41 is an enlarged image taken from a proposed alignment plan of Newcastle dated 1826. The plan was sourced from the Archives Authority of New South Wales, and displays the lot in question aligned on the corners of Watt Street and Scott Street.

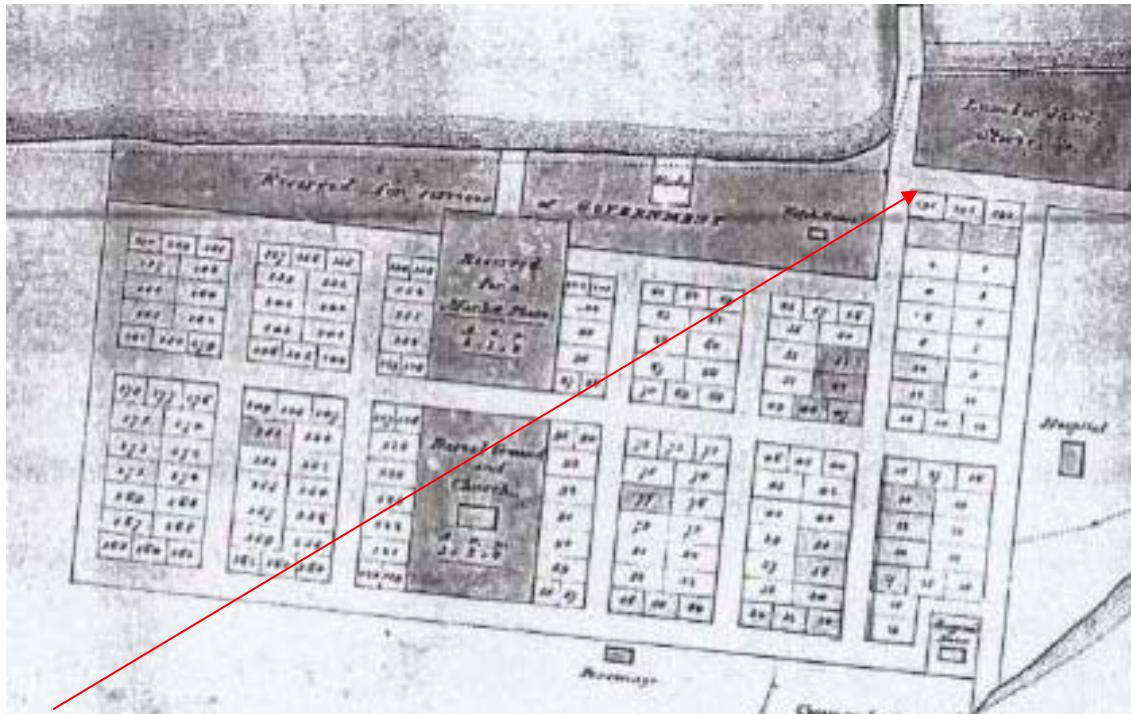


Figure 41: The Ship Inn allotment seen as having its boundary aligned to the proposed street alignments

The image displayed below (Figure 42) has been taken from an early nautical plan of Newcastle dated 1886. It shows the alignment of Scott and Watt St and the relevant boundary parcel, indicating that the above proposed alignment plan was followed for the Newcastle Road and Lot layouts. Therefore the corner on the 1830 plan should be the same corner. NB: A north point has been added due to east being up the page in the below figure.

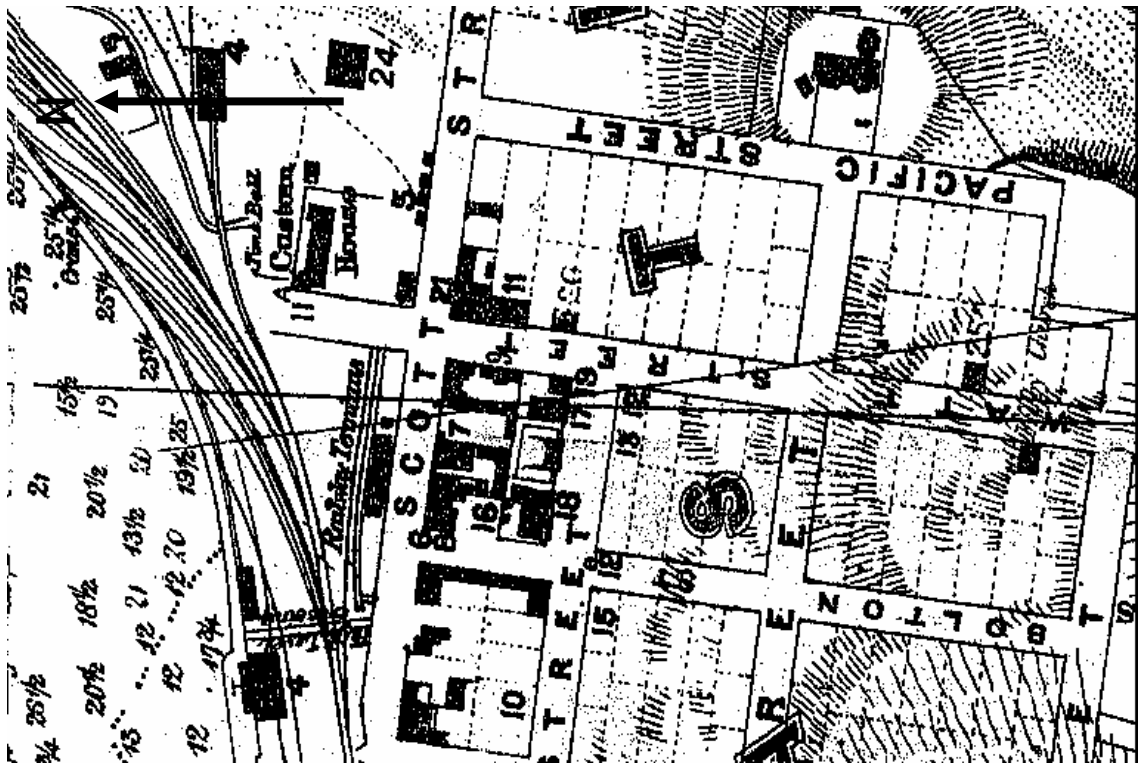


Figure 42: Image taken from nautical plan of Newcastle, 1886

Pre-dating this is an early alignment plan for Newcastle (Figure 43 below), which was done on parchment in 1870, and later photographed as a permanent record and is available from the lands department. This also shows the position of the GNH situated on the same corner. This corner was adopted as that shown on the Armstrong 1830 plan as the Ship's Inn. NB: A north point has been added due to east being up the page in the below figure.

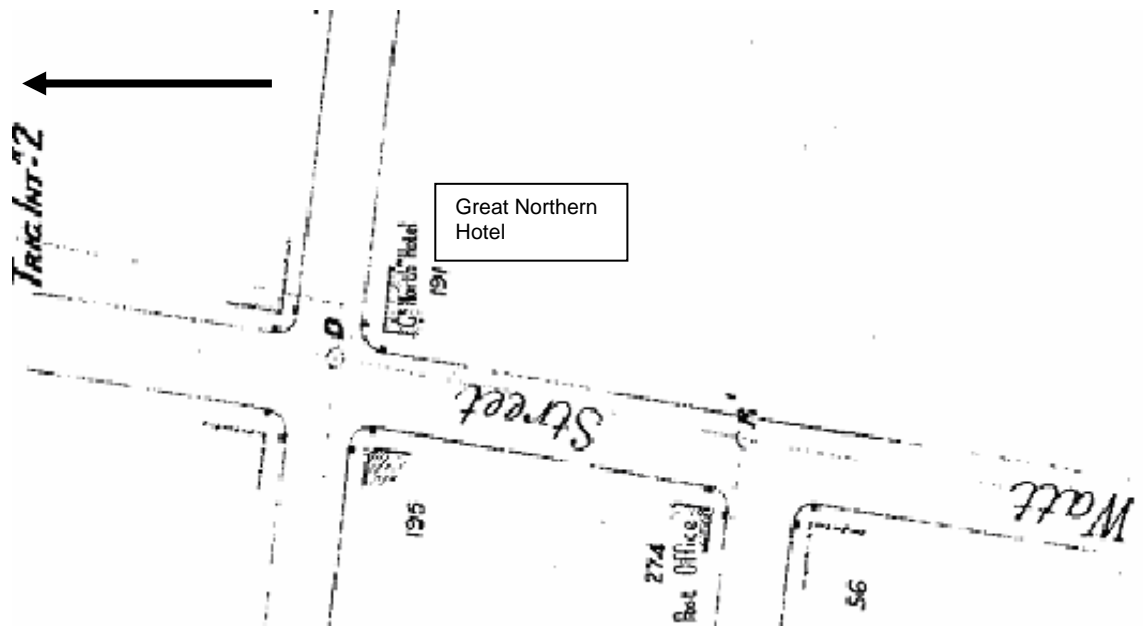


Figure 43: Alignment plan of Newcastle, 1870

Investigations into the associated deposited plans from that date on, such as the one displayed in Figure 44 below, identified that the corner of the parcel containing the Great Northern Hotel has remained unchanged in terms of position since the above 1870 alignment plan survey.

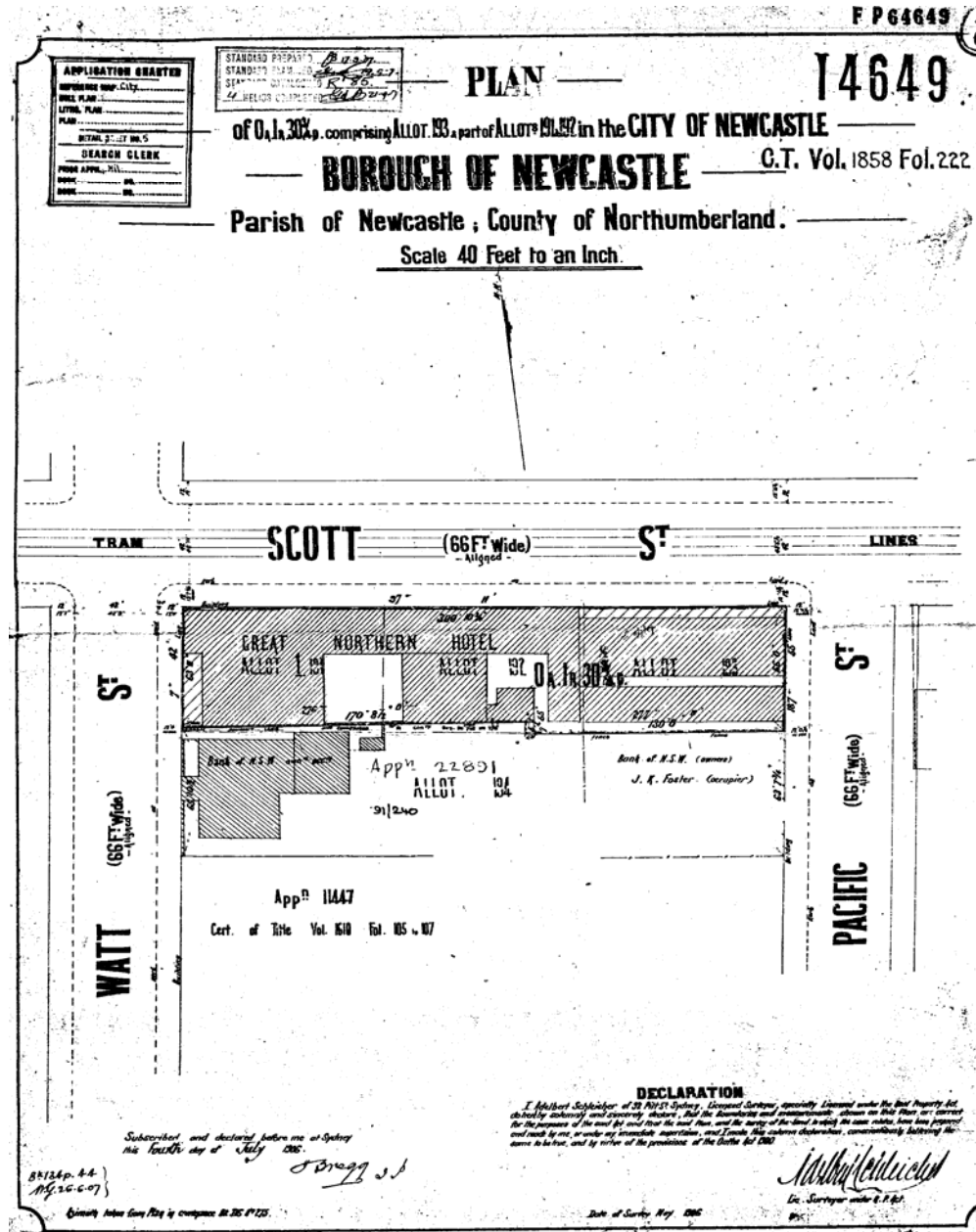


Figure 44: The full scanned version of DP 14649.

Based on the above findings, the 1993 Palmer, Bruyn and Parker deposited plan displayed below (Figure 45) was used in order to coordinate the required North Western corner of the GNH. The connection used from PM 5634 to the necessary corner can be seen in the cropping from the D.P as shown below.

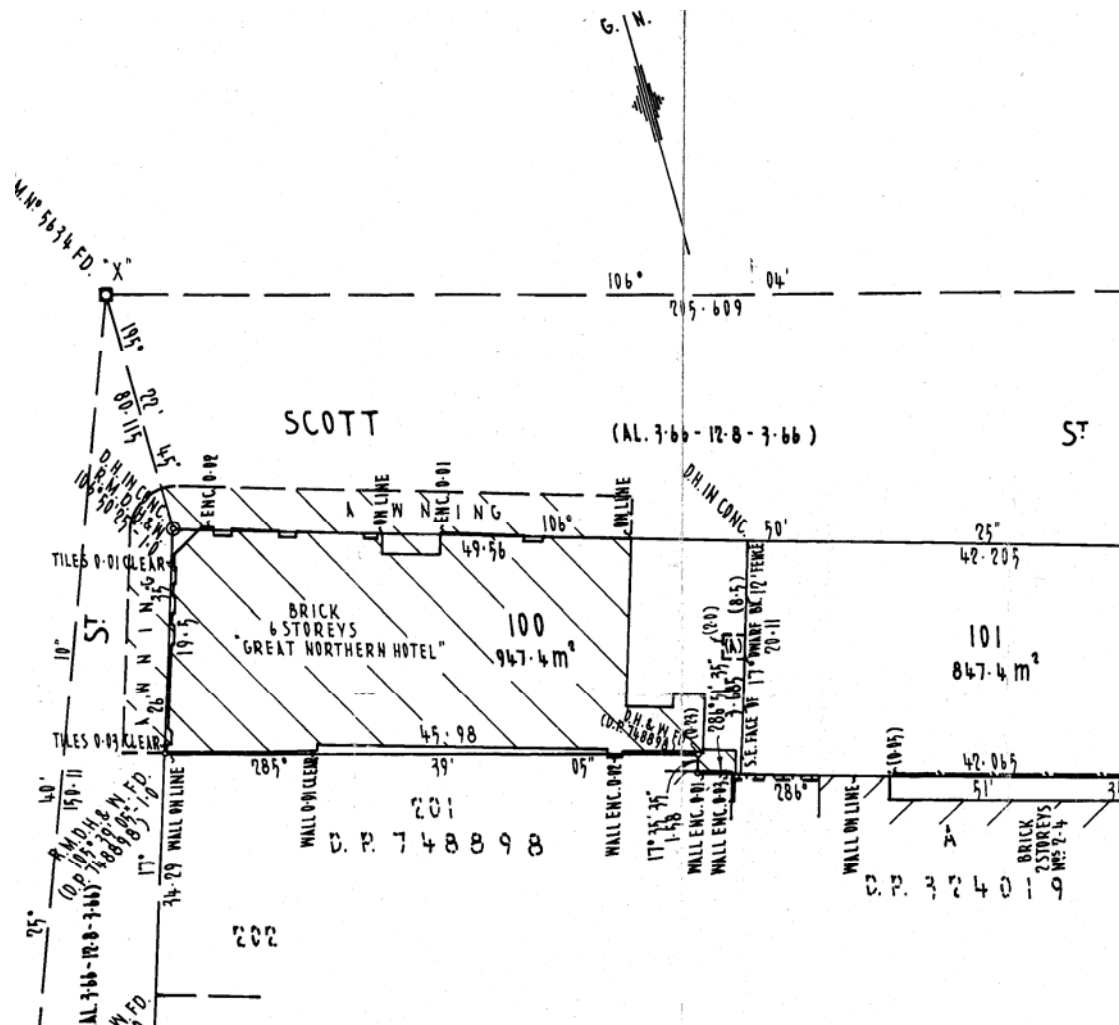


Figure 45: Connection used from PM 5634 to the relevant boundary corner

Following is Table 7 which displays the coordinates of PM5634 along with the calculated coordinates of the North Western corner of the Great Northern Hotel boundary lot. These are also the adopted coordinates of the North Western Corner of the Ship's Inn in Armstrong's 1830 plan.

Table 7: NW corner of the GNH ISG coordinates

Point	Easting (m)	Northing (m)
PM 5634	373 303.954	1 355 165.696
NW cnr GNH/Ship Inn 1830)	373 282.707	1355088.450

7.2.5. North Western corner of the Intersection of Watt and King Streets

At the North Western corner of Watt St and the proposed alignment of King St a boundary parcel existed on the 1830 Armstrong plan. This is shown in Figure 46 below.



Figure 46: NW corner of Watt St and King St

The subsequent Figure was taken from a survey plan of Newcastle of unknown age (sourced from historical section Newcastle library). However it must pre-date the 1886 nautical plan of Newcastle previously mentioned as it shows the hospital buildings as depicted on the 1830 plan (in Figure 49 and 50 which is displayed later), which had been replaced by the York Wing sometime before 1886. Therefore it must have been plotted between the 1850's and 1876, due to the fact that the land for the custom's house was designated in the 1850's, while construction was undertaken from 1876-1877. The plan is of excellent survey scale, block sizes and road widths agree extremely well with today's departmental plans. A calculation page proving the plan's scale accuracy can be seen in Appendix F.



Figure 47: Depiction of similar boundary shape, scale and orientation to that shown on Armstrong's plan derived from survey

The previously discussed plan also shows the relevant block at the corner of King and Watt Streets, along with the building footprint situated on the lot. Extra confidence was gained through the building shape displayed having the same shape, orientation and relationship to the boundary as that shown above within the Armstrong Plan (Figure 46). Note that North is directed up the page as is Watt Street. King Street is the street displayed running across the page.

The boundary corner in question was then traced through post-dated deposited plans, from which no boundary changes were found. The following image (Figure 48) was taken from D.P 818808 which shows the connection from PM 30038 to the relevant corner which was adopted as being the same boundary corner as that depicted in Armstrong's 1830 plan of Newcastle. The cadastral plan also shows within a table the I.S.G coordinates of PM 30038.

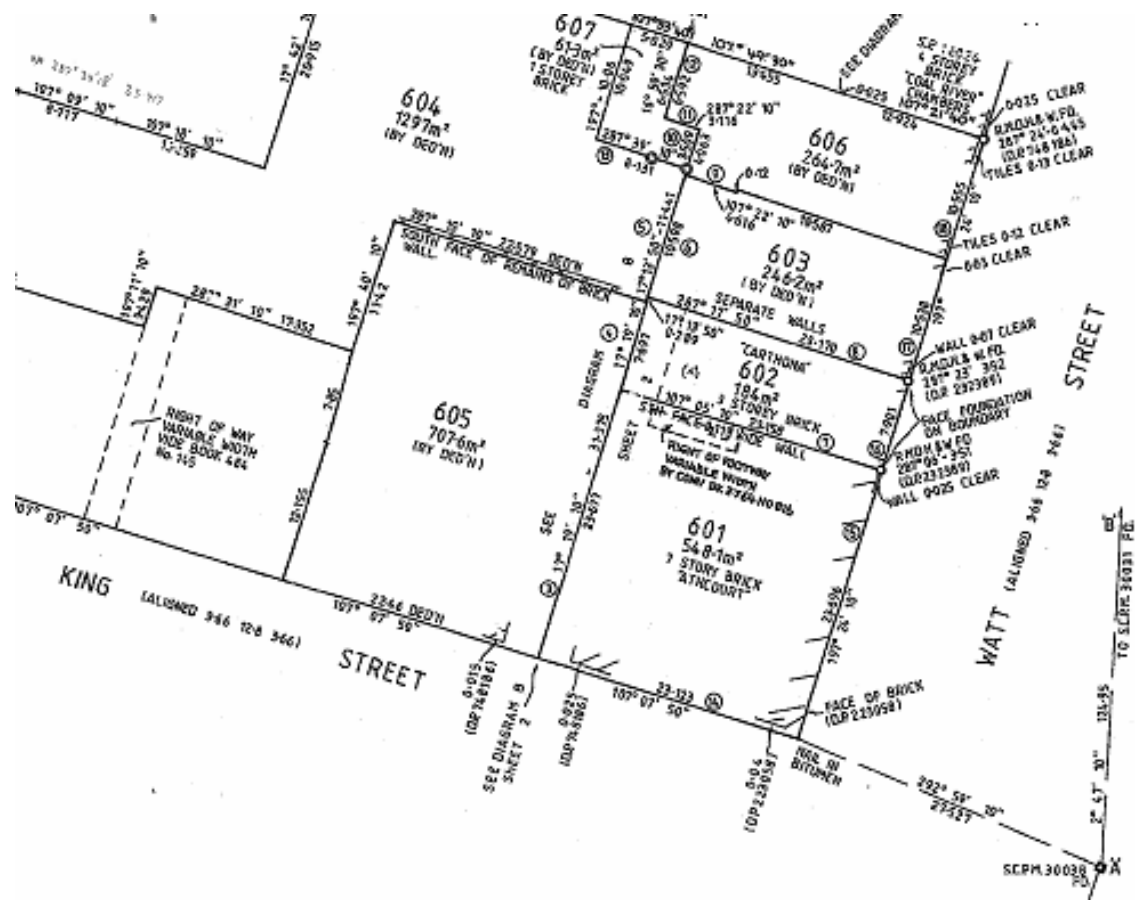


Figure 48: D.P 818808

This allowed the coordinates of the North Western corner of King and Watt Streets to be calculated using the connection of $292^{\circ}50'10''$ and 27.527m. The coordinates of the permanent mark and the calculated corner are displayed in Table 8.

Table 8: ISG coordinates of NW corner of King and Watt Streets

Point	Easting (m)	Northing (m)
PM30038	373 232.851	1 354 905.599
NW Cnr King/Watt	373 207.510	1 354 916.349

7.2.6. South Eastern Corner of the Intersection Between Pacific St and Hospital Lane (NW Cnr Colonial Hospital, 1830)

The image contained in Figure 49 is an enlarged section taken from Armstrong's 1830 plan depicting the Colonial Hospital boundary allotment. The alignment of King Street can be seen intersecting with the eastern boundary of the hospital as surveyed by Armstrong in 1830. Watt Street can also be seen running close to north south on the left side of the image. It was found that the western boundary of the Colonial Hospital as shown above was parallel to the Watt Street alignment.

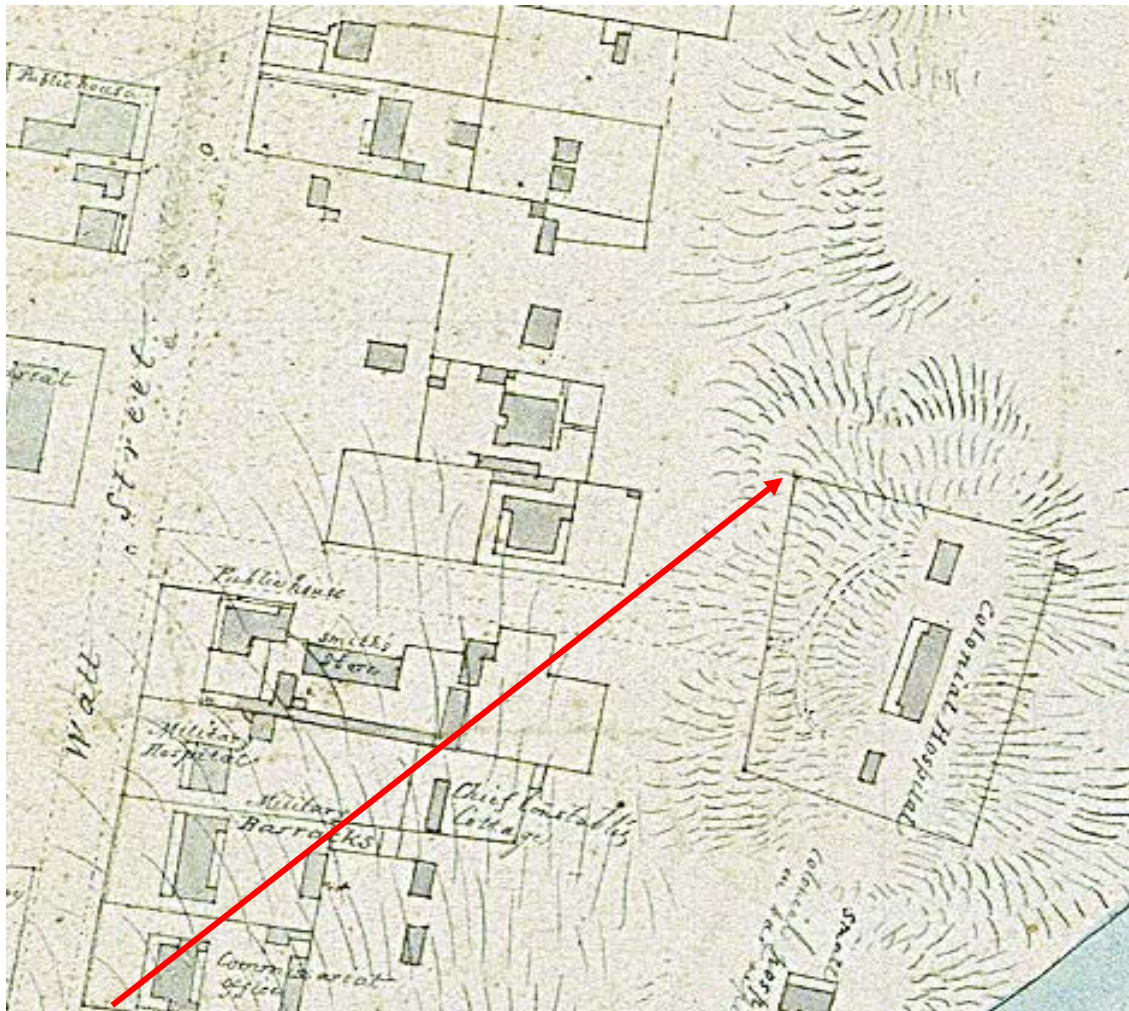


Figure 49: The North Western Corner as depicted by Armstrong.

The following image was cropped from the earlier discussed unknown survey plan of Newcastle East, approximated to have been dated between 1850's and

1876. The below plan also shows the same three hospital buildings plotted by Armstrong in 1830.

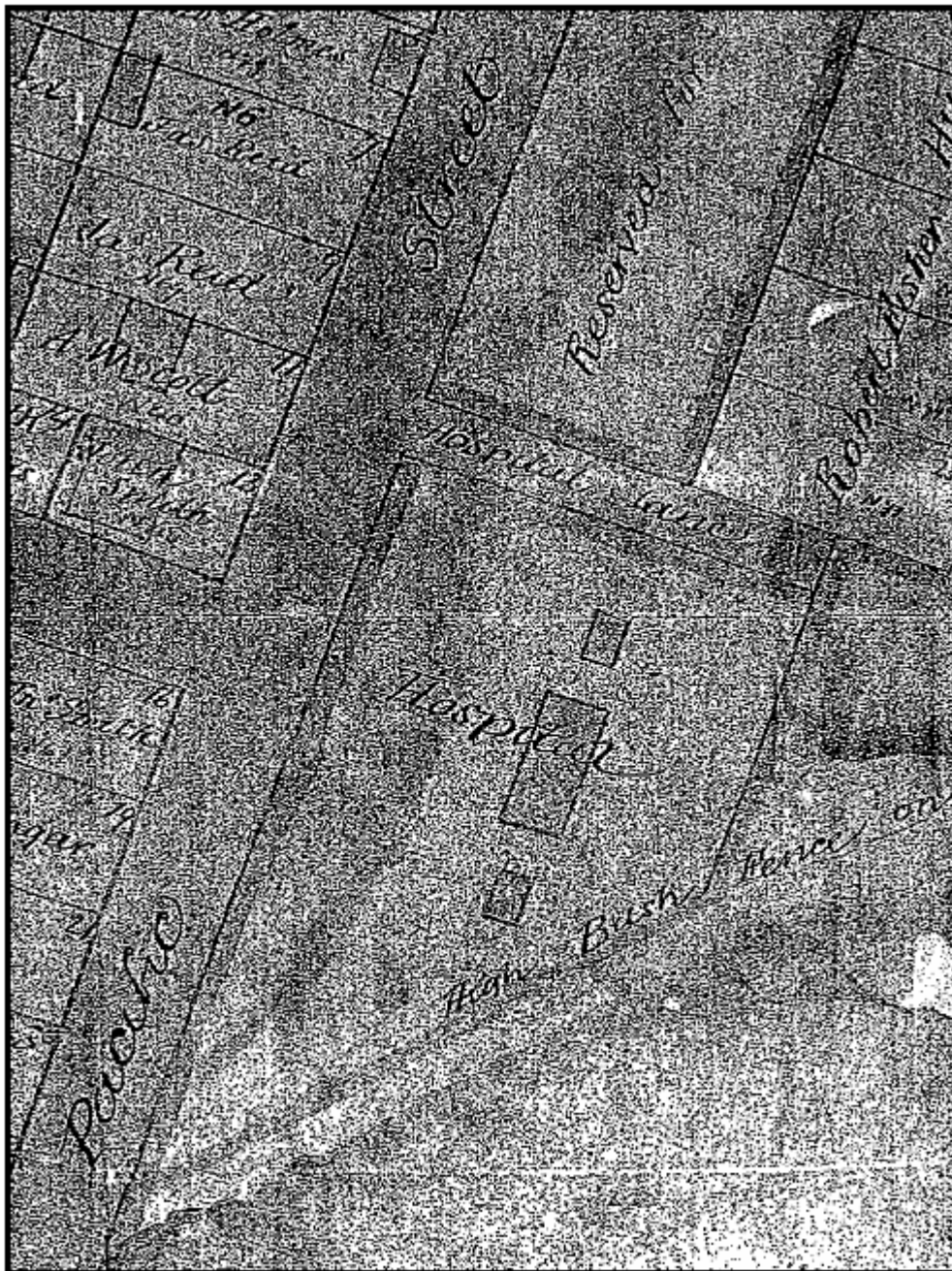


Figure 50: The three Hospital buildings are plotted to the same shape, scale and orientation as that depicted within Armstrong's 1830 Plan.

However, from Figure 50 it is visible that the buildings in the older unknown plan are plotted as being parallel to Pacific and Watt Streets, while the Armstrong plan shows the buildings rotated clockwise by approximately 5

degrees. The approximate scaling by ruler of the length of King St, (between the eastern side of Watt Street and the Western boundary of the hospital) on the survey plan of unknown age, in comparison with scaling of the same line on Armstrong's plan derived from the previously calculated coordinates. This identified the North Western corner as being approximately the same as the south eastern corner of Pacific St and Ocean St which was previously the York Wing of the Royal Newcastle Hospital and has recently been converted to apartments. Various deposited boundary plans were found for this area however nothing was found relating to any changes to the North Western corner of that depicted by Armstrong. It can be seen that Armstrong identified the northern boundary as not being parallel to King Street, whereas the below plan along with current D.P's show it as being basically parallel. This fact along with building alignment differences lowered the confidence level for this point. However the scaling for the North Western corner was still reasonable.

The deposited plan, being D.P880526, was used to calculate the coordinates of the South Eastern corner of Pacific Street and Ocean Street via the boundary connection from PM 5634. The ISG coordinates for this point were sourced from a table displayed on the D.P. Figure 51 contains a section of the deposited plan used.

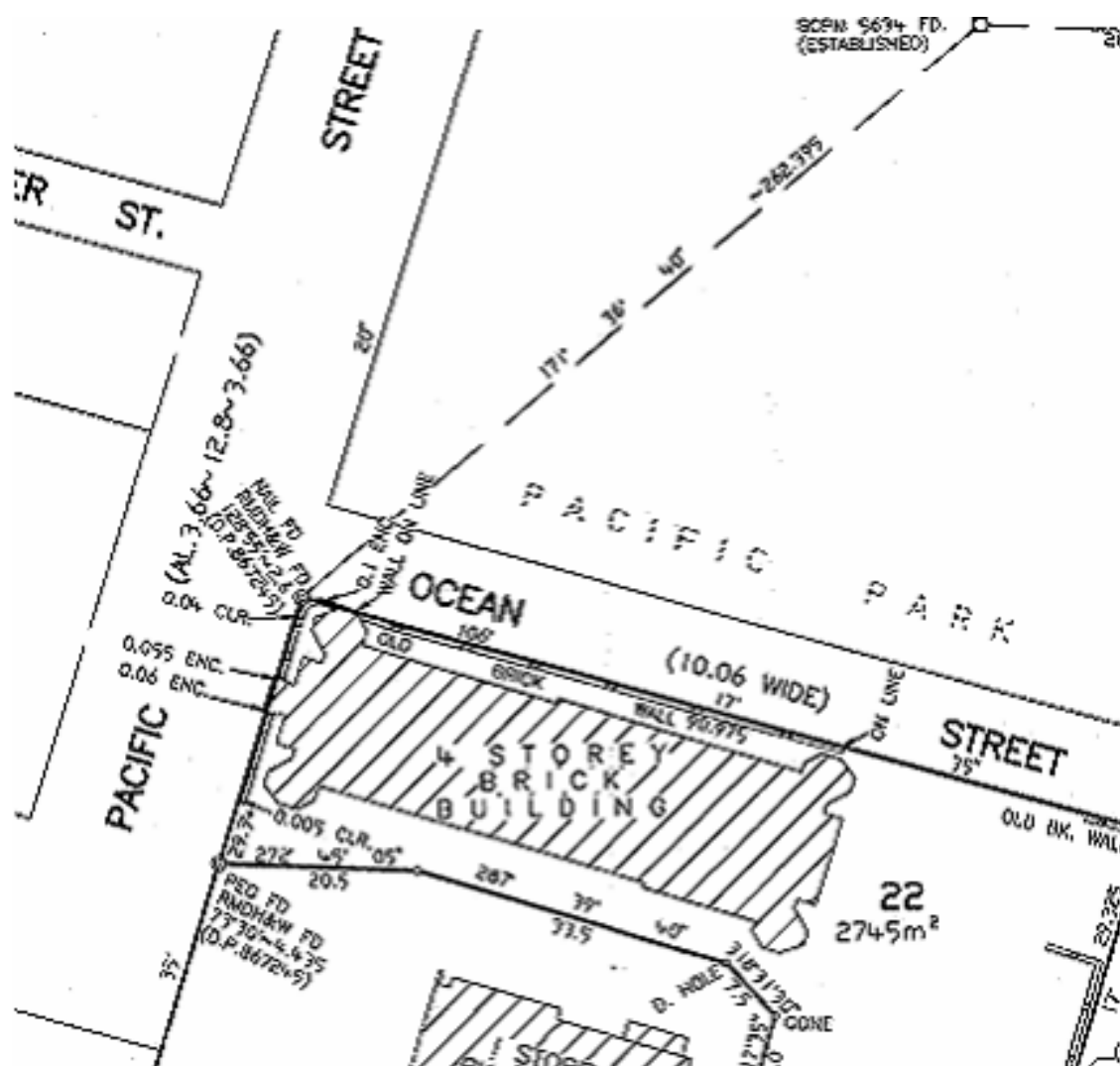


Figure 51: DP 880526. NB. The connection to the required corner.

The coordinates of PM 5634 are contained in Table 9 along with the adopted coordinates for the North Western corner of the Colonial Hospital as depicted by Armstrong.

Table 9: Coordinates of NW corner of Colonial Hospital

Point	Easting (m)	Northing (m)
PM5634	373 303.954	1 355 165.699
SE Cnr Intersection Pacific/Ocean Street's	373 342.235	1 354 906.112

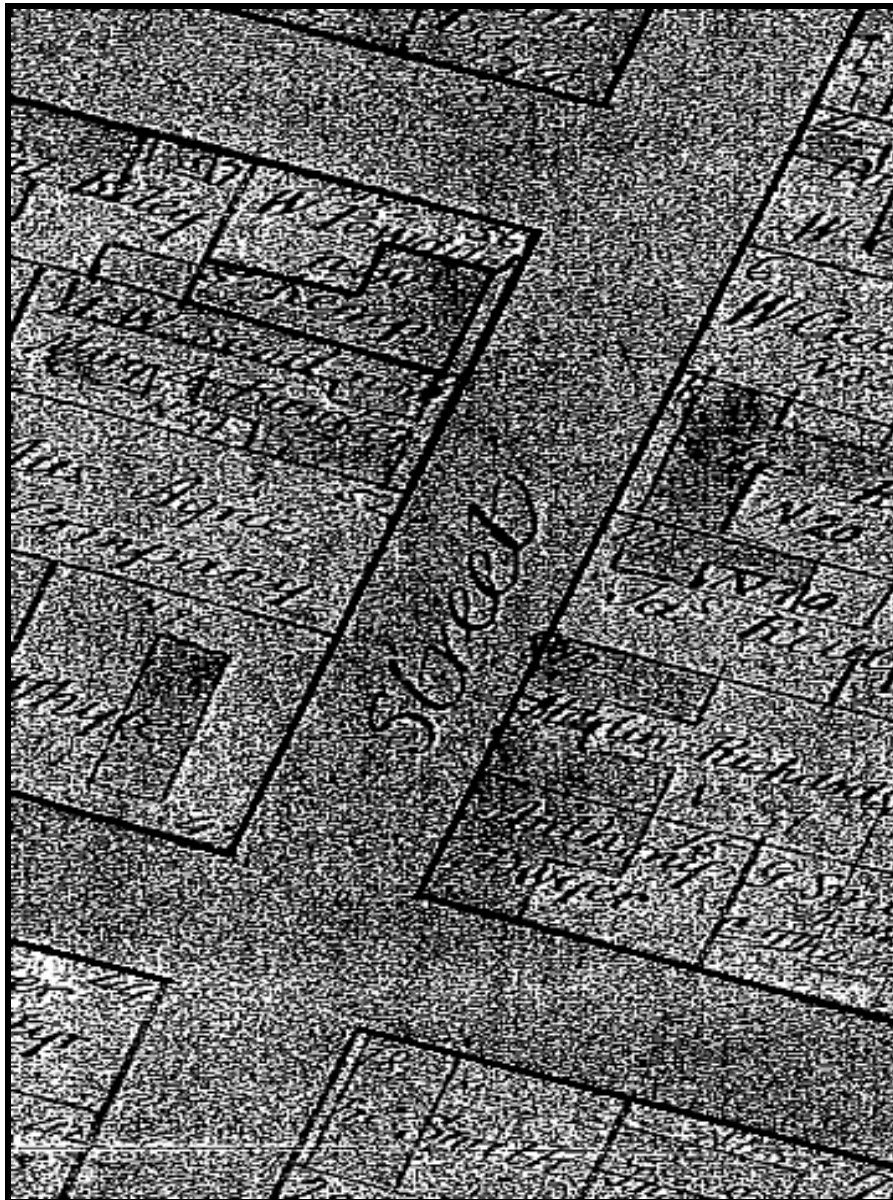


Figure 53: Depiction of similar building shape to Armstrong's Plan

As for all cadastral corners investigated an extensive deposited plan search was undertaken involving many plans both ordered and on file at Monteath & Powys Pty. Ltd. However based on the plans found, it was not possible to trace whether the North Western boundary had a strip removed or the allotments on the South Western side were widened to allow Watt St parcels to be on the one front boundary alignment, giving equal setbacks from the road. As the scaled distance along the Watt Street (between the King Street and Hunter Street) alignment on Armstrong's plan derived from previously established coordinates. The result agreed well with the current distance and it was decided that the two corners in question would be attributed the coordinates of these to boundary allotment coordinates as they would exist today. This would allow a decision to be made based on the differences in the results when the plan was fixed adopting points of higher confidence.

The deposited plan, as seen in Figure 54 below, was used to calculate the coordinates for the relevant boundary corners, using the boundary connection from PM30031 to the corner of the parcel at the North Western side of the intersection. The connection is shown by the circled letter 'b' and the bearing of $268^{\circ}52'$ and distance of 4.15m is displayed on the same DP. The ISG coordinates for the PM were found on D.P 818808. The parcel on the South Western side of the intersection was calculated via using the Watt Street alignment azimuth (same frontage) and the road width as it is an aligned road of 66 feet. A calculation page can be found in Appendix F.

Table 10 displays the relevant coordinates for the parcels on the western side of the intersection between Hunter and Watt St.

Point	Easting	Northing
PM30031	373 238.931	1 355 030.400
NW Corner Hunter/Watt	373 243.080	1355 030.476
SW Corner Hunter/Watt	373 237.068	1355011.280

7.3. Coordinate Conversions



The coordinates calculated for the points adopted to fix Armstrong's 1830 plan were on both Map Grid of Australia, MGA (GDA94) and the Integrated Survey Grid, ISG (AGD66) coordinates. The MGA coordinates also referred to as GDA 94 have superseded the ISG coordinates. This is due to the current Australian Geodetic Datum (AGD) being based on a mathematical surface of the earth designed to fit the Australian region. Continuing to work with AGD coordinates in an international environment where positioning, navigation and information systems relate to a global earth model is becoming increasingly inefficient and difficult. Therefore it was necessary to translate all the ISG coordinates to MGA coordinates. The MGA or GDA coordinates have their origin at the centre of the earth, i.e. being totally compatible with global satellite based navigation systems.

This was carried out using the *GeoSurvey* software package, which is capable of doing points transformations. Of the 6 boundary corners calculated, 4 required a coordinate conversion.

To perform the conversion within *GeoSurvey* the points needed to be entered into a new job, from which the datum was set. This is done after or during point easting and northing entry. This will not alter the coordinates entered but simply assign the relevant datum. Within job settings, on the file menu the datum can

be set if you have the MapProjections_Aust.csv (downloadable from the Lands department website) saved in the relevant place. Figure 55 below shows the correct settings for the ISG to MGA conversion.

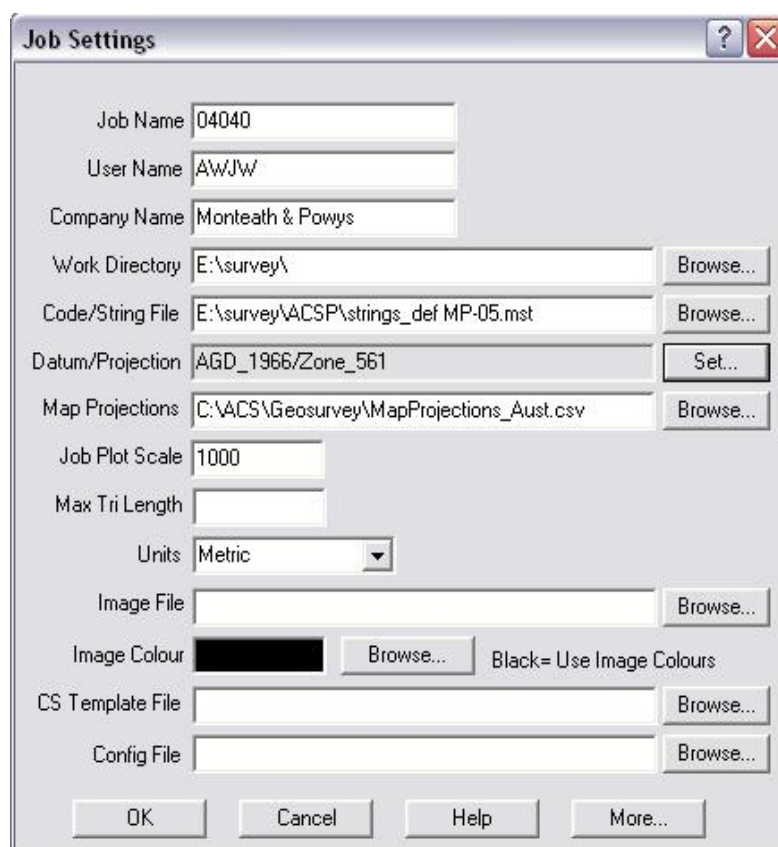


Figure 55: Job settings function within GeoSurvey

Once the datum is set it can be transformed to a new datum using 'points' - 'advanced' - 'transform to new datum' options. At which time the required datum can be chosen and applied. Figure 56 displays the transformation function within GeoSurvey.

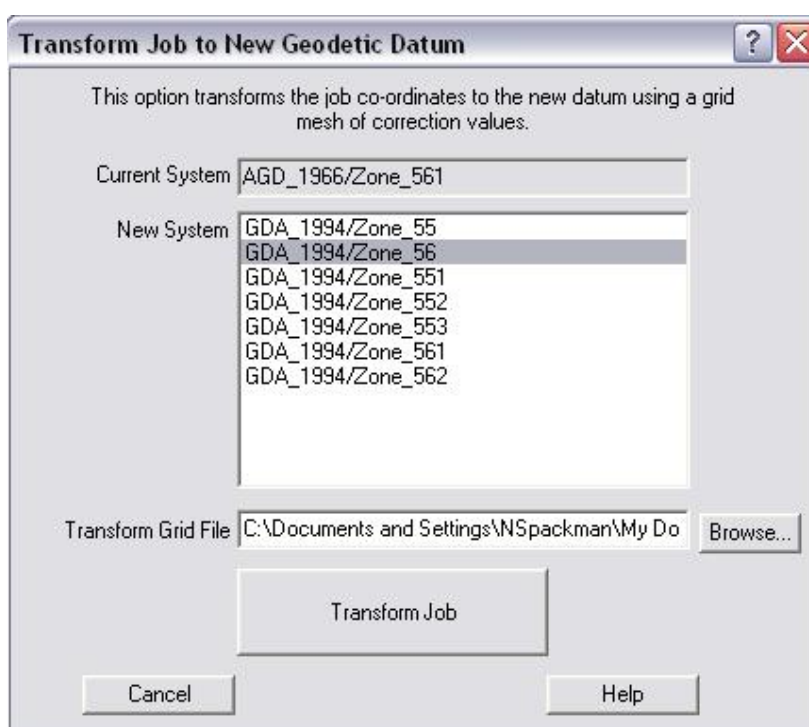


Figure 56: Coordinate transformation

Following the translation in *GeoSurvey*, a point's report was obtained. The transformed coordinates can be found in Table 11.

Table 11: Full coordinate point schedule in MGA

Point	Easting	Northing
Obelisk	385 833.166	6355 594.025
Flag Staff	387 095.83	6356 299.83
NW Cnr Burial Ground	385 950.485	6356 039.776
SE Cnr Scott St/Watt St (GNH)	386 375.526	6356 133.054
NW Cnr King St/Watt St	386 303.624	6355 959.601
SW Cnr Hunter St/Watt St	386 331.100	6356 054.289
NW Cnr Hunter St/Watt St	386 336.964	6356 073.585
SE Cnr Pacific St/Hospital Ln	386 438.486	6355 951.923

7.4. *AutoCad Fix*

AutoCad 2000 was used to fix the 1830 Armstrong Plan image. The plan was first inserted as a raster image via the 'insert' menu and 'raster image' option, at which time a single point can be attributed coordinates. A second point would then be selected allowing coordinates and a bearing/ distance between the two points to be obtained. Following this, the image can be scaled and rotated to match the correct bearing distance. That is the bearings are differenced to calculate the rotation amount, reduce a ratio between the distances to calculate scale. Once the plan is fixed to the relevant positional coordinates, the mouse can be used to zoom right in on a point to obtain the resulting coordinates based on the fix used. However the resulting coordinates could only be quoted to an accuracy of 'a point of a metre'. The reason for this is that in re-zooming on a point several times, the coordinates could only be matched to the nearest 'point of a meter'.

7.5. Results

Initially the Armstrong 1830 Plan was fixed based on the derived coordinates for the two monuments, the Obelisk and the flagstaff, as these points were both guiding marks for mariners. The results obtained are shown in Table 12 below.

Table 12: Initial coordinates schedule based on monument fix

Position	Calculated Coordinates (m)	Coordinates derived from plan fix (m)	Difference (m)
Obelisk	E 385 833.166 N 6 355 594.025	FIXED	N/A
Flag Staff	E 387 095.83 N 6356 299.83	FIXED	N/A
NW Cnr Burial Ground	E 385 950.485 N 6 356 039.776	E 385963.7 N 6356059	E -13.2 N -19.2
NW Cnr GNH/Ship Inn, 1830	E 386 375.526 N 6 356 133.054	E 386 415.2 N 6356151.2	E -39.7 N -18.1
NW Cnr Intersection King St/ Watt St	E 386 303.624 N 6 355 959.601	E386333.7 N6355967.8	E -30.1 N-8.2
SW Cnr Hunter St/Watt St Intersection	E 386 331.100 N 6 356 054.289	E386363.7 N6356060.8	E-32.6 N-6.5
NW Cnr Hunter St/Watt St Intersection	E 386 336.964 N 6 356 073.585	E 386373.4 N 6356080.8	E-36.4 N-7.2
SE Cnr Pacific St/Hospital Ln	E 386 438.486 N 6 355 951.923	E 386484.9 N 6355955.2	E-46.4 N-3.3

Average Difference: E -33.1m
 N -10.4m

Standard Deviations: E -11.3m
 N -6.6m

The results were encouraging. It can be seen in the differences in Easting that the error is always in the same direction. This is also the case for the Northing but to a much lesser extent. This trend is indicative of an error in the fix, i.e. shifted in one direction or a plan that has been stretched in one direction.

Secondly the cadastral corners which I had the most confidence in were used to fix the 1830 Armstrong Plan. The burial ground and the South Eastern corner of the Scott St and Watt St intersection (GNH) calculated coordinates were used to hold their positions fixed. The results derived are displayed in Table 13.

Table 13: Final accepted coordinates

Position	Calculated Coordinates (m)	Coordinates derived from plan fix (m)	Difference (m) Calc'ed-Derived
NW Cnr Burial Ground	E 385 950.485 N 6 356 039.776	Fixed	n/a
NW Cnr GNH/Ship Inn, 1830	E 386 375.526 N 6 356 133.054	Fixed	n/a
NW Cnr Intersection King St/ Watt St	E 386 303.624 N 6 355 959.601	E 386301.0 N 6355959.0	E 2.6 N 0.6
SW Cnr Intersection Hunter St/Watt St	E 386 331.100 N 6 356 054.289	E 386328.1 N 635 6047.1	E 3.0 N 7.2
NW Cnr Intersection Hunter St/Watt St	E 386 336.964 N 6 356 073.585	E 386336.9 N 635 6066.1	E 0.1 N 7.4
SE Cnr Intersection Pacific St/Hospital Ln	E 386 438.486 N 6 355 951.923	E 386443.8 N 6 355 948.7	E -5.3 N 3.2
Obelisk	E 385 833.166 N 6 355 594.025	E 385 833.2 N 6 355 598.1	E -0.0 N -4.1
Flag Staff	E 387 095.83 N 6356 299.83	E 387 016.2 N 6 356 281.7	E 79.6 N 18.3

The results achieved by the second adopted fix were of much better quality. However the flagstaff coordinates are incorrect by approximately 80m to the east and 18m to the north. This result on the flagstaff coordinate difference indicates itself as being the cause of the poor results in the first adopted monument fix. Therefore it can be safely assumed that the flagstaff position

must have been moved between the 1830 location by Armstrong and the 1856 location on the plan of flag staff hill.

To check the indifferent result, the azimuth of the Newcastle breakwater was scaled off the 1856 plan used to coordinate the flagstaff. The Newcastle breakwater's azimuth was then derived from the final acceptable fix of Armstrong's 1830 plan just discussed. The results can be seen below and are evidence that the flagstaff was moved, as the alignment of the breakwall agrees quite well in both plans.

1830 Plan Newcastle Breakwater Azimuth: $34^{\circ} 36'$ (calculated from plan fix)

1856 Plan Newcastle Breakwater Azimuth: $33^{\circ} 30'$ (scaled with protractor $\pm 30'$)

The derivations for the breakwall Azimuth's can be found in Appendix F. By removing the flagstaff from the fix the following standard deviations were produced.

Standard Deviations: E 3.3m
 N 4.8m

Average Difference: E 0.1m
 N 2.9m

Following the agreement of the breakwater and removal of the flagstaff the results are more than acceptable, the difference errors are now on both sides of the calculated points indicating a shift in any direction may improve some points variance while decreasing others.

The results from the final plan fix were also able to identify the correct alignment of Watt Street as that fronting the parcel that Armstrong located on the North West corner of Hunter St and Watt Street. This alignment also agrees with the frontage of the three parcels depicted at the southern end of Watt Street. (See figure 52). Therefore it is assumed that the frontage of the parcels at the SW corner of Watt Street /Hunter Street and the North Western corner of

King St/Watt St have been increased to match the alignment of the other parcels on Watt Street surveyed by Armstrong in 1830, some time since. However as the relevant deposited plans for these changes were not found the coordinates have been left as is.

7.6.Errors

The plan was originally surveyed in 1830 with no theodolite and no electronic distance measurement, only the use of a compass and a chain creating a high possibility that survey errors would exist considering the plan covers a large area, some of which is quite steep. Following this the plan was hand plotted on linen with a high chance of drafting errors realising that at an AO plot, the distance between the flagstaff and the obelisk being 1446.5m is represented by a scaled distance of 67.5cm. Therefore a scaled distance of 1mm is approximately equal to a distance on the ground of 2m. As the copy of the Armstrong 1830 plan was attained through a photograph of the original there is also the possibility of photogrammetry errors. It is also possible that previous to the photograph the original could have been stretched as a result of being rolled, which would only have to be a matter of millimetres to put points out by metres.

7.7. Conclusion

This investigation although proving extremely time consuming in terms of cadastral searches and calculations was of great benefit to myself and to the Coal River community project. This investigation improved both my plan deciphering and my calculation ability for cadastral work.

Although successfully fixing one depicted monument and 6 cadastral boundary corners (with reference to deposited plans and early maps of the settlement at Coal River) several other allotments such as the Blaxland's grant on the Armstrong 1830 plan were also searched, however there wasn't enough supporting evidence to confidently match it to any plan which I have found.

Based on the results and at the request of Dr Erik Eklund and Gionni Di Gravio, I was able to set out the position of the historically significant A pit based on my 1830 Plan fix. The position was found as being within the rear of the Historic 3rd Bolton property, at the face of the hill cutting on the back boundary. This position was only 80m NNW of the plaque in Church Street describing the historic site. The coordinates were set out using the Global Positioning System (GPS). The approximate accuracy of the set out was quoted to 10m, based on the results of the plan fix and the incorporated GPS errors. A copy of the report sent to Dr Erik Eklund regarding the A Pit setout is contained in Appendix G.

8. DIGITAL TERRAIN MODEL (DTM)

It was hoped that most of the DTM creation could be done in *GeoSurvey* to avoid using the relatively unknown 12D program. The master file, as previously discussed in Data Processing and in the Fieldwork sections contained all of the necessary topographic data. However, contour modelling had been restrained within the contour boundary string visible in Figure 5.

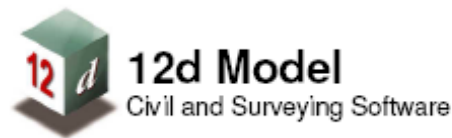
In order to generate contour modelling to the limit of the topographic data within the master file, the contour boundary string needed to be removed and contours required retriangulation. This caused over 1000 problems outside of the Monteath & Powys Pty Ltd data. It was discovered that these problems were primarily as a result of the Newcastle City Council data being imported into the same Monteath & Powys Pty Ltd file twice. Within the investigation it was found that the data was actually sent to Monteath & Powys Pty Ltd with this problem already existing. Due to the sheer gross amount of the errors, the problem had not been resolved prior to our involvement, and henceforth the placement of the contour boundary around the Monteath & Powys Pty Ltd topographic work.

These problems involved crossed strings and other errors such as “points too close”. The rectification of these problems involved the use of discon strings, no triangle strings, non-contourable points, averaging and deleting of identical points.

On completion of fixing these problems the contours were successfully generated to the extent of the topographic data within the master file. A new contour boundary string was entered around the extents of the master file data to prevent triangulation in unnecessary areas.

No triangle strings and discon strings were also used around structures such as retaining walls and buildings to prevent contouring in unwanted areas. Once all contouring requirements had been satisfied the *GeoSurvey* master file was exported as a “dxf” file.

8.1. 12D



On completion of the exported dxf file the file was imported into the digital terrain modelling program, 12D. This process was completed by the use of the functions: “File I/O – Data Input – DWG/DXF.” From this the job file location and the relevant job settings were entered into the following 12D table shown in Figure 57.

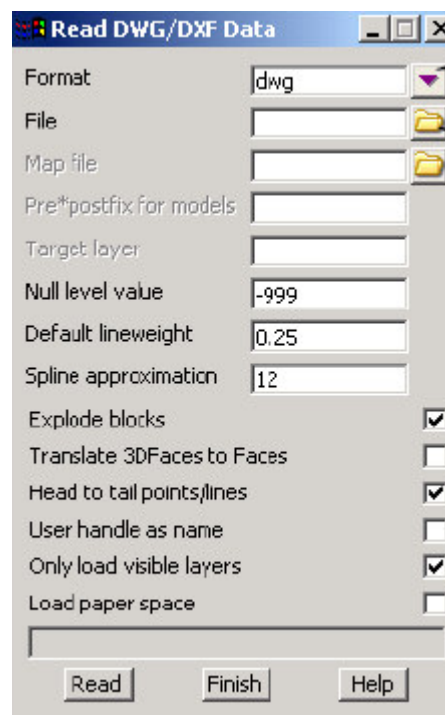


Figure 57: 12D Job settings

The “Plan View Menu” function was used to view the imported data, within which models (layers) could be turned on and off separately such as the contour layer. At this stage the triangulated irregular network was

Following the imported *GeoSurvey* data a triangulated irregular network (TIN) was created from the existing topographic data to form the DTM. This was achieved by the Tins – Create – Triangulate Data functions. To view the TIN within 12D, the View – New – Perspective functions are used. Following this

the “+” symbol was selected and the existing TIN could be added to form the DTM. Figure 58 shows a representation of the TIN perspective.

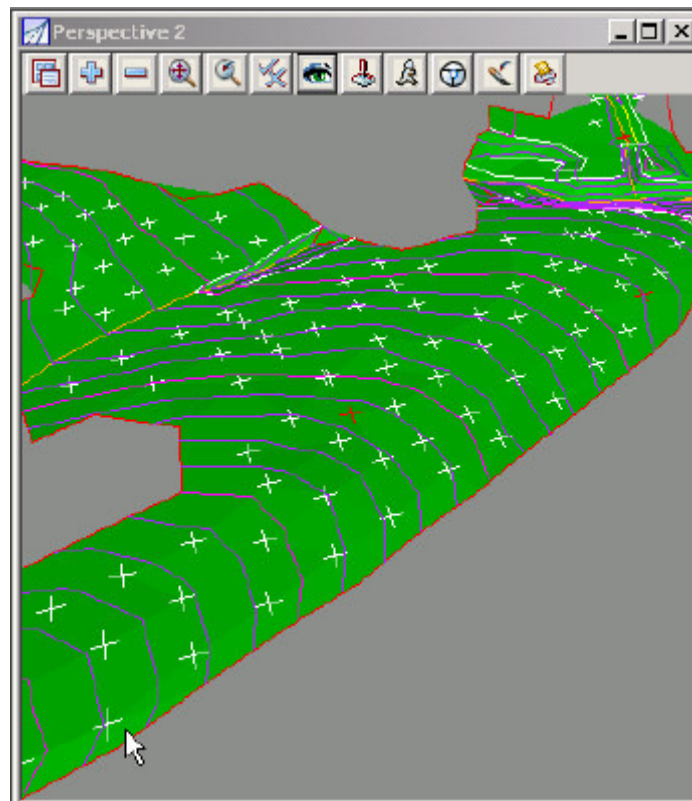


Figure 58: 12D TIN perspective

The contour layer was re-imported several times after it was discovered that additional *GeoSurvey* editing was required. The reason for this was that the DTM within 12D is purely derived from the *GeoSurvey* contouring, therefore any unrealistic surfaces produced within 12D required re-editing of the initial *GeoSurvey* contouring. This process of resolving unrealistic contours in *GeoSurvey* was continued until resulting surfaces appear in 12D as they are in real life. The following image contained in Figure 59 is the final *GeoSurvey* master file that was accepted when modelled in 12D.



Figure 59: Final *GeoSurvey* topographic data

Once the acceptable TIN was in place, it was discovered that to render the particular areas of the DTM, polygon strings needed to be inserted bounding the area to be coloured. This was also done in *GeoSurvey* from which the specific string could be exported as a dxf file and imported into 12D on its own.

This enabled bitumen areas, buildings, roofs to be rendered with realistic colours.

Due to the manner in which building roofs were located, i.e. ridgelines and eaves and gutters, 12D was able to model the structures as a realistic triangular polygon shape. However, these roofs appeared as floating bodies within the DTM. The reason for this was that the building footprint was located at natural surface level. In order to rectify this, the building footprints needed to be extruded from the natural surface level to the level of the eaves. The same process was used to create the chimney profiles above the positions located by survey.

The Design – Apply – Interface functions were used to create an interface (extrusion) between the underside of the roof/ top of retaining wall/ top of chimney and the natural surface.

The following image in Figure 60 shows an illustrative example of a concrete pad which has been located on top, being extruded down to natural surface level.

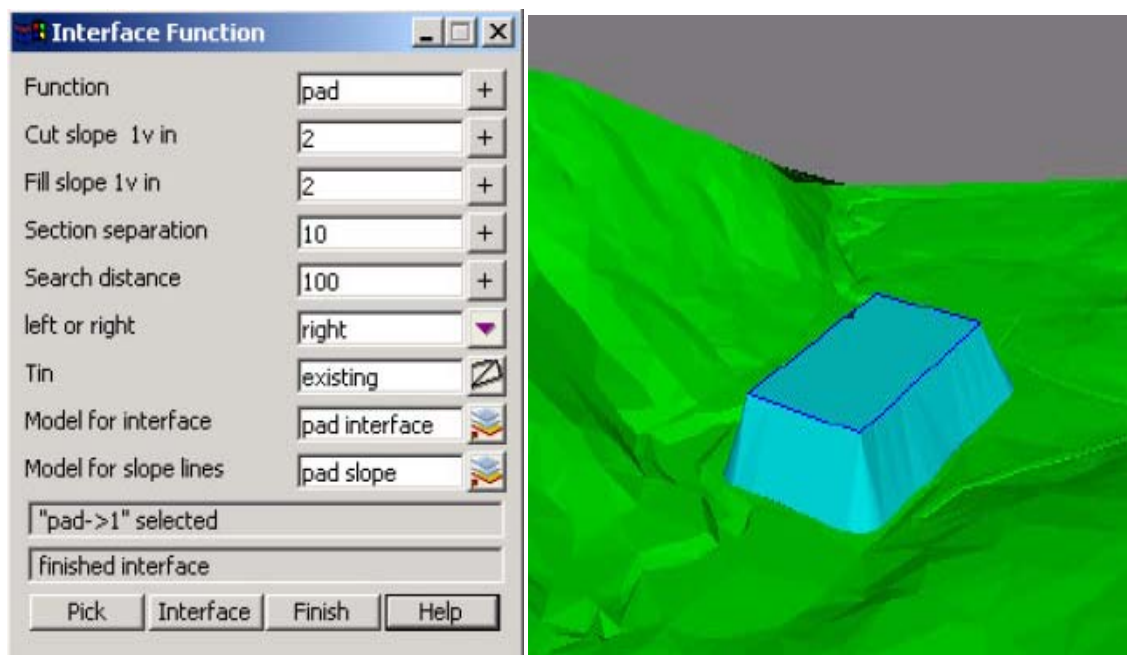


Figure 60: Example of extrusion

Similarly, retaining walls if located at natural surface and at the top of the wall can be easily modelled by 12D. However if the wall has only been located at natural surface level, or vice versa, the footprint can be extruded to the top of the wall RL, or alternatively down to natural surface level. To be able to achieve a DTM the user has to think three-dimensional.

The default library file within 12D was used to place structures such as car barriers, light poles, fences etc over their located survey positions. In addition, a sky backdrop was added to the DTM from the default library file. This was done so as to supplement the realism of the DTM. Figure 61 is an example of the car barrier and light poles inserted from the 12D library.



Figure 61: 12D video shot of car barrier and light poles

Video files of a simulated fly through can be created, so as the DTM can be viewed on multiple hardware devices without the need for the 12D software to be installed. This makes it easier to show the client the finished product. A CD has been provided containing this video file.

Figures 62, 63 and 64 are screenshots taken from the video file created within 12D of the DTM.



Figure 62: Building cluster shot

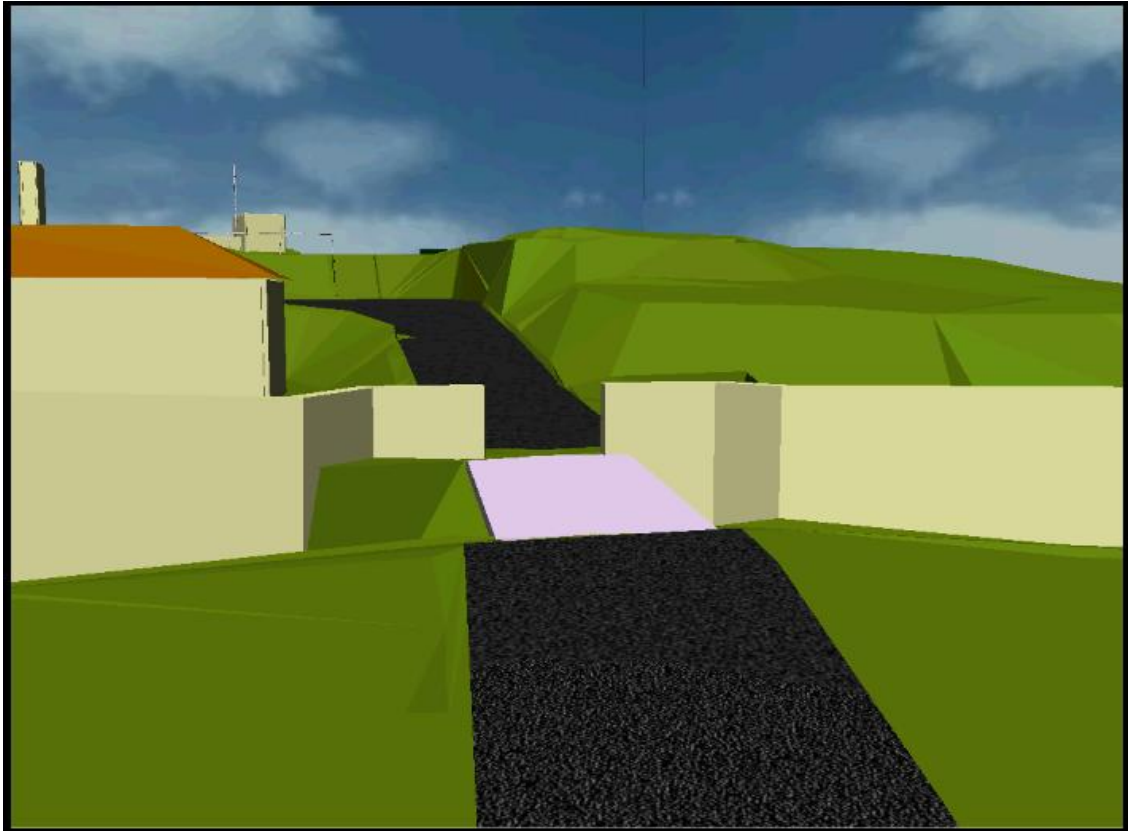


Figure 63: Depicted is the dry moat and bridge along with the concrete walls

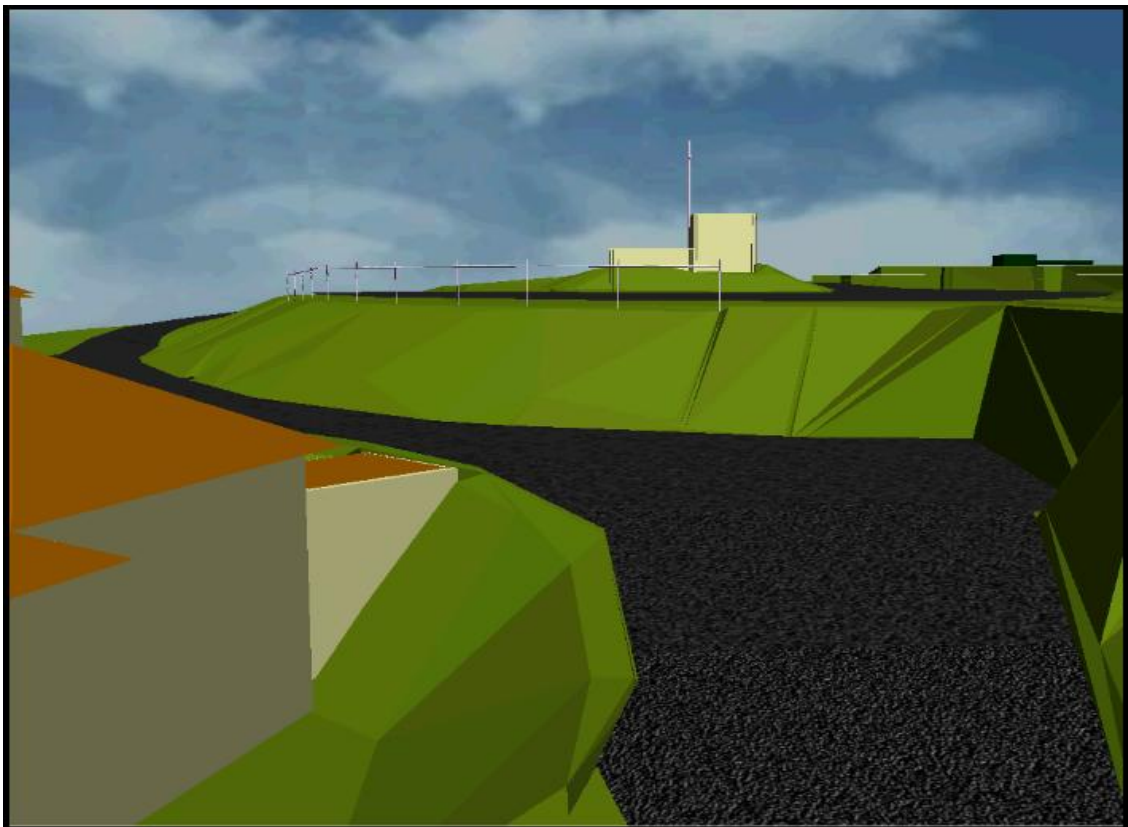


Figure 64: Flagstaff at Fort Scratchley

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www.newcastle.edu.au/coalriver

Excellence In Surveying and Spatial Information

Category: People & Community

Entrant: Monteath & Powys PTY LTD

Nominated Project: Nobby's Coal River Heritage Park

Award Entry Title: Revealing Newcastle's Convict Workings

Company Representative: Peter Sherlock, Director,
P.Sherlock@monteathpowys.com.au

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Statement of Excellence

In taking up the invitation to join the Coal River working party, Monteath & Powys Surveyors achieved high excellence within their specific role for the project.

The mine working positions as marked out by Monteath & Powys proved to be the drift locations as seen on the recently discovered 1856 “Plan of Flag Staff Hill Newcastle” or what is now known as Fort Scratchley.

New highly technical surveying equipment and survey techniques were used to set out positions that were prior located in the 1850’s.

The attain of excellence in surveying within this project can not only be measured against the success of the recent discovery of the previously unknown drift locations, as investigated and marked out by Monteath and Powys, but also as a level of community interest and involvement for the project. This has been beneficial to both the understanding of the heritage and history of Newcastle and for the wider surveying profession in general.

These achievements have gained vast media coverage, however the long term goal is to create a tangible viewing location of the site for future generations.

Project Overview

The recent 200th anniversary of the official establishment of Newcastle as a Government settlement was the catalyst for the greater community involvement by a member of the surveying profession. A community action group titled “The Coal River Working Party” was formed from the combined resources of special interest groups of heritage and history, commercial partners from industry and professions, Local Government and the University of Newcastle.

This diverse group has within it representatives from areas sometimes seen to be at opposing ends of the development spectrum. The success generated by this combination of interests has been demonstrated by the recent successful re-discovery of convict coal mines under Signal Hill in Newcastle.

This report is concentrated on the surveying activities of one group member, Monteath & Powys Pty Ltd. Monteath & Powys Pty Ltd are a Hunter based company established in 1950. The staff of 40 provide services in surveying, planning and engineering design.

Due to the significance of the coal industry to the economies of the Hunter Valley, NSW and Australia it was thought suitable that our company participated in the finding and maintenance of our communities historical heritage

The encouragement and participation in the development of community infrastructure has proven to be very rewarding for all of our staff and we look to further this involvement of our profession within the region. An interpretive centre for the education of this community into its heritage and history remains a goal for this community group

Background

The University of Newcastle formed the Coal River working party to assist The Parks and Playground movement and other interested community bodies to protect the city of Newcastle's important landmarks. The overall vision "is to create an interpretative centre to express Newcastle's unique Aboriginal, convict and industrial heritage and a management plan for the entire site by the 200th anniversary of the permanent settlement at 'Coal River' 2004." (Coal River website) The project received contributions from Local, State and Federal Governments as well as the University of Newcastle and the involved commercial companies.

The long term goal of uncovering one of the mine drift locations was so as interested community groups, tourists and students can get an appreciation of the confines of a convict coalmine and the small and cramped working conditions.

Newcastle is a town "entrenched" in mining history and it could be said that it was the lifeblood of the blue collar town for many years. It is easy to understand the natural obsession the people have with the existence of old mine warrens throughout Newcastle and therefore of the level of interest this project has gained within the town.

"Nobby's Coal River Heritage Park is:

A significant historical place that gives a tangible expression to Newcastle's Aboriginal & European Heritage. A distinctive area of public land at the mouth of the Hunter River encompassing Nobby's Headland, Macquarie Pier, The Convict Lumber Yard, The Cornish Dock and the original convict coal mine workings at Colliers Point beneath Signal Hill.

Potentially one of Australia's most significant sites: It is a place of Aboriginal heritage. It is the location of Shortland's discovery of a Coal River (named Hunter River) and of winnable coal. It is the historic focus of the official founding of Newcastle 30/3/1804 and of the beginning of convict coal mining, port development and maritime heritage. It is also a place of later military heritage." (Coal River Website)

Newcastle is the home of the first coal mines in the Southern Hemisphere, however the original mines locations "hewn out of the rock by John Platt (Sydney Gazette , May 5th 1805) at the dawn of white settlement are still unknown". (Coal River website)

Newcastle surveyor's Monteath & Powy's were invited by the University of Newcastle's Dr Erik Eklund, to join the Coal River working party to lead the search for the coal seam workings at Fort Scratchely. The directors and staff of Monteath & Powys have taken a great interest in the project both personally and from a

community perspective. Senior surveyor Mr David Wallace undertook the task of researching and resolving the relationship between available historic information and the currently available technology and documents.

Report

In undertaking the project of locating the historical mine workings of the 1804 ‘King’s town’ or ‘Coal River’ coal mine, there was particular reliance on the original plan by Lieutenant Menzies which was discovered and identified by local historian Mr Doug Lithgow in the British National Archives. This plan and other historical records, including an original description of the site by the miner John Platt, provided crucial information which was able to be verified by surveying and geotechnical means.

“The Coal mines on the sea-side of Government House Newcastle are 3½ feet thick, solid coal and resemble those at Bushy Park, between Warrington and Prescott. The same mine is also in Lord Derby's Park, near Prescott, called Nozeley Park. These coals are of the best quality and are used for furnaces, malt houses, &c. being free from Sulphur. Those at the Harbour by the Salt Pan called the New Discovery, from its being like a Delf in Weston near Prescott in Lancashire, are of a bad quality, having as much dirt as coal, and fit for burning bricks, fire engines &c.” (Coal River website)

The most valuable available plan which contained discernable landmarks was the 1856 survey plan produced by the surveyor P. Francis Adams titled, “Plan of Flag Staff Hill Newcastle.” This was only recently discovered by the university’s research team and is shown in Figure 1 below.

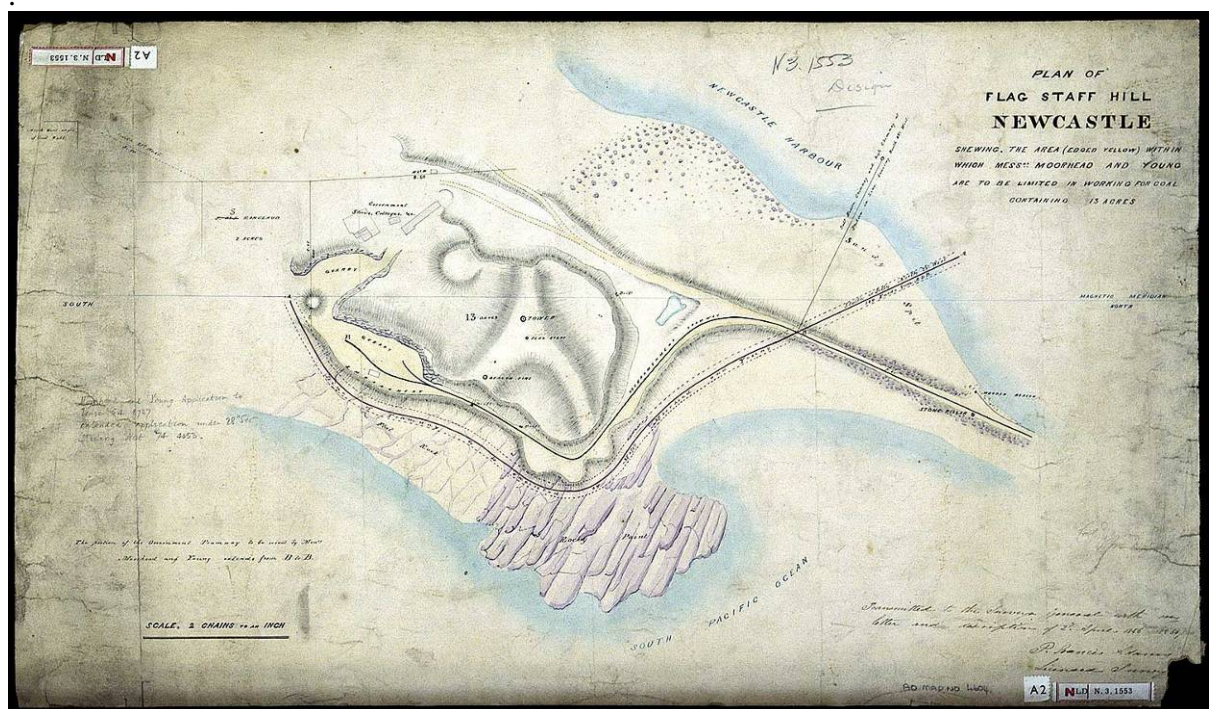


Figure 1: Plan of Flag Staff Hill Newcastle.

Notice that the locations of three of these mines are represented on the map marked as "drifts." This is a mining term describing a horizontal mine entry and tunnel as distinct from a vertical shaft.

This plan also contained valuable topographic details and of particular importance shows a surveyed connection to a cadastral land parcel and its relationship to the mine entries.

The challenge for the surveyors was to confirm the accuracy of these plans in order to have confidence in the plotted locations of the 1804 drifts. If this confidence was obtainable then the search could commence.

Monteath & Powys undertook a large detail survey comprising topographic features and existing structures within and surrounding the fort using conventional techniques and precise GPS surveying. Along with this survey, topographic work completed by the Newcastle City Council was merged into the file for the surrounding area. A large scale plot of the site area was produced, enabling (at the same scale) comparisons through overlaying this data onto a recent aerial photograph. Figure 2 depicts a plan view of the detail survey work done by Monteath & Powys and the Newcastle City Council.

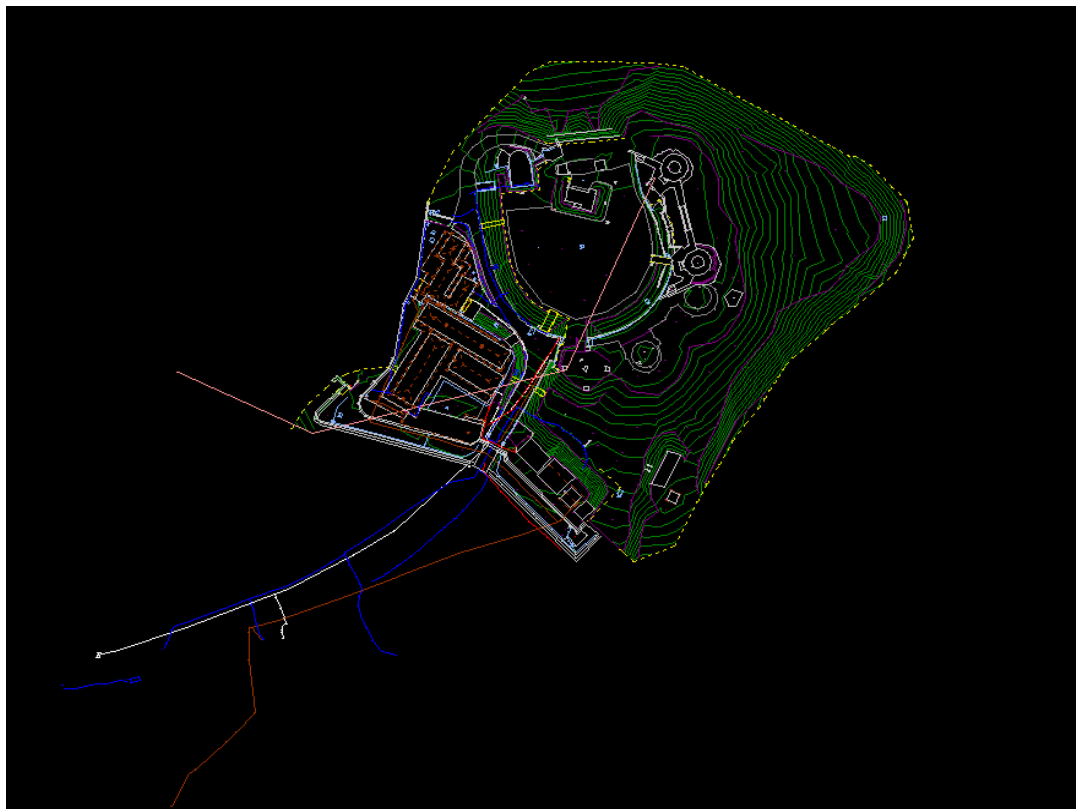


Figure 2: Survey Plan of Fort Scratchley

Using the site survey to verify the aerial photograph and ensuring that distortions through lens and reprinting had been eliminated the 1856 map mentioned previously was overlaid onto the aerial photograph by both hard copy (light table) and digital means in cad. This allowed identification of common features such as the cadastral boundary depicted in the 1856 map and the topography of the site. Despite immediate evidence of physical change due to the construction of Fort Scratchley in the 1890's there were many areas that remained unaltered. Figure 3 below shows the relevant aerial photograph.



Figure 3: Aerial Photograph of Newcastle Breakwater and Nobbys Heritage Park

The principle features adopted for the definition of the area both evident today and in P. Francis Adam's map were:

- The original cadastral boundary corner being the north west corner of Susan Ranclaud's 2 acres shown in the 1856 map which is now the fenced corner of Cottage at the corner of Fort Drive and Parnell place. This is shown in Figure 4 below.

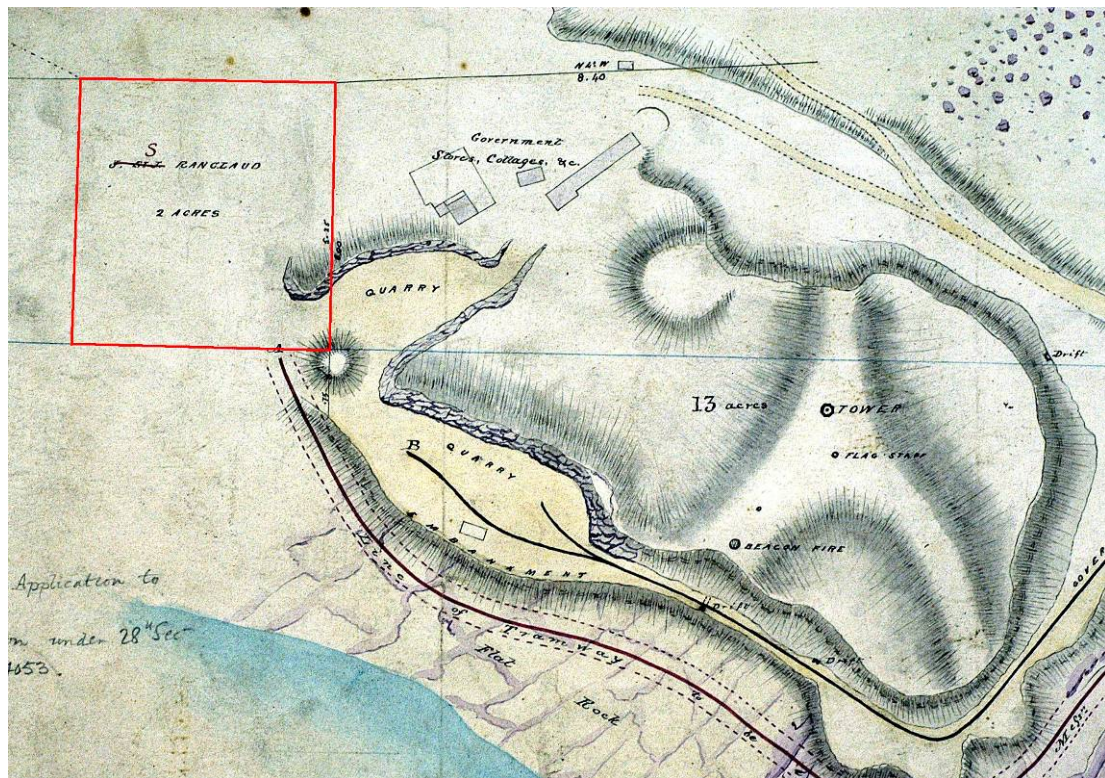


Figure 4: 1856 Plan, Ranclaud Property Outlined in Red

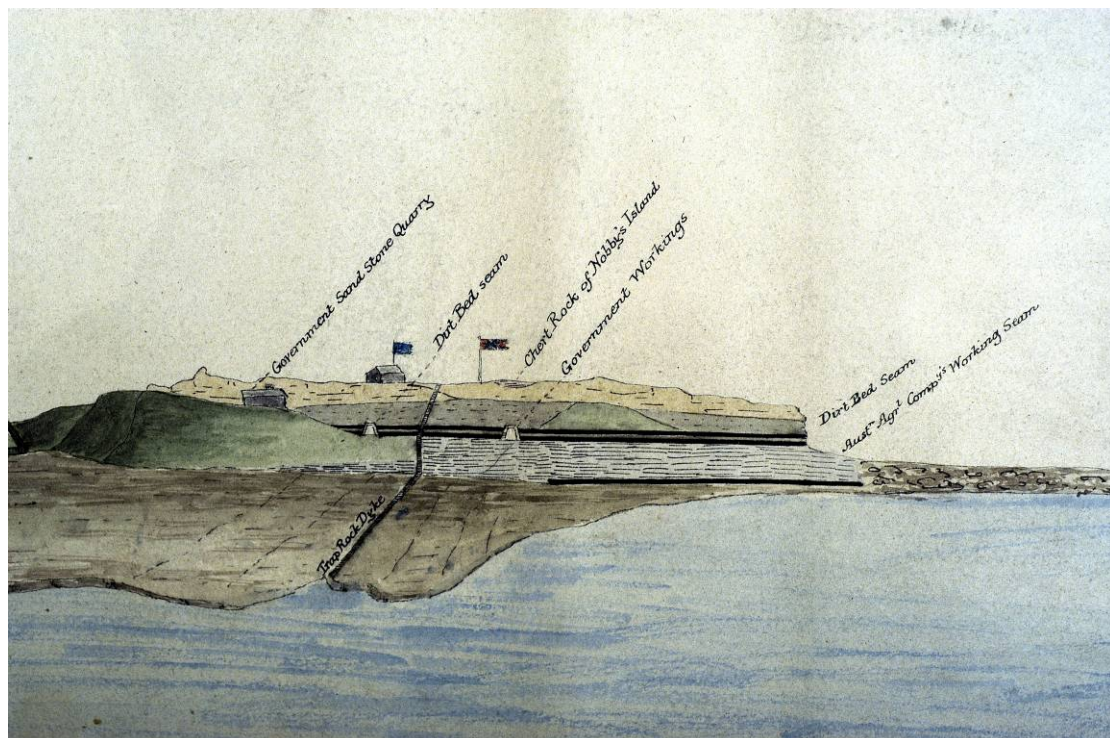


Figure 5: Early Artists Impression of Coal River

Within the search for the mine drifts, the surveyors and the geotechnical engineers worked closely in an attempt to position geological features. Director and surveyor, Peter Sherlock, worked closely with geotechnical engineer, Arthur Love, of Coffey

Partners to confirm the drift locations based on this early artists impression of the dike location. The same dike can be seen today in the below photograph. This was located by survey and gave extra confidence to the locations already ascertained.



Figure 6: Dike as Seen From Fort Scratchley Running Through Flat Rock as Indicated by Arrow

The black coal seam also depicted in the artist's depiction under the geotechnical engineer's guidance was also located by survey allowing the heights of the coal seam to be calculated. These depths of the coal seam were also crucial along with the

horizontal positions in terms of drilling locations.



Figure 7: Exposed Coal Seam on Port Drive

- The outline of the cliff face on parts of the east and west side of Fort Scratchley located by survey were aligned with the 1856 plan.

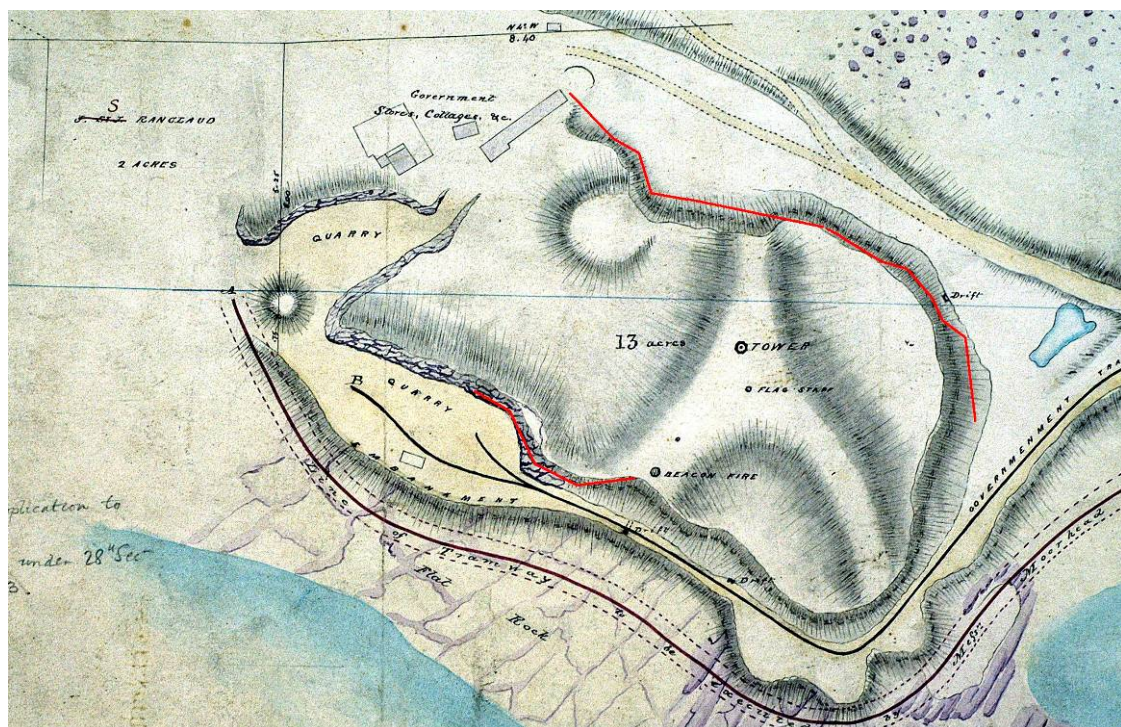


Figure 8: Plot of Top of Bank Strings Used to Overlay 1856 Plan

- The centre line of Nobby's breakwater road which follows the breakwater built by Governor Lachlan Macquarie in 1818, which is both evident in the aerial photograph and the 1856 plan, allowing additional alignment

Having determined a common alignment between the 1856 and 2004 surveys the three mine drafts shown on the old plan were coordinated, from which the positions were plotted on the aerial photograph and set out on the ground. As previously mentioned the community and therefore the media have paid great interest into the project. This is evident through an interview recorded by Phil Ashley-Brown of ABC Radio on the 12th of March 2004 with Monteath & Powys director Peter Sherlock. This was a live broadcast of the placement of survey marks at the previously unknown drift locations, at the time a real-time kinematic survey had been initialised. The recording starts with an introduction and explanation of the technique for the listeners, with reference made to the number of satellites currently being observed and the amount of satellites required to place the first drift location accurately. A recording of this interview has been placed in with the report.

On the 26th of September 2005, Coffey Geosciences also part of the Coal River working party, undertook drilling to confirm the existence of the first coal mine in Australia and probably the southern hemisphere. The positions of the boreholes were to coincide with the locations of the three drift entries as identified by the investigation undertaken by Monteath and Powys. In order for this drilling to be undertaken permits were obtained from the Local, State and Federal Governments. As a precaution against encountering explosive gases in the mine workings Col Donegan of Coalmine Pty Ltd volunteered to check methane levels before drilling was carried out by Pugsley Blasting Services

Results of Drilling

The first borehole, BH1, was located by Monteath & Powys at the southern most entry, Drift 1, where the coal seam was expected to be below the road level of Fort Drive. The drill penetrated about 0.5m of concrete, followed by approximately 2m of weathered silt stone before encountering coal that continued for a distance of 4.02m from the entry point. At this point a void was encountered through which the drilling rods could penetrate without the need for percussion drilling techniques that are required when drilling through hard material for a total distance of 8.9m from the surface. The drill had exposed the coal mine, which had been concealed for 120 years after the entry had been sealed in 1885 during construction of the lower ramparts of Fort Scratchley.

The coal seam was found to be in essence horizontal, with the void 1.4m high and was found to contain about 0.6m of coal left in the roof. This agreed well with historical records that indicate the coal seam was originally 2m high and that the lower 1.4m had been mined.

Straight from the success of the first drilling the rig was moved to the location of Drift 2. The drilling encountered about 0.5m of concrete before penetrating about 4m of fill and siltstone. Coal was encountered at about 8m from the face and extended to 8.7m where another void was exposed. The coal seam was about 2m thick with the elevation of the seam being similar to that found in the nearby borehole.

At Drift 3, the most northerly location, two boreholes were drilled. The first of which struck a small coal seam, however the borehole was continued for a further 25m without encountering another seam. The second was designed for a low angle (8 degrees) to intersect the coal seam over a horizontal distance. It was first encountered at a distance of 3.5m and continued to 10.4m where a void was discovered approximately 1m wide. In alignment with public and historical interest, the drilling was recorded via video camera and can be now seen on the Coal River Website, including footage from within the borehole and the void.

These findings confirmed the positions as investigated by Monteath & Powys surveyors, which now have considerable historical importance to the region. In doing so the profession and the company has gained widespread community interest and recognition. In addition to creating greater community awareness of the importance of surveying, it has highlighted the varying techniques (new and old) and lateral thinking used by surveyors for problem solving

Reference:Coffey Geosciences Pty Ltd, 'investigation of convict coal mine workings'

Community Awareness and Interest

On the historic day of 30th of March 2004, exactly 200 years since European settlement, a Coal River open day exploring aspects of our convict and colonial history was held on site at Nobbys Road, Newcastle. Historic displays and guided tours of the rediscovered coal mine locations dating from 1804 were undertaken with the public. The various companies involved with the project held stalls showcasing the techniques used for the uncovering of the historical mine workings.

Monteath & Powys used this day to showcase the technical equipment used for the investigation along with the plans and aerial photo's from which the project was coordinated. The public was encouraged to take an interest in the processes used within this project and the wider practices of the surveying profession. Peter Sherlock along with David Wallace presented explanatory information to school groups, interested community groups such as the historical society, along with tourists and the wider community offering hands on opportunities and the use of new survey technologies. As with all the other phases of the joint project, local radio and television stations were on hand to record the event for the evening news.

Picture from Open day

The involvement of Monteath & Powys along with the services of the other involved entities was pro bono in an attempt to give something back at a social and community benefit level. Through this project the survey profession can be seen as preserving and fostering the actual history of the community. This has proven to be a vehicle for the development of the survey profession. This can be seen via the involvement of currently employed students of the University of Newcastle, John Wilson and Alex Widgery who have participated in the previous survey work and are now intending to develop a three dimensional model of the heritage park. Digital walkthroughs of the drifts as depicted on the "Plan of His Majesty's Coal Mine at King's Town New Castle District County of Northumberland New South Wales in its present Situation of working, July 1804" will be part of a university project to complete their degree studies.

APPENDIX A

- Monteath & Powys Pty Ltd Report to the NSW Surveyors Excellence Awards

APPENDIX B

- Field Notes

APPENDIX C

- Reduced Stadia Files

APPENDIX D

- Historical Documents

APPENDIX E

- Coffey's Report

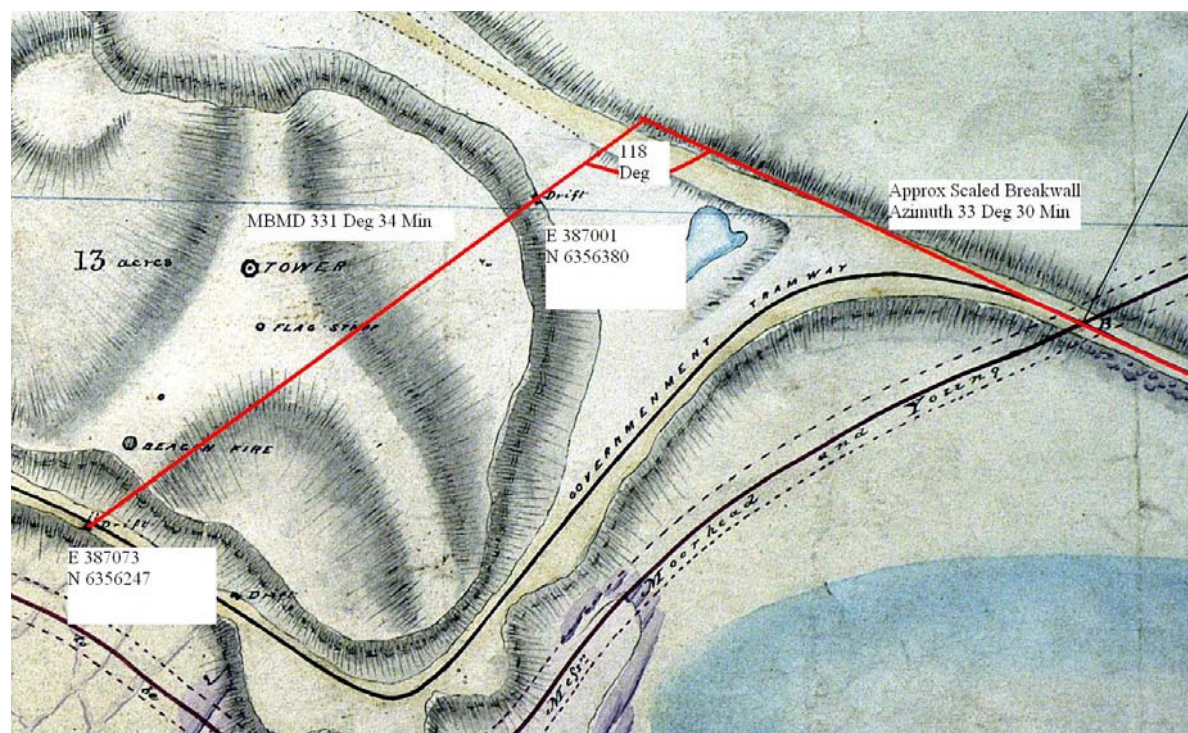
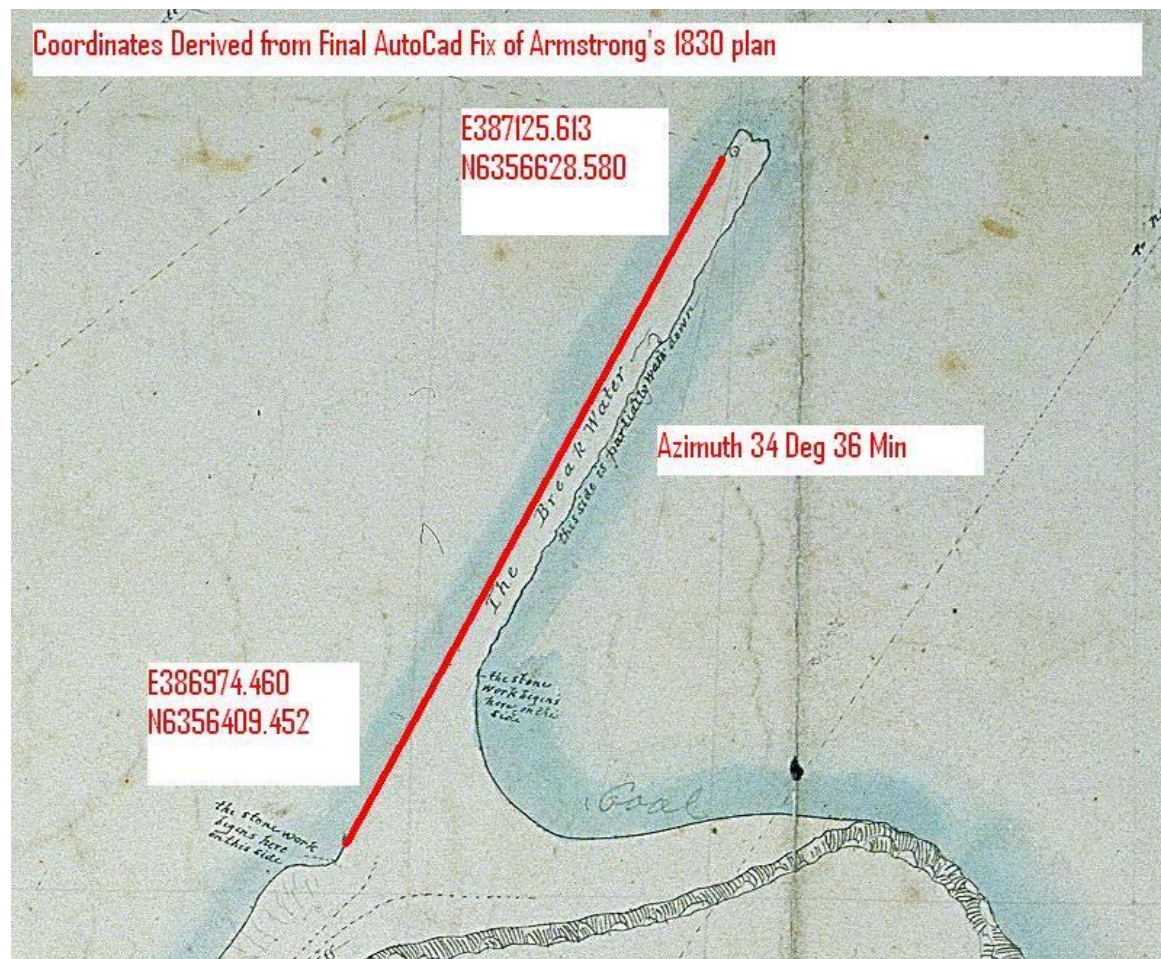
APPENDIX F

- Calculations

APPENDIX G

- Diary Entries

Breakwall Calculations



Cadastral Calculations

DOCUMENTS RELATING TO THE HISTORY OF HUNTER'S RIVER

Exerpts from Historical Records of New South Wales. Vol. IV. Hunter and King. 1800, 1801, 1802. Edited by F.M. Bladen. Sydney: Charles Potter, 1896. (pps. 404-409)

HUNTER RIVER

14th June, 1801

REMARKS, &c., on board His Majesty's armed surveying vessel, Lady Nelson, in Hunter River, 1801.

By LIEUT. GRANT, COMMANDER

Sunday, 14 June, 1801. Wind S.E. by E. to W.N.W. At 6 a.m. bore up and made all possible sail, the Coal Island [The Nobbys] (an island in the entrance) N.N.W. 6 miles. At halfpast 10 I went on shore with Dr. Harris, to examine the entrance, which we found very narrow. On the left-hand side going in was a reef of rocks from the island, with much heavy surf breaking on it; on the right was an extensive flat, with a tremendous roll of sand breakers over it. The channel in was troubled with much heavy swell, and did all but break, so that I hove the boats head round and pulled out again ; sounded 5 fms. On considering the risk we run of bringing the vessel in without well ascertaining the channel, I pulled in, carrying from 5 to 4 and 3 ½ fathoms close to the island. On our getting on shore we climbed up this steep island and hoisted a flagg as a signal this was the right place. It was then the first of the ebb and calm ; therefore hastened on board and towed the brig in. At noon the Coal Island bore W.N.W. 3 or 4 miles. The latitude they observed in was 32°37'34" south. [Probably a copyist's error for 32°57'34"S.]

Monday, 15 June, 1801. - Wind W. P.M. [Lieut. Grant in this journal followed the nautical method of reckoning time, i.e., the day commenced and ended at

noon, e.g., 15th June would be from noon on the 14th to noon on the 15th civil time: hence it is that each day's entry commences with P.M., except in the case of the first day's record, which starts from daylight on the 14th, when off the river's mouth.] – at half-past 1 a light air sprung up from the eastward, which with the boats ahead and sweeps enabled us to stem the tide, the Francis schooner towing in after us. On getting nearly abreast of the island and close to the reef, found the tide running so strong that we could not stem it. Let go the best bower, but not having room to veer out of any scope of cable, found the vessel draft. Let go the small bower and brought her up. From the strength of the tide was obliged to steer the vessel to it. Warped the vessel under the island. Here we found the tide run very strong and in eddies, which I am of opinion is occasioned by the heavy surf which breaks between the main and the island meeting the outside surf, which must make this place a very unsafe roadstead for any vessel to lay in when it blows from the eastward, more especially as there is no room to veer out any scope of cable, nor ought any vessel to stop here unless necessity requires it. Let go at the strength of the tides during the night a second anchor under foot, and steered the vessel to it. At daylight weighed, it being low water, and towed up abreast of a saw-pit, where Mr. Meehan had laid during his stay here. Came too with the small bower within 30 yards of the shore in 3 fathoms water, and steadied with a warp fast to a tree ; schooner in company. Here the native, which Dr. Harris brought off with him, as before mentioned, left us.

Tuesday, 16 June, 1801. - Wind W. to N.W. P.M. – moderate and cloudy weather ; employed occasionally. A.M. – rain with lightning; at daylight fair and cloudy. Colonel Paterson and I went on shore to examine the coals ; took the miner with us. At the place where he had been before at work on, we found a strata of coal 22 inches thick, and of good quality.

As this was on an elevated situation, and not very easy of access, we found at the foot of the hill and on the reef at low water, plenty of excellent coals in beds of different thickness. Made the necessary arrangements for setting the people to work.

Thursday, 18 June, 1801. - Winds W. to N.W. We walked a short distance inland, and found in the vicinity of the coal mines the soil black and good (with plenty of water at hand). It is mostly pasture land, covered with short grass, which would answer any sort of cattle but more particularly sheep. From its elevated situation it is dry and healthy, nor can it ever be overflowed as it rises high above the source of the river and shows a steep front to the sea, which in some places is rocky. There are also vallies sheltered from all winds and nevertheless well elevated, though it is to be understood that they are not of extensive magnitude, for they are only in the vicinity of the coal stratas, and I suppose might be comprised within the compass of six or seven hundred square acres. I am the more particular on this head from it being so near the sea, as the cold bleak winds are often as pernicious to some constitutions and vegetation in general as swampey confined damp grounds are, of which there are no scarcity in this harbour. After leaving this spot the ground gradually falls and gets more of a light, sandy soil, covered with brush and trees interspersed, until it reaches the hills, the nearest of which are of no great distance nor of any height. The low land all around this place is more or less subject to be overflowed, and is full of swamps, some of which are of considerable magnitude.

Monday, 22 June, 1801. - Wind west. Colonel Paterson wishing to examine the island in the entrance, as from its appearance he expected to find coal in greater plenty, and perhaps superior quality, Mr. Barrallier and myself wishing to ascertain the soundings in the entrance, the weather being favourable for that purpose, we went together, taking the miner with us, and while the Colonel and miner examined the island, I sounded the entrance of this harbour. The strata which appeared like coal on the island proved to be of much inferior quality to those on the main which we had been digging, though at the foot of the island and on the reef were several beds of good coals ; but these were covered with large stones which the flood and tide had rolled up and were overflowed every tide; therefore, however well it may appear to some that coals may be more easily got, and more expeditiously shipped from this spot, when I consider the risk run and the very small portion of labour saved, if any there may be, I am confident it will fall much short of giving that satisfaction which

might be expected from such a measure, and one single accident (of which they are liable to more than one) might be of more serious consequence and greater loss than all the coals in this small spot are worth, more especially where they are to be had in abundance, without risk, within little more than musket shot of the same place. Having obtained the different points before mentioned, we returned and went to haul the sein. We observed a stranger making up to us, which we could perceive was none of our party. It proved to be a man named John Loft, who had been unfortunately wrecked out of a boat belonging to Underwood of Sydney. She was cast on shore to the north of Port Stephens. They were three in number, and he had been 32 days in traveling to this place from where she was wrecked. His other two companions, one he said was killed by the natives, the other eat a toad fish – which he complained of for some days – and died. He had a bag with a few small shell-fish on which he had chiefly subsisted. It was fortunate we were here, as I think it would have been impossible for him to have reached Sydney on foot. The emotions that he felt on meeting are much better imagined than described; the laugh and the tear had their repeated place in turns, and his first utterance was, “I am starving with hunger.”

Saturday, July 4th, 1801. - Wind, S.S.W. I this day visited the coal miners, and found them hard at work. They had found a strata of coals nearly four feet in thickness and of excellent kind. It was entirely from side to side through the hill – that is to say, from the harbour side to the sea on the opposite side; and on the low side which faces the harbour the miner informed me they were not above ten yards down. This consequently will yield a supply of coals for a great length of time. The miner informed they were equal to any bed of coals he had ever seen in England. I saw a lump of them. It was clear and transparent, free from earth and smut, and no doubt will answer for any use whatever.

Saturday, 18 July, 1801. - Wind S.W. P.M. – fresh gales and rain. At 5 p.m., the Colonel and Dr. Harris, with Mr. Barrallier, returned on board, Mr. Barrallier having surveyed up the arm until stopped by a cascade, which he could not pass. The Colonel had been up and met with another chain of mountains, one

of which he named Mount King, and another Mount Grant. I now ventured to name my little mount, and called it Mount Edgerton, in obedience to the particular wish of my friend Captain Schank. A.M. – got the yards and topmasts up.

Sunday, 19 July, 1801. - Wind S.W. to calm. In the morning Mr. Barrallier and Dr. Harris went to survey for the last time, the survey being completed in its most material points.

JAMES GRANT

Transcribed by Margaret Fryer April 2005

Archives, Rare Books & Special Collections, Auchmuty Library. University of Newcastle.

Exerpts from Historical Records of New South Wales. Vol. IV. Hunter and King. 1800, 1801, 1802. Edited by F.M. Bladen. Sydney: Charles Potter, 1896. (p.413, 414)

ENSIGN BARRALLIER TO GOVERNOR KING (King Papers)

Hunter's River, le 24 juin 1801

Monsieur,

J'ai l'honneur de vous envoyer par voye du schooner [the Francis] l'entrée de la rivière,

et une partie adjacente que j'ai levé depuis que nous sommes arrivés, avec leurs respectifs sondages, rocks, bancs de sable et ses différentes mines de charbon de terre connues jusqu'à present. J'avance à grands pas vers le banc nord que vous imaginez très vraisemblablement aboutir au Port Stephen, [presumably the Williams River] mais suis retenu presque à chaque instant par le grand espace contenu entre les deux rivages et par la difficulté de me procurer des points propres à établir des bases certaines pour les triangles.

Vous verrez par ma carte quell affreux passage il faut franchir pour arriver dans cette

belle rivière. Les mugissements des vagues qui, se jetant les unes sur les autres et se brisant avec un éclat épouvantable sur les rochers escarpés de l'isle, et roulant avec impétuosité les sables du rivage opposé feroient trembler le marin le plus intrépide. Vous eussiez vu tous les matelots la terreur peinte sur leur visage, mais ferme à leur poste, obéir avec une dextérité incroyable les ordres de leur capitaine pour le tirer de ce labyrinthe presque impénétrable. Le docteur est un homme réellement bien nécessaire car il est indéfatigable en tout ce qu'il entreprend, et si ce n'eût été sa grande persevérançe ni nous ni le schooner n'auroient entré la rivière ce jour-là.

Le colonel a fait, a ce qu'il dit, beaucoup de nouvelle découvertes en plantes, et se propose d'explorer le pays aussi loin qu'il lui sera possible avec sûreté. Il est bien malheureux pour lui qu'on soit si mal pourvu en bateaux, vu qu'étant obligé de me servir des deux qui appartiennent au vaisseau il n'a d'autre choix que de se servir de celui qui appartient au docteur.

Je suis avec respect, Monsieur, de votre Excellence le très humble serviteur,

F. BARRALLIER

Exerpts from Historical Records of New South Wales. Vol. IV. Hunter and King. 1800, 1801, 1802. Edited by F.M. Bladen. Sydney: Charles Potter, 1896. (p.413, 414) Translated from the French by Emeritus Professor Ken Dutton.

ENSIGN BARRALLIER TO GOVERNOR KING (King Papers)

Hunter's River, le 24 juin 1801

Sir,

I have the honour to send you via the schooner* [a map of] the entrance to the river, and some of the adjacent parts, which I have drawn up since we arrived, with the relevant depths, rocks, sandbanks and its various coal mines that have been discovered to date. I am rapidly advancing toward the northern bank which you may imagine to end most probably at Port Stephen,‡ but I am held back at almost every moment by the great space that exists between the two shores and by the difficulty of finding points that are suitable for establishing clear bases for the triangles.

You can see from my map what a fearsome passage one has to traverse in order to reach this beautiful river. The roaring of the waves, crashing one upon the other and breaking with a terrible noise on the steep rocks of the island, and raging as they roll onto the sands of the opposite shore, would make the most intrepid sailor tremble. [If you had been here] you would have seen all the seamen, with terror showing on their faces but remaining firm at their posts, obeying with incredible dexterity their captain's orders in order to extricate him from this almost impenetrable labyrinth. The doctor [Dr Harris] is a man who is truly necessary, for he is indefatigable in whatever he undertakes, and were it not for his great perseverance neither we nor the schooner would have entered the river that day.

The Colonel [Lieutenant Colonel Paterson] has, he says, made many new discoveries of plants, and he proposes to explore the country for as far as he can safely go. It is most unfortunate for him that we are so badly provided with boats, seeing that as I have been obliged to use the two which belong to the ship he has no other choice than to use the one belonging to the doctor.

I am, Sir, with respect, Your Excellency's most humble servant,

F. BARRALLIER

* The Francis.

‡ Presumably the Williams River.

Transcribed by Margaret Fryer April 2005

Archives, Rare Books & Special Collections, Auchmuty Library. University of Newcastle.

Exerpts from Historical Records of New South Wales. Vol. IV. Hunter and King. 1801, 1802. Edited by F.M. Bladen. Sydney: Charles Potter, 1896. (pps. 414-416)

LIEUTENANT-COLONEL PATERSON TO GOVERNOR KING.

Hunter River, 25th June, 1801

Dear Governor,

As Mr. Grant gives you the detail of our voyage to this place, it will, of course, be more explanatory than anything I could say on that head. He will, of course, inform you how near our pilot had brought the Lady Nelson into a very unpleasant situation, from mistaking an open bay about 13 miles to the southward from this port. [The open bay was the entrance to Lake Macquarie. The entrance was given the name of Reid's Mistake, which it retains to this day. William Reid (or Reed) was master of the Martha, 30 tons, ante, p. 205 (note)]. We, however, got to anchor at the island on the 14th. As we went in with an ebb tide, it was as much as we could do to tow the vessel clear of the surff, which was running very high. Next morning we got round the point, since which time every one, I assure you, has been busily employed. My first object has been to ascertain the different strata of coal, and to give you what information I can upon that head.

The northern point of land, which I have call'd "Colliers' Point," is composed of two stratas in sight and one which is bare at low-water mark only. This is by much the best coal, which you will see by the speciman I desired might be kept apart from the other, which is the middle strata, about 16 in. deep ; that below is 22 in. ; the distance between them is about 20 ft. The upper strata is too near the surface to be worth working. Upon the island, which I have named "Coal Island," the stratas are the same as on the mainland. The bed of coal at low-water mark is rather better than at Colliers' Point, and might be got very quick, as the anchoring place is close to the coal ; but, if the coal work is to be

permanent, I should suggest the mines to be on the main, which might be sunk with very little trouble, and I have no doubt but that in a very short time Government would find their advantage in it. Salt works might be erected and carried on at very little expence, as the rubbish of the coal that is not worth sending to Sydney would answer the purpose of boiling the salt, and there is such abundance of fish that a few industrious fishermen might in the course of the cold season load several vessels with excellent fish. These are my present ideas with respect to the entrance of this place. I have not as yet discovered anything like lime-stone, but the quantity of oyster shells on the beaches inland is beyond conception ; they are in some places for miles. These are four feet deep, without either sand or earth. Vessels might lay within a few yards of where they are found.

The hills from this to the southward are covered with excellent grass, without any wood or shrubs, except in the vallys, and those but little. As they have much the appearance of those hills you see sheep feeding on in England (and I am certain would answer well for that purpose), I have named them the "Sheep Pasture Hills." The low land along the water side is in general sandy, with very high trees – chiefly swamp oak and gum trees. This soil will answer very well for India corn.

Harris and myself have been out every day, but as our observations as yet are not of any particular use, I hope we shall be more perfect by the return of the schooner, which we may expect in about three weeks; but this place is so extensive that I do not think it can be surveyed by the time you have ordered Mr. Grant to return, and it would be a pity to leave it till the survey was compleat. I have only to say every one is doing what they can to effect it as soon as possible. I have made several discoveries in my own way, and one that may prove useful to Government, which is a new species of cocanut. The tree grows from 40 to 50 feet high. The fruit is not so large as those found within the tropics.

Plat, the collier, and his party have done wonders in getting the coals for the schooner so soon. I shall keep them going on, and get the coals laid in a

situation where the tide cannot reach them. If they are to continue her they will want more picks and baskets.

The sawers have cut some corkwood, which is the only wood worth cutting at this place where we are laying. They are now at Ash Island, and whatever Aikin can take at this trip shall be sent. Whether it is the novelty of the business or from any other cause I know not, but every one seems to try to out-do the other in working.

We have had very strong westerly winds for some days, otherwise the Lady Nelson would have been up to the Cedar Arm and the sawers employed cutting cedar. If they remain any time here, they will want two more falling axes and some files. We have not as yet had any communication with the natives. We have seen them at a distance, but remarkably shy. Yesterday, the 22nd, Mr. Barrallier and Bowen fell in with one by accident and brought him on board, but as Bungery had left us we could make nothing of him. He was more removed from the human race than any I have yet seen. He would neither eat or drink, and kept constantly repeating what he heard others speak. After cutting his beard off, we gave him some biscuit and sent him on shore. Where they found this native, Whitaker the solder observed a person about 50 yards off with a jacket and trousers, which he believed to be a European. There is not doubt of Grace's being in this neighbourhood, and from what we could learn (from a native that came on board at the bay I mentioned to the southward of this), he is the only one left of the party.

A few days ago, in company with Mr. Grant on the beach, we observed a person in tattered cloaths coming towards us. We found him to be a man named Lofts, who had charge of Underwood's boat. As he returns in the schooner, he will give you all the particulars of his sufferings.

As we have not heard anything of Mr. Palmer's people, I begin to think the natives have caught them off their guard, which may occasion their shyness. However, it is probable they may be so far up the Cedar Arm as not to have heard anything of our arrival, and it is not improbable they may have gone into

the place called Reed's Mistake. [Lake Macquarie.] Even in that case, we should have heard of them from the native that came on board.

Mr. Palmer's people are arrived. Mr. Grant will give you the particulars.

Should you judge it necessary to continue the colliers or sawers at this place, I think if you send some grubbing hoes and some spades, Indian corn and garden seeds, they might be able to raise vegetables for themselves.

I beg my best respects to Mrs. King, and love to Elizabeth. With compliments to Chapman and McKellar.

I remain, &c.,

W. PATERSON.

Transcribed by Margaret Fryer April 2005

Archives, Rare Books & Special Collections, Auchmuty Library. University of Newcastle.

Exerpts from Historical Records of New South Wales. Vol. IV. Hunter and King. 1800, 1801, 1802. Edited by F.M. Bladen. Sydney: Charles Potter, 1896. (pps. 627-628)

MR. M. MASON TO GOVERNOR KING (King Papers.)

Hunter's River, 21st November, 1801

Sir,

I am sorry to hear of your Excellency's indisposition, and sincerely wish you better. I have 3,820 baskets of coal at hand, or 190 tons, if the baskets hold one hundredweight each. With three minors and three carriers I rais 180 baskets, or 9 tons a day. They can do this in five hours. One mine is 34 yards under ground ; one do., 31 ; one do., 27 ; one do., 10. I can set nine more minors to work immediatly, and with one drawer for each can rais 190 tons per week. The strata of coal we are now working is 30 foot high, out of which there is 14 inches of clay and other rubbish, so we have but 22 inches of neat coal ; over this there is a strata of 18 inches good coal. In Fresh Water Bay I can open a mine where there is a strata of 3 foot neat coal under the above two stratas ; the coals are of supereor quality. I send one cask as a specimen by this conveyance. I can open mines to set twenty men to work in Fresh Water Bay ; if there are not minors in the colony then many ruffens may be made good minors, and a wharf may be run out to reduce labour, that the schooner may be laden by twelve men in twelve hours if she can lay in the same situation where Mr. Palmer's sloop loads. Plat is a good working minor ; I believe him to be a good man, but he cannot see much further into the ground than his pick cuts. Leveling and dialing are two necessary accomplishments for exploring those hills and conducting mines to save labour and carrey of the water. In boath I am deficient ; but if your Excellency will allow me James Meehen (who is with Mr. Grimes) for two or three months when Mr. Grimes can best spair him, I can acquire it, and at the same time learn to survey either a known or unknown country. I have not mentioned this to Mr. Grimes least he may

suppose I wish to interfere with his department. That is not the case ; it is to serve myself and enable me to ascertain where to open any of the hills to the most advantage. Nothing can be done at fishing with hooks and lines worth the loss of time. The aidagong [aid-de-camp] Kirkwald went up the river with Mr. Grimes and Barallear ; he returned sick. The small boat is still employed in the survey, so we have but one boat, and if the schooner returns cannot load her without it ; here are but eight working hands, so that nothing hath been done. If lime be an object I can have a shipload at any time without the ashes being mixt with it. The report of the country is rather unfavourable. Mr. Grimes and Barallear has found the natives disposed to be hostile. Between sixty and seventy came in here (men, women, and children) without spears, and manifested the most friendly dispositions. I fell in with a party some distance up the river who seemed to oppose our landing. I ordered the boat to pull from them, and called to some in their knoes [canoes], one of which had paid us a visit. We landed with him, and soon had an interview with his friends, about thirty men, women, and children, but many of them trembled when they shook hands with me. They saw we would ground the boat, and two of them came after us and paddled before us in their knoes [canoes] to shew us the deep water, and then pushed the boat over a small bank of mud. One of them came in here and stole two blankets ; he had been drinking spirits when he came in. The misty is where he got the spirits. The soldiers went after him. I positively charged them not to shoot him ; we suspect there are white men with them. We have about eight days' provisions in store after this day's issue. I have issued forty-eight pounds of flour and twenty-four of pork to Mr. Palmer's men. The storekeeper has sent the receipt to the Commissary's Office. I put two of them to public labour one week, as they were not at work for Mr. Palmer. We are in want of lamps with covers to prevent spilling the oil when they are upset in the mines, oil and candles, soap, a whip saw, door locks and hinges, bricks for chimneys, unless your Excellency directs them to be made here. The soldiers have applied to me for grates and a man to fetch them coals and water. I have allowed Corporal Wextead the woman he brought with him, and the privates one woman to wash for them. George Plat, one of the soldiers, has applied for two blankets in lieu of them stolen by the natives. I wish to have for my own use a fusee, if there are any in the store, two pounds of gunpowder, six pair of small brass hinges

and three small locks, 200 brads, a little glue, and a Pir of scrues to make a press for flowers.

I have, &c.,

M. MASON.

Transcribed by Margaret Fryer April 2005

Archives, Rare Books & Special Collections, Auchmuty Library. University of Newcastle.

A new Mine has been found at Hunter's River, which is likely to yield an abundance of the finest coal that has ever been witnessed. The discovery was made by J. Platt, a miner in the employ of J. Palmer, Esq. and a quantity of the coal brought round by the Edwin. A sample will be sent home by His Excellency, in His Majesty's Ship Glatton, and from the accounts given of the mine, we have every reason to affirm, that it will prove highly beneficial to the general interests of the Colony. The coal resembles that found in the Colliery at Leith, near Edinburg, but more flexible, is of a rich appearance, and easy to be worked.

1803, May 8 Sydney Gazette, 3a, a new mine is found at Hunter's River and a sample will be sent to England on the Glatton.

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Sydney Gazette, May 5th 1805, Account given by John Platt a coal miner of the coal mines at Newcastle.

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Coal-mines at Newcastle.*

The Coal-mines on the sea side Govern-
ment House, Newcastle, are $3\frac{1}{2}$ feet thick,
solid coal, and resemble those of Bushy
Park, between Warrington and Prescot.—
The same mine is also in Lord Derby's
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These coals are of the best quality, and are
used for furnaces, malt-houses, &c. being
free of sulphur.

Those at the Harbour, by the Salt-pan
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&c.

PRINTED AT STONEY. AND ADVERTISING
MENTS RECEIVED BY G. HOWE.

The Coal mines on the sea-side of Government House Newcastle are $3\frac{1}{2}$ feet thick, solid coal and resemble those at Bushy Park, between Warrington and Prescot. The same mine is also in Lord Derby's Park, near Prescot, called Nozeley Park. These coals are of the best quality and are used for furnaces, malt houses, &c. being free from Sulphur.

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The Fortification Works and the Old Coal Workings under Flagstaff Hill.

THE contract in connection with the fortification and defence works at Newcastle, has, our readers are aware, already reached a very decided point on Flagstaff, or "Captain Allan's" Hill. The contract for carrying out the work under plans and specifications from Colonel Scratchley, has, for some months past, been steadily progressing under the contractor, Mr. James Russell, and more recently under the immediate supervision of a civil engineer from the Colonial Architect's office—Mr. Campbell. Already a greater portion of the gun pits, magazines, galleries, and other cuttings and excavations are more or less complete, but an unexpected cause for alarm as to future progress of the work seems to have recently cropped up. We allude to the early-days tunnels and drives for coal under the basement of the hill, which some half a century ago were carried out by the then authorities with convict labour. Of late it has been evident, during the act of blasting at sundry times, that something was wrong with the understructure. This having led to enquiry, the fact of the hill being honey-combed with old workings underneath was brought to mind. In order to examine into their condition, numerous longitudinal cuttings and drives into the hill-side have been made; cutting rectangularly into a series of chambers—propped and beamed. A gang of men are at present occupied running these out, in order to ascertain their exact bearings with regard to the new superstructure overhead. Mr. Mackenzie, Examiner of Coal Fields, accompanied (amongst others) by Mr. Thomas Mills, an old miner, who worked at the spot nearly forty years ago, made a preliminary examination of the drives yesterday, so far as they were opened. Some of them are fully seven feet in height, others narrowing down to three or four feet—the seam being narrow as a rule. Whilst groping through the darkness the party came across a not uninteresting relic of old Newcastle days. This consisted of a number of iron lag-chains and manacles with which some unlucky, overworked, and brutally treated unfortunates had doubtless many years before been fastened. They also brought to light a well formed glass pickle-bottle, evidently used as a pepper-pot. Its mouth, for this purpose, was ingeniously closed by an old copper coin carefully let into the orifice and perforated in numerous places. These curios are now to be seen in the contractor's office on the hill top. So far as the danger of the workings is concerned, we do not venture to offer an opinion. Doubtless the matter will be duly laid before the higher authorities, with a view to having a thorough and complete investigation made. To shut the door when the steed shall have escaped, will prove of little service, nor would it suit the public taste should any such contingency arise as the sliding away of a hill side when several twenty-ton guns are placed in position and heavy casement battery armament is erected. The matter, however, is in thoroughly good hands, and can fairly be left to those whose duty it is to attend to it.

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Transcribed by Gionni Di Gravio

3rd August 2006

The Coal Workings under Flagstaff Hill.

Since referring to the old coal shafts under Captain Allan's Hill (on which the fortification works are being erected) active work has been going on there to trace the drives accurately. The whole base of the hill is now perforated with about twenty different holes, and the former workings are now fairly well traceable. Many of them are completely choked up with debris, and no little danger is experienced by the falling of stones from the roofs. A large gang of men are at present employed there. Colonel Scratchley has not yet officially inspected the works.

Continuing work to trace the coal drives under Captain Allan's Hill.

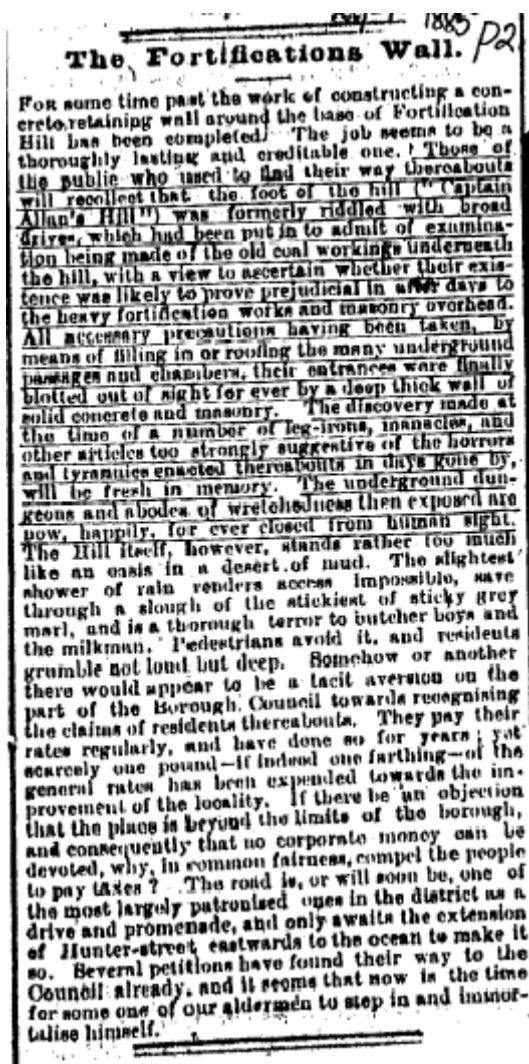
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Transcribed by Gionni Di Gravio

11th February 2004.



Recollection of old coal workings at foot of the hill (Captain Allan's Hill) and discovery of leg-irons and manacles now all encased behind a wall of concrete.

The Fortifications Wall

For some time past the work of constructing a concrete retaining wall around the base of Fortification Hill has been completed. The job seems to be a thoroughly lasting and creditable one. Those of the public who used to find their way thereabouts will recollect that the foot of the hill ("Captain Allan's Hill") was formerly riddled with broad drives, which had been put in to admit of examination being made of the old coal workings underneath the hill, with a view to ascertain whether existence was likely to prove prejudicial in [after?] days to the heavy fortification works and masonry overhead. All necessary

precautions having been taken, by means of filling in or roofing the many underground passages and chambers, their entrances were finally blotted out of sight forever by a deep thick wall of solid concrete and masonry. The discovery made at the time of a number of leg-irons, manacles, and other articles too strongly suggestive of the horrors and tyrannies enacted thereabouts in days gone by, will be fresh in memory. The underground dungeons and abodes of wretchedness then exposed are now, happily, for ever closed from human sight. The Hill itself, however, stands rather too much like an oasis in a desert of mud. The slightest shower of rain renders access impossible, save through a slough of the stickiest of sticky grey marl, and is a thorough terror to butcher boys and the milkman. Pedestrians avoid it, and residents grumble not loud but deep. Somehow or another there would appear to be a tacit aversion on the part of the Borough Council towards recognizing the claims of residents thereabouts. They pay their rates regularly, and have done so for years; yet scarcely one pound – if indeed one farthing – of the general rates has been expended towards the improvement of the locality. If there be an objection that the place is beyond the limits of the borough, and consequently that no corporate money can be devoted, why, in common fairness, compel the people to pay rates? The road i.e., or will soon be, one of the most largely patronized ones in the district as a drive and promenade, and only awaits the extension of Hunter street eastwards to the ocean to make it so. Several petitions have found their way to the council already, and it seems that now is the time for someone of our aldermen to step in and immortalize himself.

2. RESULTS OF DRILLING

2.1 Drift 1, Borehole BH1

The first borehole, BH1, was located at the southern most entry, Drift 1, where the coal seam was expected to be below the road level of Fort Drive. BH1 was drilled at a height of 1.35m above road level and up the concrete ramparts angle down at 21° to the horizontal;

The drill penetrated about 0.5m of concrete, then about 2m of weathered Siltstone before encountering COAL that continued for a distance of 4.2m from the entry point;

At 4.2m the drill encountered a VOID through which the drilling rods could penetrate without the need for the percussion drilling techniques used for drilling through hard material for a total distance of 8.9m from the surface of the rampart;

The methane gas level in the borehole was found to be only 0.1% methane that indicates no significant risk of the presence of explosive gases;

The drill had exposed the coal mine, which had been concealed for 120 year after the entries were sealed in 1885 during construction of the lower ramparts of Fort Scratchley;

The log of the borehole is attached and a section through the boreholes is shown on Figure 1;

The coal seam is essentially horizontal and after correcting for the angle of dip of the BH1 (21°) the void would be about 1.4m high with about 0.6m of coal left in the roof. This agrees with historical and nearby

Borehole records that indicate that the coal seam was about 2m high and that only the lower 1.4m was mined. It was reported that the upper 0.6m was inferior coal and was generally not mined;

The borehole was cased for a distance of 3.5m to support the hole and allow access to the void by a down the hole video camera.

2.2 Drift 2, Borehole BH2 and BH3

Flushed with the success of encountering the mine workings in the first hole the rig was moved to the location of Drift 2; BH2 at Drift 2 was drilled at an angle of 17° from a height of 1.6m above road level;

The drilling encountered about 0.5 of concrete before penetrating about 4m of fill and siltstone. Coal was encountered at about 8m from the face and extended to 8.7m where a void was encountered. The void was less than 2m wide before reaching refusal to push from the drilling rig. The void appeared to be partly full of debris. Again the coal seam was about 2m thick with the elevation of the seam being similar to that of the nearby borehole. This is illustrated of Figure 2 attached;

BH3 was drilled at a steeper angle of 28° in an attempt to intersect the void closer to the face. Again a small void was encountered at a similar elevation as at BH2, but closer to the face of the ramparts;

Casing was inserted into both boreholes to maintain the hole until the video camera was available.

4. CONCLUSIONS

The drilling and camera viewing of the boreholes indicates that:

- Extensive workings are present in the coal seam beneath Fort Scratchley (Colliers' Point);

- The coal seam has been identified as the Upper Split of the Dudley (or Dirty) Seam;
- The coal seam is 2m thick and generally the lower 1.4m of the coal seam was mined;
- Workings were encountered at the three identified drift locations;
- The workings have been backfilled with fill brought into the mine from outside, probably as part of the sealing of the workings in 1885, to provide support for the fortifications of Fort Scratchley;
- The filling appears, at least in the Drift 3 location, to extend at least about 10m in from the entry;
- The extent of the filling within the workings is unknown, but complete filling of all the workings was probably not possible and extensive voids probably remain under the majority of the hill;
- Further investigations consisting of drilling low angle to horizontal holes from Fort Drive could establish the extent of void.

Drilling vertical holes from within Fort Scratchley or in Nobby Road could also be carried out to assess the extent of the mining and remaining voids.

It is interesting to note that the workings may extend to the west beneath Nobbys Road since it has recently become known that a void was encountered during the drilling of some of the pier holes beneath the units on the western side of Nobbys Road.

Further research and field investigations are required to expand our knowledge of these important workings.

Engineering Log - Borehole

Client: COAL RIVER WORKING PARTY

Principal:

Project: COAL RIVER, MINE WORKING, FORT DRIVE, NEWCASTLE

Borehole Location: *REFER TO DRAWING*

SCREENFILE NUMBER 9-01 CPU COFFEE.CUT 16:01:05

Borehole No. **BH 3**

Engineering Log - Borehole

Sheet 1 of 1
Office Job No.: **N08709/01**

Client: **COAL RIVER WORKING PARTY**

Date started: **26.9.2005**

Principal:

Date completed: **26.9.2005**

Project: **COAL RIVER, MINE WORKING, FORT DRIVE, NEWCASTLE**

Logged by: **SJK**

Borehole Location: **REFER TO DRAWING**

Checked by:



drill model and mounting:		Percussion Drill LM690	Easting		slope: -25°		R.L. Surface: 13.90			
hole diameter:		100 mm	Northing		bearing:		datum: AHD			
drilling information				material substance						
method	penetration	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type, plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
1	2	3								
LM690							FILL: CONCRETE, grey.			FILL - CONCRETE
							FILL: Clayey SAND, grey to pale brown.			FILL / RESIDUAL SOIL
							Sandy SILTSTONE: pale grey.			WEATHERED SANDY SILTSTONE
							COAL: black			RCA3 RL 12.2m+ WEATHERED COAL
							NO CORE:			VOID
							Borehole terminated due to end of void. Borehole BH 3 terminated at 8m			RCA3 RL 10.2m+
method		support		notes, samples, tests		classification symbols and soil description based on unified classification system		consistency/density index		
AS AD RR W CT HA DT B V T *bit shown by suffix e.g.	auger screening auger drilling rotary washbore cable tool hand auger drill tube blank bit V bit TC bit ADT	M mud C casing penetration no resistance needing to re-drill water 10"/158 end of level on data shown water inflow water outflow	N nil	U ₁₀₀ U ₅₀ D N N _r N _b V P Bs E R	undisturbed sample 100mm diameter undisturbed sample 50mm diameter disturbed sample standard penetration test (SPT) SPT - sample recovered SPT with solid cone vane shear (kPa) pressuremeter bulk sample environmental sample refusal	D dry M moist W wet Wp plastic limit WL liquid limit	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense			

Borehole N08709/01 GDI COFFEY GDT 1801 08



APPENDIX H

- A Pit Report

Date	Person	Comments	Hours
31 July, 06	John W	Survey Excellence Award Background for Monteath and Powy's Pty.Ltd (M & P)	10
1 August, 06	John W/Alex W	Survey Excellence Award Background/Report for M & P	10
3 August, 06	John W/Alex W	Survey Excellence Award Report for M & P	7
10 th August, 06	John W/Alex W	1 st attempt 1804 Plan (direct entry)	8
17 th August, 06	John W/Alex W	A0 Plot of existing M & P/NCC data. Site Analysis of required areas and existing Stations. Email sent to Registered Mining Surveyor Mark Avery in regard to 1804 Plan	8
21 st August, 06	John W	1804 crosscut, bearing and distance table conversions	4
24 th August, 06	John W/Alex W	Laid out needed control, established from M & P control. Following which the loop was levelled	8
28 th August, 06	John W / Alex W	1 Hour meeting with Gionni Di Gravio and Dr Erik Ekland regarding required outcomes from student project	2
4 th September, 06	John W	Attempt to overlay 1830 plan onto aerial photograph of Newcastle to distinguish discernable features.	4
6 th September	John W	Plotted copies of 1804 and 1856 plans, which were then dropped to Mark Avery following his commitment to have a look at the mining jargon.	4
20 th September, 06	John W	Organised use of reflectorless instrument for Monday and Tuesday's detail work at M & P	2
21 st September, 06	John W	1830 plan fix continued	8
22 st September, 06	Alex W	1804 plan investigation start	6
25 th September, 06	John W / Alex W	Traversing of placed control	5
26 th September	John W / Alex W	Detail Survey field work undertaken and completed	8
28 th September	John W	Downloading and reduction of feildwork	8
3 rd October, 06	John W	Begin 1830 plan investigation into boundary parcel grants	4
5 th October, 06	John W	1830 Plan fix continued	6
6 th October, 06	John W	1830 Plan fix continued, first fix attempted within autocad based on two monuments i.e. FlagStaff and Obelisk	6
7 th October	John W / Alex W	John W 1830 plan work/Alex 1804 plan work	10
9 th	John W	John W began writing 1830 report while Alex began overall report	6

October, 06	/ Alex W		
10 th October 06	John W	Meeting with John Fryer regarding 1830 initial fix results	1
11 th October, 06	John W	Continued writing 1830report	8
12 th October , 06	John W	Tidied up our topo file and merged it into mastefile containing M & P/NCC topo data	4
16 th October, 06	John W	Attempted to recontour masterfile after removal of contour boundary string around M & P work. Many Errors	8
16 th October, 06	Alex W	Investigation into 1804 plan historical documents	8
17 th October, 06	Alex W	Investigation into 1804 plan historical documents	8
18 th October	John W / Alex W	Continued working on masterfile inorder to create full contour model for 12D DTM.	6
18 th October	John W / Alex W	Continued working on masterfile inorder to create full contour model for 12D DTM.	3
19 th October, 06	Alex W	Investigation into 1804 plan historical documents, downloading images from coal river website for powerpoint display	12
19 th October, 06	John W	Scanned all Deposited plans used. Refixed 1830 Plan based on twp high confidence cadastral corners	8
20 th October, 06	John W	Setout location of Historic A-Pit using hand held GPS	3
21 st October, 06	John W / Alex W	Created powerpoint display for project seminar	8
23 rd October, 06	John W / Alex W	Location by survey of coffees boreholes, including levels and derived bore hole angle	5
25 th October, 06	John W / Alex W	Initial import of masterfile into 12D, analysis of unrealistic modelling. Fixing causes of these problems within Geosurvey.	8
26 th October	John W / Alex W	Fianalising 12D DTM, practice of seminar.	14
27 th October, 06	John W / Alex W	Seminar presintation	4
1 st , 7 th , 8 th and 9 th November, 06	John W / Alex W	Finalising report	32

Total Hours: John Wilson 240.

Alex Widgery 188.

The full dairy is available if required from John Wilson (John.J.Wilson @Studentmail.com.au)

Uncovering the Historic A Pit. By John Wilson

At the request of Dr Erik Ekland and Gionni DiGravio, and with the support of Monteath and Powys PTY. LTD. I attempted and succeeded to coordinate John Armstrong's 1830 'careful survey' of Newcastle and the Coal workings of the Australian Agricultural Company within it, as part of my major student Surveying project at The University of Newcastle . (The plan can be seen within the links section of the Coal River Website). This allowed me to gain coordinates within approximately 10 metres of Newcastle's historically significant A pit and the company's coal loading birth which is marked on Armstrong's 1830 plan as the 'company's intended wharf' location.

On the 20th of October Ben Belfield and John Wilson of Monteath and Powy's PTY. LTD. were able to positively identify the location of the once A pit and the coal birth using the Global Positioning System. The A-Pit position fell within the rear of the Historic 3rd Bolton property, behind the Tower Cinemas and only 80metres NNW of the plaque on Church Street regarding the historical site. The Coal Birth was found to be on the western side of Harry's Cafe de Wheels, across from Scratchely's restaurant. Following is the relevant technical data.

A-pit MGA (Map Grid of Australia) coordinates: E385575.4, N6356038.2

Coal Loading Birth MGA coordinates : E385852.4, N6356264.8

The 1830 Armstrong Plan displays several discernable points, I was able to ascertain the coordinates in MGA for 1 depicted monument and 7 Cadastral boundary parcels. The monument being the stone and brick windmill erected in 1820 for grinding flour and later removed in 1847. After which followed an uproar from mariners, as the point was a guiding point for ships The 6 possible boundary corners were traced through relevant deposited plans (D.P's), ordered and on file at Monteath and Powys Pty Ltd. The points used are:

- The North-Western Corner of the Cathedral and Burial Grounds
- South Eastern Corner of the Great Northern Hotel (Ship Inn, 1830 Plan)
- Parcel at North-Western Corner of King and Watt streets
- Parcel at South-Eastern Corner of Pacific Street and Hospital Lane (colonial Hospital, 1830 Plan)
- Adjacent Parcels on either side of Hunter Street, on Western side of intersection with Watt.

Reference was also made to early maps of the settlement at Coal River (Newcastle) along with the D.P's to match boundary shape, boundary scale, building shape and scale until a high confidence was obtained. Finally coordinates were calculated from more recent, D.P's with connections to coordinated marks. Several other allotments such as the Blaxland's grant on the 1830 plan were also searched, however there wasn't enough supporting evidence to confidently match it to any plan in which I have found.

The North-Western Corner of the Burial Grounds and the South Eastern Corner of the Great Northern Hotel's calculated Coordinates were adopted to fix the Armstrong 1830 plan. The following table displays the results of were the others fell relative to those calculated.

POSITION	CALCULATED	DERIVED FROM PLAN FIX	DIFFERENCE
NW corner burial ground	E 385 950.485 N 6356 039.776	Fixed	n/a
SE corner (great northern)	E 386375.526 N 6356 133.054	Fixed	n/a
NW corner King/Watt	E 386303.624 N 6355 959.601	E 386301.0 N 6355959.0	E 2.6 N 0.6
SW corner Hunter/Watt	E 386331.100 N 635 6054.289	E 386328.1 N 635 6047.1	E 3.0 N 7.2
NW corner Hunter/Watt/Watt	E 386336.964 N6356073.585	E 386336.9 N 635 6066.1	E 0.1 N 7.4
SE corner Pacific St/Hospital Ln	E 386438.486 N 6355 951.923	E 386443.8 N 635 5948.7	E -5.3 N 3.2
Obelisk	E 385833.166 N 635 5594.025	E 385833.2 N 635 5598.1	E -0.03 N -4.1

