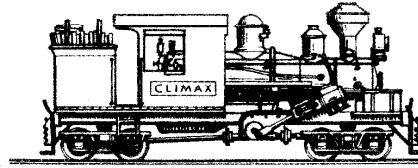


Light Railway Research Society of Australia Inc
PO Box 21, Surrey Hills 3127



Black Saturday 2009

A post-fire survey of historic timber industry sites in bushfire affected areas

Heritage Victoria Project Number 3544

Field Manual prepared by Peter Evans

Introduction

This manual is intended as a guide to participants in the LRRSA post-fire survey of timber industry sites in forested areas. This manual should be read in conjunction with the Heritage Victoria publication "Guidelines for Conducting Historical Archaeological Surveys" available for download from:

<http://www.heritage.vic.gov.au/admin/file/content2/c7/SurveyGuide.pdf>.

In carrying out this post-fire survey we are bound by the *Victorian Heritage Act 1995*. The relevant sections of the Act state:

131. Archaeological surveys

(1) A person who undertakes an investigation or survey of any land for the purposes of finding an archaeological site or relic must — (a) notify the Executive Director of his or her intention to undertake an investigation or survey prior to the commencement of the investigation or survey; and (b) provide all site documentation collected in the investigation or survey to the Executive Director. Penalty: In the case of a natural person: 120 penalty units. In the case of a body corporate: 240 penalty units.

(2) In this section, "site documentation" includes site records, photographs, maps, plans and field notes and any prescribed documentation relating to the investigation or survey of the site.

132. Discovery of relics to be reported

(1) A person who discovers an archaeological relic must as soon as practicable report the discovery to the Executive Director or an inspector unless he or she has reasonable cause to believe that the relic is recorded in the Heritage Register. Penalty: In the case of a natural person: 120 penalty units. In the case of a body corporate: 240 penalty units.

(2) If an archaeological relic is discovered in the course of any construction or excavation on any land, the person in charge of the construction or excavation must as soon as practicable report the discovery to the Executive Director. Penalty: In the case of a natural person: 120 penalty units. In the case of a body corporate: 240 penalty units.

(3) It is a defence to any proceedings under this section in relation to an archaeological relic if the defendant did not know or could not reasonably have been expected to know that the relic was an archaeological relic.

The application under Section 131 (1) of the Act has been lodged and a permit issued (see overleaf). Note that nothing in this permit provides permission to be on private or public land, to excavate (go sub-surface) at any site, or to collect any relic. (LRRSA policy regarding the non-disturbance of relics actually pre-dates the *Heritage Act 1995*). Permission must be sought from the owner of private property before entering the land and, as a matter of courtesy; we must inform the relevant land managers when carrying out field surveys. These include the Victorian Department of Sustainability & Environment (DSE), Parks Victoria and Melbourne Water (for controlled water catchments).



Ref: PL-HE/01/0008 13

8 April, 2009

Peter Evans
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Vic 3127

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Melbourne 3001
Level 4
55 Collins Street
Melbourne 3000
Telephone (03) 8644 8800
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www.heritage.vic.gov.au

Dear Peter

RE: PROPOSED SURVEY

3544 AREAS AFFECTED BY THE FEBRUARY 2009 BUSHFIRES

Thank you for forwarding the completed Notice of Intent to Carry Out an Archaeological Survey form advising of your intent to conduct a historical archaeological survey at the above site. Please quote the project number listed above in all following correspondence that relates to this survey.

Section 131 of the *Heritage Act* 1995 requires that copies of all documentation resulting from a survey or investigation must be lodged with Heritage Victoria for reference and archival purposes. Comprehensive documentation provides the basis for future management of Victoria's historical archaeological resource.

The recently released technical guide, *Guidelines for Conducting Historical Archaeological Surveys* provides details on the statutory processes and required documentation in conducting a survey, completing a Heritage Inventory Site Card and producing a final report. Any incomplete, inaccurate or illegible documentation will be returned for appropriate completion.

As detailed in the technical guide, a report must be submitted even if no new historical archaeological sites have been located during the course of the survey or desktop study.

Should you have any queries or require any further assistance please call Brandi Bugh, Heritage Victoria Archaeologist, on (03) 8644 8901.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'Ray Tonkin'.

**RAY TONKIN
EXECUTIVE DIRECTOR**



Organising the field work

The intention of this survey is that you should enjoy yourself as well as recover valuable information for future LRRSA publications, Heritage Victoria and the appropriate land managers. A full list of the intending participants will be found in the contacts section at the end of this manual. Survey parties will be organised by Scott Gould, who will notify the relevant land managers when survey parties are in the field. From past experience, parties of four seem to work well, but this can be flexible (although three would be the minimum number in terms of safety). Each party should decide on a party leader (usually the person with the most experience in this type of field work).

As a minimum, each party should carry the following survey equipment:

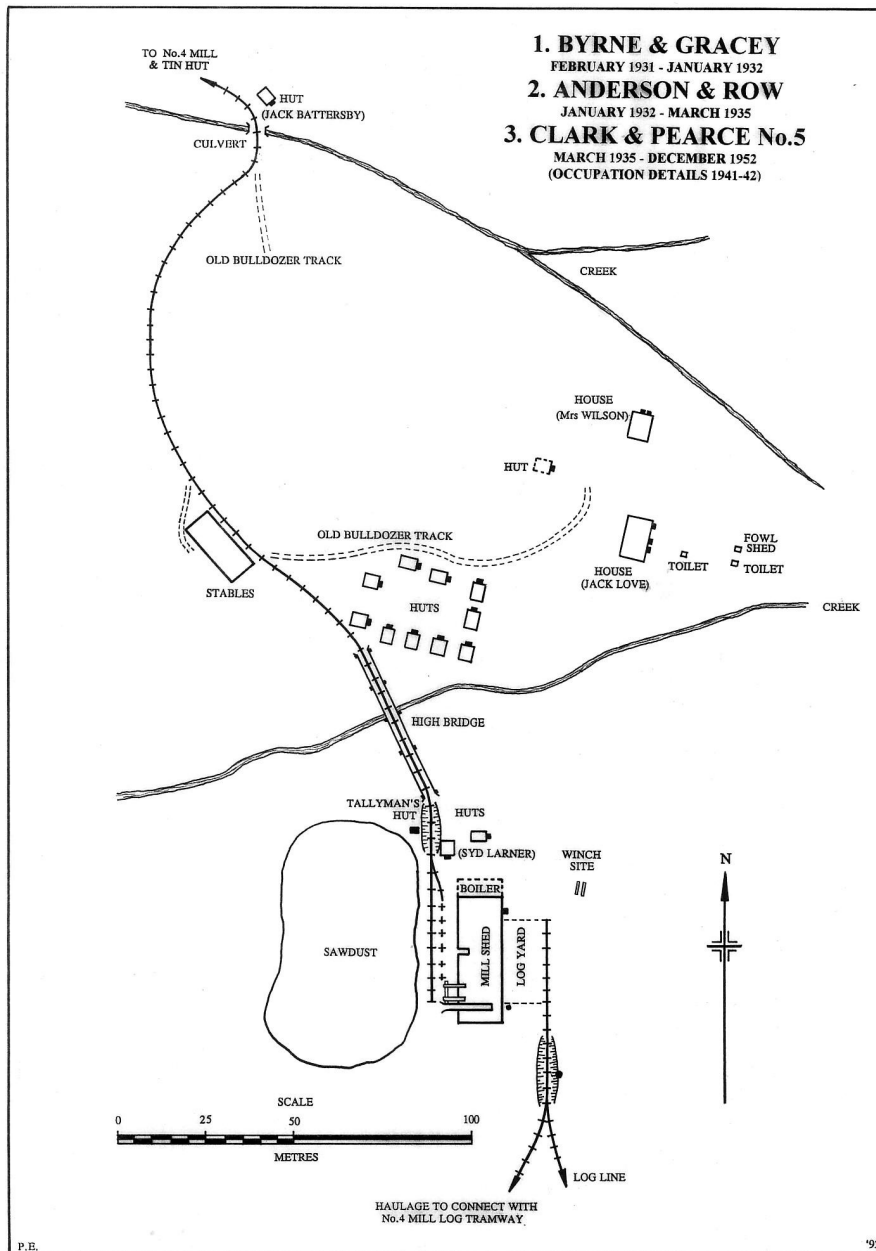
- Digital camera and photo identification board.
- Scale ruler (this can be made from a folding plastic metre ruler)
- Measuring tape (long for site mapping, short for artefact description)
- GPS system capable of Australian Map Grid (AMG) 1966 coordinates
- 1:25,000 topographical map sheet of the area being surveyed
- Historical mapping data for the site being investigated
- Field note-book (preferably of rag paper, which resists rain)
- Magnetic compass ("Silva" bushwalking type is sufficient)
- Bushwalkers' First Aid kit

A typical field survey kit (minus the paperwork) would look something like this:

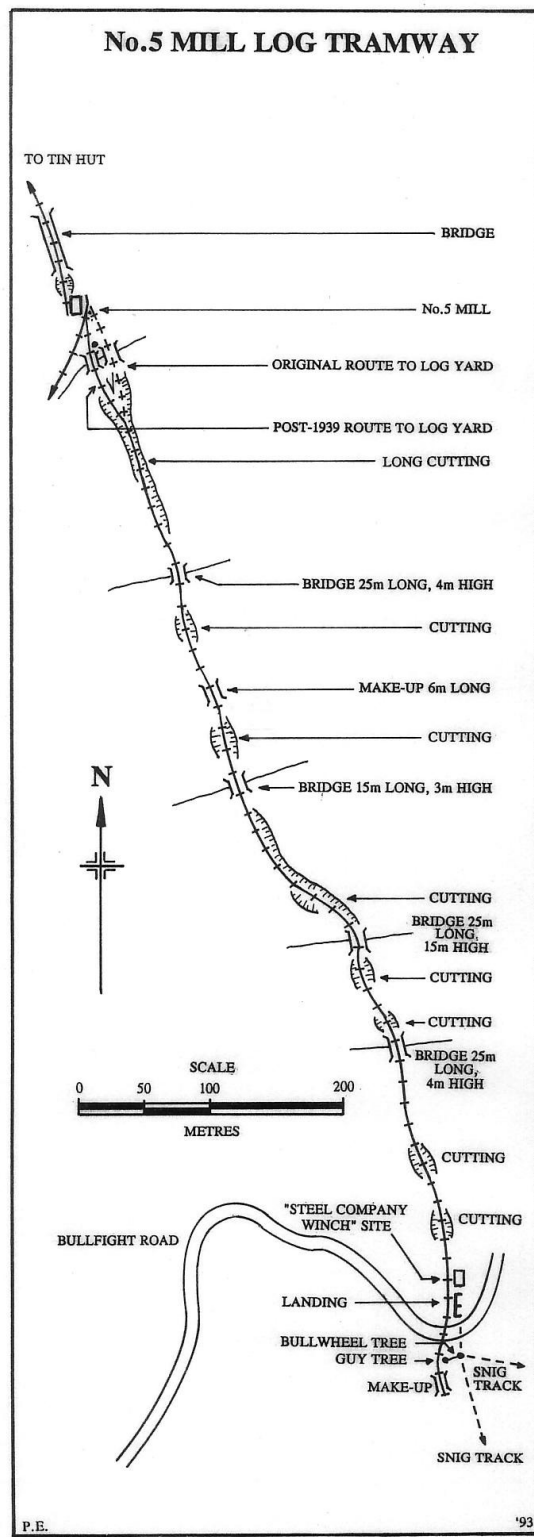
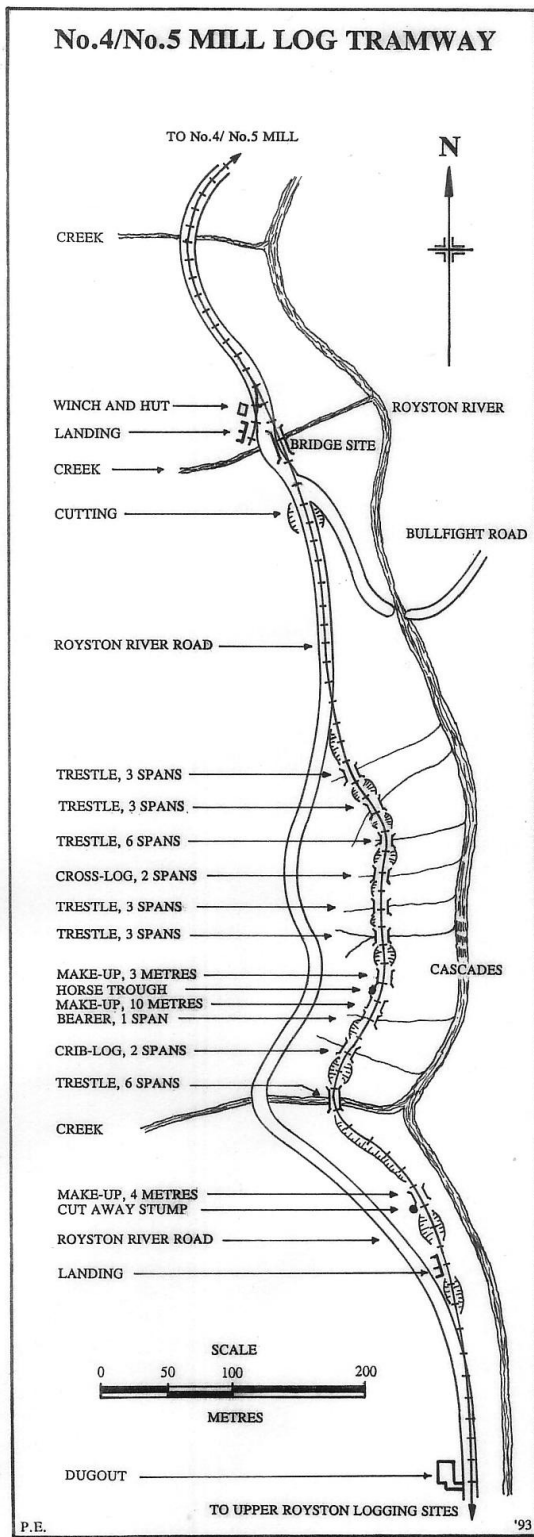


Mapping

We will be mapping two main types of sites: spot sites (like sawmills and winch sites) and linear sites (like tramways, which will themselves link a number of spot sites). Spot sites will require a GPS reference at a central position (the head of the sawdust trench at a mill is a good choice) and this reference should be noted on the site plan. Positions and orientations of other features (such as building sites) should also be noted. Each plan requires a scale and a north arrow. A finished spot site plan might look something like this:



Linear sites require a more descriptive approach and the recording of more textual detail, and might look something like this:



Maps like these need not be produced in full at the site, so long as sufficient field notes are taken so that the site map can be accurately produced later on. Note that field note-books should be retained for future reference.

Photography

Photography is likely to present the greatest challenge in terms of recording sites, as the photographs required for the individual Heritage Victoria site reports will be quite different from those used to illustrate articles produced for "*Light Railways*" (of which, of course, we hope there will be many!) Each photograph will need to include a photo board with the details of the photograph recorded. An example provided by Heritage Victoria is shown below. Such a board might be made out of a slate as shown, or a whiteboard (but something dark will photograph better). All photographs should also include a scale.



Heritage Victoria requires that a photographic log be kept in which the following details are recorded:

- site
- photograph number (sequentially numbered, e.g.: 001, 002, 003...)
- description
- direction (e.g. facing NW)
- date
- name of photographer.

Photographs must be of a quality suitable for subsequent reproduction and be submitted – along with the photography log – on an archival-quality electronic record.

It is the writer's suggestion that one member of each party be given the task of photographically recording the site in the manner required by Heritage Victoria while the others can be engaged in taking photographs for their own collections and possible inclusion in "*Light Railways*".

Photographic files should be named using the following LRRSA protocol:
Photo number_photographer's initials_location_operator_short description_date

Site Record Cards

The collation of field data and the creation of the final report will be the responsibility of Peter Evans. This will include lodging a Heritage Victoria "Site Record Card" for each site. This card will be filled-out mainly using data collected by survey parties, and must include the following information:

1. Place

Name: (usually the sawmiller concerned).

Other/former names: (perhaps a previous occupancy if known).

Description of site: (your words from the field survey).

2. Current statutory listing

Usually none, but Peter Evans can supply this data where required.

3. Suggested protection

Victorian Heritage Register ID for the Victorian Heritage Register.

Heritage Overlay ID for the Heritage Overlay, Local Planning Scheme.

This can be worked-out post-survey and/or supplied by Peter Evans.

4. Archaeological description

Surface artefacts and landscape features (your words from the site survey).

Degree of disturbance (your words - how intact is the site?)

Archaeological potential (to be provided by Peter Evans post-survey).

5. Archaeological significance

This can be decided post-survey and quantified by Peter Evans.

6. Location

Site location (AMG 1966 coordinates from site survey and approximate site boundaries from site description). Map sheet (map name and number), closest access road. State, Postcode, Local Government Area (Peter Evans can supply).

7. Cadastral location

County, Parish, Township Section, Allotment – Peter Evans can supply.

8. Indigenous values

Sawmilling sites generally have no known Indigenous values and the LRRSA does not have the expertise to identify such sites.

9. Associated sites

Peter Evans can supply.

10. Keywords

No more than five words from the list:

early 19th century sub-surface urban pastoral domestic

mid 19th century surface non-urban agricultural industrial

late 19th century disturbed remote timber commercial

early 20th century costal mining religious

mid 20th century transport maritime
mid-late 20th century communication water infrastructure

11. Plan of site

Separate plan attached (as already discussed) showing scale, north arrow, main site features, relevant AMG references.

12. Place history

Can be supplied from LRRSA publications or by LRRSA researchers. If in doubt, Peter Evans can supply.

13. Interpretation of site

Including phases in the development of the site, functions and activities represented (your words from the site survey with possible additions by Peter Evans and other LRRSA researchers).

14. Assessment of archaeological significance

Can be completed by Peter Evans.

15. Assessment of cultural heritage significance

(Statement of Significance can be supplied by Peter Evans, and will include Historical significance, Scientific (including archaeological) significance, Aesthetic significance, and Social or Spiritual significance).

16. Present use

Usually State Forest but possibly public park or water catchment.

17. Threats

As always, logging, looting, and bottle collectors.

18. References/ Informants

Relevant LRRSA publication or researcher.

19. Photograph(s) of site

As already discussed.

20. Map showing location of site

Photocopy or scan of 1:25,000 map showing spot and linear sites

21. Owner/ Occupier details

Generally Government Agency responsible (DSE, Parks Victoria, Melbourne Water). If private property, Postal address, owner's name, contact name, Telephone, Facsimile, Email address

Peter Evans will also be responsible for forwarding site cards to DSE, Parks Victoria or Melbourne Water where relevant. The Land Manager is usually in the front line of the defence of this type of site, and it is critical that they have all the details available to them.

Locating and Mapping Sawmill and Tramway sites using Archival Sources.

A Victorian Perspective by Peter Evans.

Introduction

Almost all historic sawmill and tramway sites will be archaeological in nature. Some sites will be in densely populated areas and will be well known to local people, and may even be evident to those without prior knowledge of the site. Other sites will be in areas with a low population and most will be obscured by heavy undergrowth from the casual observer. These may be little-known and, often, very difficult to locate. For any typological study of this type of site, access to archival sources is often the only way of obtaining clues as to where to look for them. This short guide is based on my three year's experience with The Victorian Department of Natural Resources & Environment's Historic Places Section.

Step 1: The Bureaucrats' Domain

The first step in locating an archeological site from archival sources is to understand the legislation under which the site was first established. Permissive occupancy for a site like a sawmill or tramway on crown land outside town boundaries will usually be given by the Department of Crown Lands and Survey. In Victoria, these records survive as VPRS 44, 242, 5357 and a few smaller series at the Public Record Office. All of these records are organised under the survey designations of county, parish and township. Of these, parish is the most useful and the first step is to obtain a map showing the parishes in the area in which you are interested. Once armed with a list of parishes and the county in which they are located, the search for an archival resource can begin. The second vital piece of information is the section of the Lands Act under which the site was established. In Victoria, this can be ascertained from the Lands Manual. For example, at various stages, sawmill licences were issued under sections 19, 25, 47, 93, 99, 138 and 145 of the Lands Act. Each licence was given a serial number with the section of the Act under which it was issued; viz. 1234/99. Most "occupation licences" in Victoria were issued for a three-acre site, and this can sometimes provide an additional clue. The licence number (also issued for tramways) is the most important key to the records.

Step 2: Archival Resources

Light Railway Research Society member Mike McCarthy has compiled a database of sawmill and tramway licences, sawmill and tramway contracts, sawmill partnerships, sawmill company formation, and sawmillers' insolvencies published in the *Victorian Government Gazette*. The database runs from 1862 (when sawmill licences were first required) to 1914 when regular publication of licences

appears to have ceased. This is an extremely valuable reference and can be used extensively to determine sawmill start and end dates, as well as provide a guide to the Lands Department records at the Public Record Office.

Using the licence database to provide a key to Lands Department files reveals that many of the licences no longer have extant correspondence files and, hence, for a large number of sawmills, no positional information on a finer scale than "parish" is obtainable unless that information could be found in the Lands Department Occupancy Branch "put-away" plans at the Central Plans Office. For those licences for which the file has survived, many gave only vague positional details despite the fact that the site itself was officially surveyed as part of the issue of the site licence. Mills in this category can be located only within an accuracy of between 500 metres and 1000 metres. Other files not only reveal the exact location of the mill but also gave precise details of the number and disposition of the buildings on the site as well as other features such as water races. The history available from these files ranges from simply a start and end date, to a detailed history of the mill as well as some insight into prevailing policy in regard to forest use.

In 1907, control of forest produce passed to the newly-established Victorian State Forests Department, but sawmill site licences in Protected Forest as opposed to Reserved Forest remained the responsibility of the Lands Department. This means that some licence information remains available from Lands Department records until 1940 when all sawmill site licences passed into the control of the Forests Commission of Victoria.

When the Forests Commission assumed control from the Forests Department in 1919 it set about rationalising the filing system and a large number of files were subsequently destroyed. These included files inherited from the Lands Department in 1907 as well as files generated between 1907 and 1919. While a few of the more "important" pre-1919 files were kept and have been transferred to VPRS 1472, there is a great "black hole" of information on Victorian sawmills between 1907 and 1919 which is largely impossible to fill without extensive newspaper research. Even after resort to intensive newspaper reading, little positional information is usually available.

A second large wave of file purging occurred in the mid 1970s. This seems to have been less "reasoned" and trivial files with two sheets of paper have survived where larger files containing more information were "red-effed" (finalised and destroyed by pulping). The surviving files form VPRS 11563 and are an excellent source of information on sawmills and tramways. A current indexing project has seen file details entered to the late 1970s but the database has still to be finalised. The index can be supplemented by the use of Forests

Commission Occupation Branch “put-away” plans to retrieve positional information for sites for which files no longer exist.

Most official files give only an approximate location on parish plans devoid of topographical information. Often the site is on a large blank area labelled “timber reserve” and transferring the site to a modern map is a matter of re-scaling a surveyor’s traverse where one is available. When transferring these sites without such a traverse, several assumptions as to the probable location of the site must be made. Such assumptions take into account the location of the log supply, suitable logging and outlet routes and a reliable supply of water. This results in a range of site data with variable accuracy ranging from “somewhere in a given parish” to an accuracy of a few metres.

Step 3: Transfer to modern mapping system

After a copy of a parish plan has been obtained with the results of the file and map research entered on it, it is time to transfer the information to a modern topographic map. There are two means of doing this. The first is to enlarge or reduce the parish plan to the same scale as the modern map and overlay the two on a light-box. The second is quicker and easier, but relies rather a lot on the researcher’s ability to match visual patterns. Nineteenth Century surveyors have left an indelible mark on the Australian landscape in the form of roads and fence lines delineating properties. (Every time I fly from Tullamarine I can see the work of Clement Hodgkison and other early surveyors in the late 1840s and early 1850s). The survey lines on parish plans can be matched up with roads and fence lines on modern maps and the sawmill or tramway pencilled onto the modern map. I then pencil owner/date/source on the margin of the map and link the two with a pencil line for ready reference.

Step 4: “Ground-truthing”

With all your archival research information pencilled onto a modern topographic map, it is time to go and locate the site map it accurately. (The Australian Heritage Commission called this “ground-truthing”). I always try to plan a round-trip to get in as many sites as possible in a day and, if I can, work downhill towards the end of the day.

The secret to locating sawmill sites is to learn to think like a sawmiller. You need a good downhill slope to snig or tram logs to the mill. The mill will nearly always be sited at the lowest point of an allocated logging area so, if these are shown in file maps, they are well worth recording even if the actual mill site is not shown. A supply of water is essential, preferably one that does not have to be pumped. Sometimes dams are excavated to supply one day’s water and refill overnight. The mill will usually be below the dam but always close by. There

needs to be a side slope of about fifteen degrees to assist handling the logs/flitches/finished timber through the mill. There should also be enough flat land for a few houses and gardens, although this is generally a lower priority than the mill requirements being absolutely right. Finally, there needs to be an outlet route for tram or wagon below the mill to get either to a road or railway station. After a while, you should be able to look at a patch of forest and decide on the best place to put a sawmill. Then it's just a case of having a look. Incidentally, the requirement for good forest cover, access to water, not too far from a road and gentle side slopes also suits another, more modern industry. You will find a lot of small marijuana plantations using these criteria!

The mill layout enables you to decide on the scale of the mill and the type of machinery used. This however, is a more complex matter and outside the scope of this paper. (*See following section*). What is absolutely necessary is to find the top side of the mill itself (the log yard), for it is here that your search for log tramways will begin. Similarly, from the lower side of the mill you can start your search for an outlet tramway.

Following tramways along any appreciable side slope is relatively easy, as the bench in the hillside is usually easy to follow except in very soft soils and very heavy undergrowth. Most tramways maintain a reasonably constant grade, and once you have established this you can extrapolate the line to get across any heavily disturbed areas. On flatter terrain, however, it is easy to lose the route in heavy undergrowth. In this case I extrapolate the line to the point where the tramway would cross the nearest creek, look for a distinctive tree to mark the spot, make a beeline for the tree and examine the creek environs. Disturbance from construction of the line near the creek (cuttings, bridge abutments etc) will be greater than on the gentler slopes on a spur, and a zigzag traverse up and down the creek is sure to pick something up if the line did continue past the disturbance where you lost it. It is worth recording such features as log ramps and winch sites. These often turn out to have quite regular spacing, and are indicators of the stages in which the line was constructed.

In the writer's experience, logging tramways usually end with some sort of siding accommodation to allow full loads to pass empty trucks. Firewood tramways, in contrast, just stop dead.

Step 5: Practical mapping

You will need a topographic map (or a photocopy of the relevant section), at least a 50m fibreglass tape and a good magnetic compass. Magnetic bearings are converted into true bearings using the local deviation shown on the map sheet and entered as "degrees true" in your note book. I also carry a pocket altimeter and a small spirit level calibrated with angles to measure the gradient

of inclines. I take my field notes in a surveyor's rag paper notebook using a fine drawing pen. This provides the best protection against losing your notes to inclement weather. All entries should be dated and you should make your notes as comprehensive as possible, draw sketches of artefacts in your notebook, and use a scale in all photographs. You can make a useful scale using a standard folding carpenter's ruler and filling in alternate 10cm sections using a black felt-tipped permanent marker. This is not only compact but can be used in a wide variety of situations.

Note that a GPS system is not essential for mapping mill sites and tramways with an accuracy of ± 50 metres (4mm on a 1:25,000 map). However, for accurate, repeatable work, a GPS is a necessity (especially when having to produce accurate maps for heritage protection purposes). I use a Garmin 12XL which cost me about \$500 many years ago – cheaper units are available today but you should ensure that you get one that works well under forest canopy.

At sawmill sites I always give the grid reference at the head of the sawdust trench and mark it conspicuously on my site plan. The site plans are drawn on an A1 gridded sheet – the master was made on tracing paper and the copies run off at a commercial plan printing business. This and your map can be carried rolled up in a tube made from plastic plumber's pipe with a screw cap on one end and a handle for easy carrying. The one I made also fits a camera monopod, a spare machete and some barbecue skewers that can be used to mark datum points on the site. I always carry a roll of surveyors flagging tape (bright orange) and this is useful for tagging datum points and providing a marker for taking bearings in dense undergrowth. Where possible I draw the sawmill layout directly onto the A1 sheet at the site. If I can get the car close enough, I have an A1 sized sheet of Masonite with some large bulldog clips to hold the plan flat. In the rain, this can be left in the back of the four-wheel drive and I can draw in comfort out of the rain under the flap of the tailgate. If the sawmill site is far from the road, I usually use the top of a log or stump as a table. Recently I have developed a shorthand method of notes for gathering site measurements and bearings and entering them into my notebook for later transfer to the site plan. Once finished, the plan is reduced in sections and taped together and re-photocopied to make an A3 master. This is then inked in on heavy tracing paper and reduced to A4 for inclusion in the report. I have experimented with Microsoft Visio-Technical, but find this only suitable for small and relatively simple sites. Nothing beats the "organic" feel of a hand-drawn plan!

When surveying tramways I take notes of bearings before and after each curve and take a GPS reading at spurs, creek crossings, sidings, junctions, landings, winch sites and termini. On inclines I take GPS readings at the top and the bottom, note the bearing, and take gradients at several points. The GPS

readings are then entered onto the topographic map and the tramway route is drawn in with the help of the bearings taken in the field as a guide.

Equipment

Equipment is really up to the individual. I usually wear overalls in the bush as the pockets hold compass, notebook and pen for ready access and the mobile phone pocket takes the GPS unit. I carry a compact daypack with every external strap and buckle that might catch in foliage removed. I do not have the harness cinched up very tightly as, after a fall, you sometimes have to wriggle out of the pack to extricate yourself. Inside the pack are my rainwear, first aid kit (including compressive bandages for snakebite), lunch, measuring tape, cameras, spare batteries and a photographic scale). Gaiters to guard against leeches and snakes along with a pair of stout "Red-Back" boots (cheaper and better wearing than fancy bushwalkers' boots and just as comfortable) complete my kit. Next on the purchase list is a personal distress beacon since, for some reason, most fellow LRRSA members (with the exception of Norm Houghton) look askance and shake their heads if I suggest a joint expedition. Happy sawmill and tramway hunting!



If the recent fires have done one good thing, it will be that scenes like that above need not be recorded on this survey ...

The Archaeological Expression of Forest based Sawmilling

From Stump to Sawdust – Site Components and their interpretation

By Peter Evans

Forest sawmills were generally located close to their supply of timber to minimise transportation costs. A large amount of waste was generated by the milling process in the form of sawdust and timber which could not be economically processed into saleable sizes. Some of this waste could be utilised as fuel for the mill boilers, but most was simply burnt or dumped. This siting close to their resource meant that mills were often isolated, and as a result some developed sizable communities deep in the forest.

At the less disturbed sites, remains can still be found of almost every industrial and social facet of the sawmilling process, and serve to help fill in the gaps in the documentary record.

These remains are not all concentrated at the mill site, although the bulk of the building sites are found here. Saw milling areas averaged around 1,000 acres for each individual mill (boundaries were often ridges and creeks), and the mill was not allowed to be shifted until the area was "cut-out" to the satisfaction of the local forest officer. This meant that every tree which was accessible and could be commercially utilised was cut. Logging tramways cost money both to construct and operate, so the trees closest to the mill were cut first. Winch ropes could reach a mile in radius into the bush from the terminus, although it was usual to snig the logs downhill. If the lower boundary of the area was a watercourse, a tramway built along its banks usually meant that the slope could be logged all the way to the ridge top. In this way, a pattern of disturbance was built up which covered practically the whole of the allotted sawmilling area. The historic features which remain in the bush today therefore cover most of this area with a relative concentration of features along the tramways and at the mill site.

Stumps and snig tracks

These remains start at the source of the timber, the tree. Tree-stumps dating from the late nineteenth century can still be seen in the forest. Stumps, as well as being an indicator of the tree density and maturity of the forest in existence during the milling period, also provide other signs of the timber extraction process. Apart from the familiar nicks in the stump to hold the boards used by the fallers to stand on, the stump may contain distinctive cuts placed by the

fallers to wedge an axe or crosscut saw in the tree in order to sharpen these tools. If the top of the stump is not too decayed, the direction of fall can be ascertained from the position of the lower face of the scarf. Haulage or "snig" tracks from the felled position of individual trees can be hard to detect, but due to the nature of steam winch snigging, these usually converge in a short distance to form a main snig route. The deep guttering caused by the passage of many logs is a distinctive and long-lasting feature which shows up well on early aerial photography and on the forest floor today.

Other features which often remain from this process are trees or stumps grooved with an axe to take a wire strop for a bull wheel used in the winching process. Often this strop was left behind when the bull wheel was moved, and sometimes the bull wheel itself remained when the area was remote from the mill and was burnt out in a fire. Winch ropes were sometimes discarded in the bush when their working life had expired, and are a relatively durable artefact. Another indicator of the presence of winch ropes, especially along well-used routes, are scars cut into rocks alongside the snig track, a reminder of the hard use to which these ropes were put.

Landings and winches

On arrival at the landing the log was transferred to the log tramway trucks for its journey to the mill, except where the mill was newly established and the winch was sited at the log-yard. These landings, as well as steam winch settings, were constructed from substantial logs spiked or bolted together, and many have lasted extremely well. They are usually easily distinguished from more modern landings designed for motor trucks by their lower height to suit the tramway rolling-stock and the narrowness of the formation for the older transportation method. The major exception in this case is for mills where the change-over from logging winches to crawler tractors is being made and the formation for the tramway may have been made by a crawler tractor with a blade instead of by manual methods. A careful search for other evidence will usually enable a distinction to be made. Some steam winches were abandoned after the introduction of crawler tractors and can still be found in situ. Still others were used to haul logs to landings for motor trucks and were either abandoned when steam technology was discarded or were converted to diesel power and removed from the bush once cutting had ceased in that area.

Tramways

Very few tramways were laid flat on the ground with no earthworks at all. On any appreciable side slope a side-cutting can be observed. In rougher country deep cuttings were excavated through spurs and, in confined gullies, on the approaches to bridges. Earthworks of this type persist well except in very wet

areas on steep side slopes where the "flow" of the hillside can make them difficult to detect. In some cases, substantial timber tramway earthworks have persisted for over a century, and tramway formations have even been traced through cleared paddocks due to the presence of old fence lines or subtle changes in the colouration of the vegetation growing there today.

Most tramways associated with sawmills had wooden rails nailed to split wooden packing. The wide rail surface was of particular assistance in braking on steep downhill grades. The persistence of remnant features is largely dependent on the age of the tramway and the species of timber used in its construction. Rails were sawn and tended to be of the species which the mill was primarily cutting, albeit of a grade not commercially utilised due to faults in the timber. Packing for the tramway horses to walk on was usually split nearby and hauled only a short distance to the formation. Where sleeper impressions are widely spaced, some form of locomotive traction is indicated. Where the impressions are contiguous, horses were used.

Iron rails and fastenings provide more durable artefacts, and were often used in combination with wooden rails, especially on curves where friction and wear from wheel flanges was a problem. Rail remains range from simple flat iron strapping nailed to the upper surface of wooden rails, angle iron, light iron rail of the type used in mines, and heavy rail purchased second-hand from street tramways and Government Railways. Where the rail is missing, rail fastenings can help to determine the type and size of rail used. Sawmillers could seldom afford to purchase new rail, and with the deep flanges and wide treads used on timber tramway rolling-stock there was seldom a need for high quality rail anyway.

Rolling-stock

Rolling-stock remains found in the bush are often the result of wear, accident or fire. They have been abandoned due to damage during their working life or the destruction of the tramway system which was the only means of retrieving them. Remains of tramway locomotives are rare, although large horseshoes are common, indicative of the size of the animals which did most of the haulage work.

Inclines

Another common element of timber tramway systems were inclines. These took the form of two-railed winch-operated haulages where the load had to ascend the incline, or three-railed gravity-operated lowering-gears where the load had to descend the incline. While the valuable cast-iron wheels of the latter were

often removed, isolated examples remain intact, and many still retain frames of heavy timbers in which the wheels were originally mounted.

Bridges

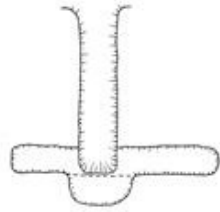
Often the most substantial engineering works on timber tramways were bridges. These took the form of low "make-ups", often less than a metre high, and used to cross a low depression or swampy area where a conventional railway would use an earthen embankment. Simple bridges often consisted of no more than two substantial logs thrown over a creek or gully with cross-log or dry-stone walled abutments. Larger bridges fall broadly into three categories: "trestles", the most elegantly engineered and consuming the least timber in their construction; "pig-sties", where the trestle support was replaced with square foundations built up from layers of logs; and "crib-log" construction, where the bridge employed a network of solid timber supports from the rails almost to the bottom of the gully. The latter consumed the most timber in their construction, and often have substantial remains.

The mill site

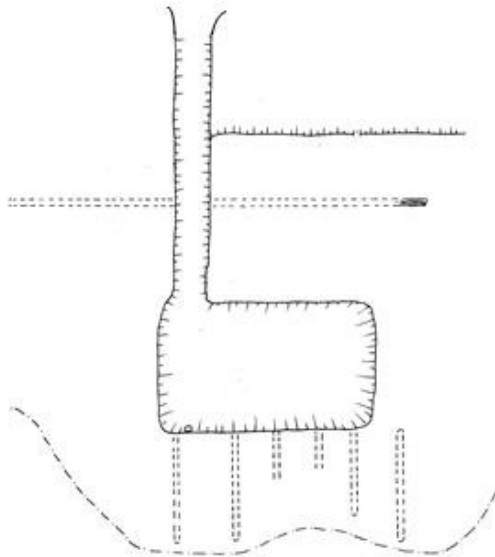
Mill sites fall into two broad archaeological categories: those where the mill was shifted to a new site in the forest, and every reusable item was moved on by the owners; and those which were burnt out by wildfire or simply abandoned by their owners when improved road transport and Forests Commission policy dictated that mills be located outside the forest areas. In the latter category, substantial remains can be expected, especially at the more isolated mill sites.

Breaking-down saw frames, bed-logs and roof pillars are generally the most durable of the timber remains at the mill, and along with earthworks, enable the size of the mill shed to be readily determined. Sawdust trenches, machinery mountings, boiler settings and the slope of the terrain on which the mill was built help to determine the internal layout. The number of benches and the layout of the foundations differentiates "spot" mills from "full" mills.

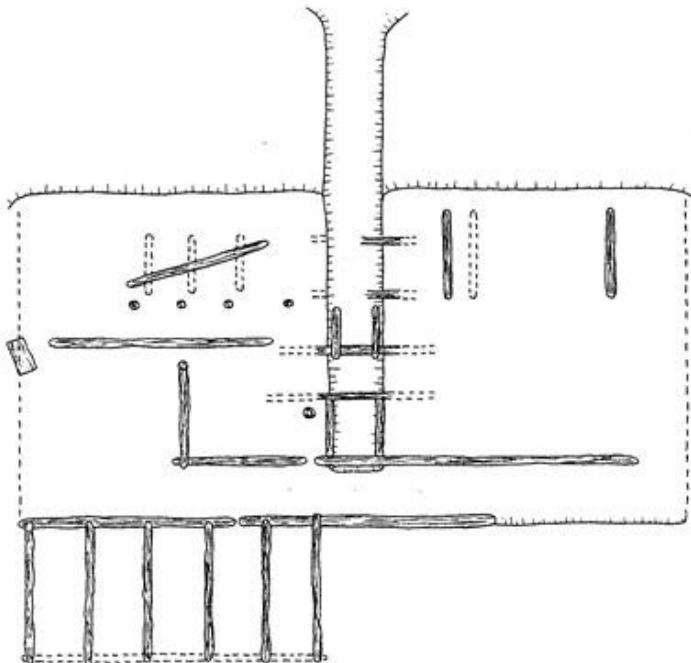
The following page shows, using site plans from previously surveyed sawmills, the differences to be expected between the main three types of sawmill. The first is the "Spot" mill (single bench and small, and existing throughout the bush sawmilling period), the "Full" "Vertical" mill, (mainly nineteenth century), and the "Full" "Modern" mill (mainly restricted to the first half of the twentieth century). All three types may be met with in the bush and deciding the type of mill in use at a location is one of the more important observations to be made during site survey.



Spot mill - short, shallow trench with room for a small bench at the closed end. Very little in the way of bedlogs. The mill is on a single level.



Vertical mill - large square pit to take the vertical breaking down saw, resulting in the sawdust trench being relatively deep. Moderate amount of bedlogs required. The mill is usually on two distinct levels because the breaking-down track is built up above the ground



Full "modern mill - straight trench much larger in scale than that for a spot mill. The trench runs beneath both breaking-down and rip benches and the mill is on three distinct levels sloping towards the mouth of the trench. Large number of bedlogs required

Most mills were powered by steam or, less commonly, water. Boilers are often found at the more remote sites, and where the actual boiler is missing, remains of the boiler setting will often help to determine the boiler type. Valuable information as to the working pressure, period of operation of the mill and clues to the boiler's previous history can be found stamped into the backhead or around the compensating ring of the manhole. The "BIA" (Boiler Inspection Act) number should be recorded wherever possible. The remains of the power-plant vary from foundations which enable an estimate of the size of the engine to be made to, in rare cases, the engine itself. Often, mills were powered by portable engines and the remains of these (usually minus all brass fittings and easily removable cast iron) are sometimes found. Other common machinery remains found at mill sites includes shafting, belt-pulleys and discarded (often fire-buckled) saws. All these mill remains enable an estimate of the size of the mill and the type of technology used to be made.

A common requirement of Forests Commission sawmilling area licences in later years was the burning of sawdust residue from the mill. "Green" sawdust does not burn well without a specially constructed retort and a strong draught, and earlier mills simply dumped the sawdust below the mill. These sawdust heaps, sometimes of considerable size, provide an evocative reminder of the amount of timber which passed through the mill, and seem almost immune to decay. They do however subside, and a measurement made from the top of a stump charred in the 1939 fires in the Rubicon Forest has indicated that a subsidence rate of three metres in 50 years has occurred at that particular mill site.

An important ancillary building associated with sawmills is the blacksmith's shop. The location of this is often indicated by piles of horseshoes and assorted metal objects, and sometimes by the remains of the forge, either in the form of bricks or the cast iron water jacket for the bellows nozzle.

Remnants of outlet tramways are similar to those of the log tramways. Where the timber from the outlet tramway had to be transferred to motor truck, a gantry topped by a crab-winch on rails was a common method used to make the change-over. As these were generally built at the more recent mills, some still survive today. Other remains associated with early motor transport include bridges, board tracks and corduroy roads.

The mill settlement

The remains of the mill settlement help to determine the size and make-up of the mill community. The single men were housed in small huts arranged "barrack" fashion, often on the other side of the mill from the married couples who lived in larger houses. The ratio of each type of building, where these can be identified, helps to arrive at an understanding of the demography of the

community. Contemporary photography and sketch-maps provided by oral sources are an invaluable aid in this identification. Where these are not available, a more careful assessment must be made of the form of each building and the artefacts present in the ruins.

The most common form of the building remains are low mounds of fireplace stones and brickwork which once lined the inside of the large timber or corrugated iron chimneys. These fireplaces were often backed with a discarded saw blade or sheet of iron to reflect the heat. The persistence of timber remains once again depends on the age of the mill, whether it was simply abandoned or destroyed by fire, and the species of timber which the mill was cutting. Other common remains are glass, china, galvanised or cast iron and leather objects such as shoes and horse harness.

After the 1926 bushfires, the Forests Commission encouraged the construction of fire-refuge dugouts at sawmills. After the 1939 fires, they insisted. These refuges can still be identified today at most sites. While the roof may have collapsed, dry stone walling for the entrance and bearers for the earth filling making up the roof are common remains.



The photograph above (*Hayden's mill under construction in the Otways in 1919*) shows almost every facet of modern mill construction which will be typical of the majority of the sites to be visited during the present survey (*Author's collection*).

Safety guidelines

Please note carefully: potential hazards exist when carrying out archaeological surveys of this nature. You should be aware of the following dangers:

Environmental factors (weather): The weather in mountainous areas can change quickly. It is your responsibility to be equipped with the necessary protection, i.e., wet weather gear, long-sleeved shirt, long trousers with stout footwear and gardening gloves to protect your hands. High visibility clothing is recommended and LRRSA vests will be provided to you as part of this survey. Please wear them as it also identifies us to the relevant land manager.

Adverse terrain: At times we will be walking on steep hillsides. The ground underfoot can be unstable and slippery. Watch out for loose surfaces and walk across them rather than straight up and down. Beware of using vegetation as a handhold – it may either cut your hand if you slip, or give way affording you no protection from a fall. Tripping hazards abound in bush country. On steep slopes, watch out for loose rocks dislodged by other members of the party. Never walk directly downhill from another person in case they dislodge a rock. If a dislodged rock is moving towards you, seek shelter behind the nearest tree, being careful to keep all parts of your body behind it. Note that in mountainous country, steep slopes above a river can terminate in a dangerous cliff. Near streams, do not walk too close to the banks in case they are under-cut.

Fatigue, dehydration, exposure: If you become fatigued, you must notify the survey party leader immediately. There is limited water available in some of the bushfire affected areas and you must carry adequate supplies of water or other fluid. Sports drinks that replenish electrolytes and energy are especially recommended. If you become wet and cold and begin to feel unwell, you must notify your party leader immediately.

Abandoned mine shafts: Mining areas are littered with abandoned mine shafts, some of which are disguised by vegetation and can be very deep. Not all will be shown on topographical maps. Never walk where you cannot see the ground. If you see a shaft of which others may not be aware, it is your duty to warn them. Watch out for small green areas in dry country as it usually indicates a depression. Never enter a mine tunnel or fire-refuge dugout as there is a danger that old workings may collapse or contain concentrations of gases that may constitute a breathing hazard.

River crossings: Field work will inevitably require that we cross some creeks and rivers either by fording them on foot or by using logs across the river. These rivers and creeks are normally shallow and not very wide, and should not

present a danger. However, rocks and logs can be slippery and roll under your feet. Where possible, use a stick to assist you on the crossing. If you do not feel confident of making the crossing, notify your party leader immediately.

Fauna: The most dangerous creatures you are likely to meet are snakes. All snakes in Victoria are venomous. Look before you place your hand on a rock or step over a log to make sure you are not surprising a sleepy reptile. Snakes are usually shy and will not be seen when large numbers of people are moving about. Snakes will only strike if they feel threatened, or you disturb them in the breeding season of mid-summer when they can become territorial. Leeches may be met with in wet areas. Protect yourself with a long-sleeved shirt and long trousers tucked into socks. Leeches can usually be dislodged using salt, heat or an insect repellent. Never pull a leech off directly as it can leave behind material that leaves you open to infection. Watch out for Bull Ant nests – usually indicated by a patch of fine granules on the ground, but which can also occur in and around fallen logs. If bitten, the alkaline juice from a broken bracken fern stem can neutralize the acid in the sting and provide relief from the pain. Note that spiders can live in abandoned machinery. Never place your hand anywhere where you cannot see potential dangers from bites. If in doubt about any bite or sting, notify your party leader immediately.

First aid: Your party leader will be carrying a First Aid kit to deal with minor injuries but will not necessarily be formally trained in First Aid. It is your responsibility to make him or her aware of any allergies from which you may suffer and to carry any of your required prescription medicines clearly labelled with your name, the name of the drug and the name of your doctor. Note that, in bush areas, mobile telephones do not usually work so a doctor cannot normally be called in case you injure yourself.

Safety in numbers: Stay with the survey party. If you need to move away, notify the party leader who will stop the group until you return. If you see another person leave the group, please notify the party leader immediately. When walking along a track which junctions with another, never move on until you are sure that the person behind you has seen the route taken by the party. If you think someone may be missing from the group, notify your party leader immediately.

These warnings do not include all potential hazards applicable when working in mountainous country. It is the responsibility of all members of the survey group to work in a safe manner and to watch out for any actions of others that may pose a risk to the individual or the group as a whole.