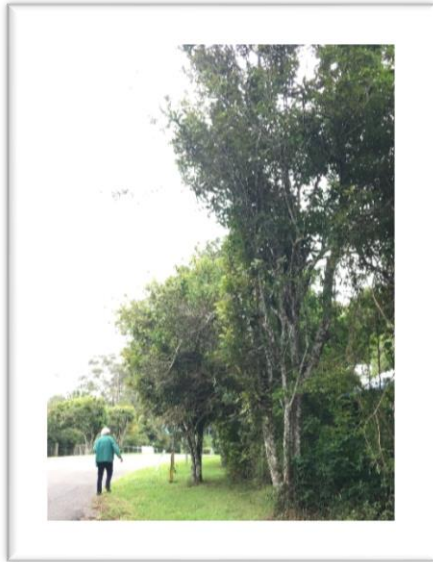


Report on the history and current state of 1927 footpath plantings of *Macadamia tetraphylla* along Mount Glorious Road, Mount Glorious Qld



Views of some of at least 35 roadside macadamia trees and the street-scape, Mount Glorious

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Table of contents

page

| | |
|----|--|
| 1 | Title page Views of some of at least 35 roadside Macadamia trees and the street-scape, Mount Glorious |
| 3 | Location Aims and objectives History of planting at Mt Glorious Survival and identification of the original trees |
| 4 | Similar roadside Macadamia plantings - Lower Beechmont, Qld. |
| 5 | Mt Glorious survey results Distribution of trees |
| 7. | Present condition of surviving trees Photograph of tree health issues |
| 8 | Photograph of nuts collected May 2019 Mt Glorious Qld. Botanical and further comments |
| 9 | Macadamias as food and the future benefits of genetic analysis |
| 11 | Recommendations Conclusions |
| 12 | Appendix – Photographs of individual Macadamia trees, Mount Glorious |
| 14 | Acknowledgments |

Maps

page

| | |
|---|-----------------------|
| 5 | Regional location map |
| 6 | Tree distribution map |

Location

The author has a 60-year interest in the history and welfare of the historical plantings of Macadamia trees at Mt. Glorious, Queensland. They are located along Parkview Avenue (formerly Mt Glorious Road) in the centre of the village. It is situated approximately 40 km north-west of Brisbane, at an elevation of 640 m on a crest of the D'Aguiar Range. The property at 1843 Parkview Avenue, from where the photos on the title page were taken, was bought by the author's parents Les and Daisy Carter in 1959, and it has been owned and occupied by successive members of the family ever since.

Aims and objectives

1. to provide initial information, hoping to interest groups (or sponsors) to conserve and study these heritage macadamia trees and improve their condition,
2. and to ensure that future generations of residents and visitors can continue to appreciate them and enjoy collecting the nuts.

History of planting at Mt Glorious

An original resident of the mountain, the late Mr Ted Gibbons, recorded that the original Macadamia trees on Mt Glorious Rd (Parkview Rd) were chosen and planted as seedlings in 1927 by the Queensland Main Roads Department, for a trial as street trees. He recollected that "*the Mt Glorious Progress Association had persuaded the Main Roads Dept to assist in planting an avenue of trees from the foot of Harden's Hill to Maiala National Park. In spite of protests, the only trees forthcoming were Queensland Nut Trees – planted because the Main Roads man was interested in their culture, and wanted to see how they would do on Mt Glorious.*" ¹.

Survival and Identification of the original trees

Some of the original plantings in the Mount Glorious appear to have survived, judging from their size and the regular spacing distances. Members of our family have memories of them as quite large trees since at least 1959.. They still bear good crops of nuts which are collected by local people and the many day-visitors each year. Whether the original seedlings had included some of *M. integrifolia* is not easily determined, nor is their provenance. Some of the larger surviving trees are

¹ Ted Gibbons, Reminiscences – Early Glimpses of the Mt. Glorious and Mt. Nebo Region, unpublished family notes, 1970.

unmistakeably *M. tetraphylla*, based on their leaf arrangement, other easily-observed qualities such as more prickly leaf margins, and the bright red-to-pinkish colouration of the leaf flushes and inflorescences. Other trees lack some of these characteristics, and their nuts also have a range of shell thicknesses. In earlier years, *M. integrifolia*, *M. tetraphylla* and the inedible small-seeded *M. ternifolia* were described as a single species². Observations of the extent of variation, including hybridisation between the species in local populations of macadamias elsewhere, include those of C.T. White³ and Germaine Greer, who began a private conservation project (later operating as a UK registered charity, “Friends of Gondwana Rainforest” on degraded land at Cave Creek in the Numinbah Valley, near Lamington National Park⁴).

Similar roadside Macadamia plantings - Beechmont district, Qld.

Mr Ian McConachie AM has noted that in the 1920s-1930s local council workers had planted seedlings, which were predominantly of locally sourced *Macadamia tetraphylla*, along a public road in the village area. He advises that Beechmont Land Care have limited information about the early plantings, and that some of these original trees remain⁵.

Mr McConachie also assisted during much later (2011) partly-subsidised street-side plantings along Lower Beechmont Road. In this case, selected macadamia trees growing in rainforest along the roadside had to be removed to enable realignment of the road. Well over 100 mostly cutting-grown trees and some seedlings of *M. integrifolia* trees were planted. The cuttings had been sourced from identified trees which were due for removal, in order to preserve and study genetic quality. Leaf tissue samples from the parent trees were to be used in ongoing genetic studies to record their genetic history. This work was the subject of a final report to the Department of Transport and Main Roads Department in 2018.⁶ Some few *Macadamia tetraphylla* trees were also recorded within, and surrounding, the study area, but they were not included in the final assessment of plant growth. It is noted in the report that hybridisation with related local species was expected to be confirmed.

Recent research by Hardner *et al.* has used genetic analysis of macadamia leaves to reveal information on tree origins; for example, relationships to other wild trees, evidence of hybridisation, and the influence of cultivated trees⁷. The authors state

² *The Queensland Flora* IV ((1901) pp.1379-1380.

³ C.T. White (1927) A thin-shelled variety of the Queensland Nut. *The Queenslander* 8/9/1923. And <https://trove.nla.gov.au/newspaper/article/22647108>

⁴ Greer, G (2014). *White Beech. The Rainforest years.* Bloomsbury, London, pp. 262-283.

⁵ Ian McConachie, personal communication 2019

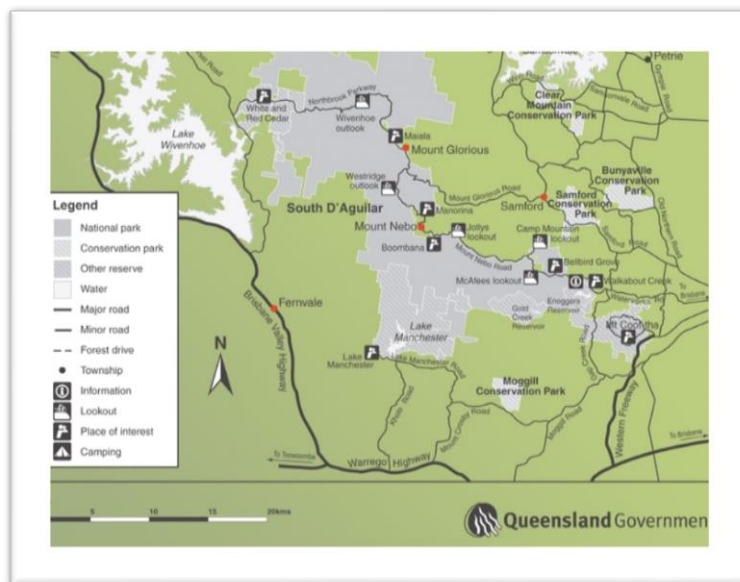
⁶ DTMR offset Beechmont ETBC 2010/5674 (2018) Macadamia Offset Review, Lower Beechmont (September 2018)

⁷ Hardner, C., Nock, C., Batley, J., Termizi, A.A.A., Peace, C., Hayashi, S., Montenegro, D. and Edwards, D. (2016) Backyard macadamias in Brisbane as a reservoir of genetic diversity for

that genetic information can help to determine conservation priorities and recovery actions for macadamia populations, as well as to identify traits for potential for use in horticulture.

Mt Glorious survey results

During May 2019, the trees located on both sides of Mount Glorious Road (also known as Parkview Road in Google Maps), were inspected in Mount Glorious village, between the main hairpin road bend and the Mount Glorious Café (originally Maiala Rainforest Teahouse and Restaurant, street number 1850). There may be additional trees remaining further west to the Maiala National Park which were not noted or included here.



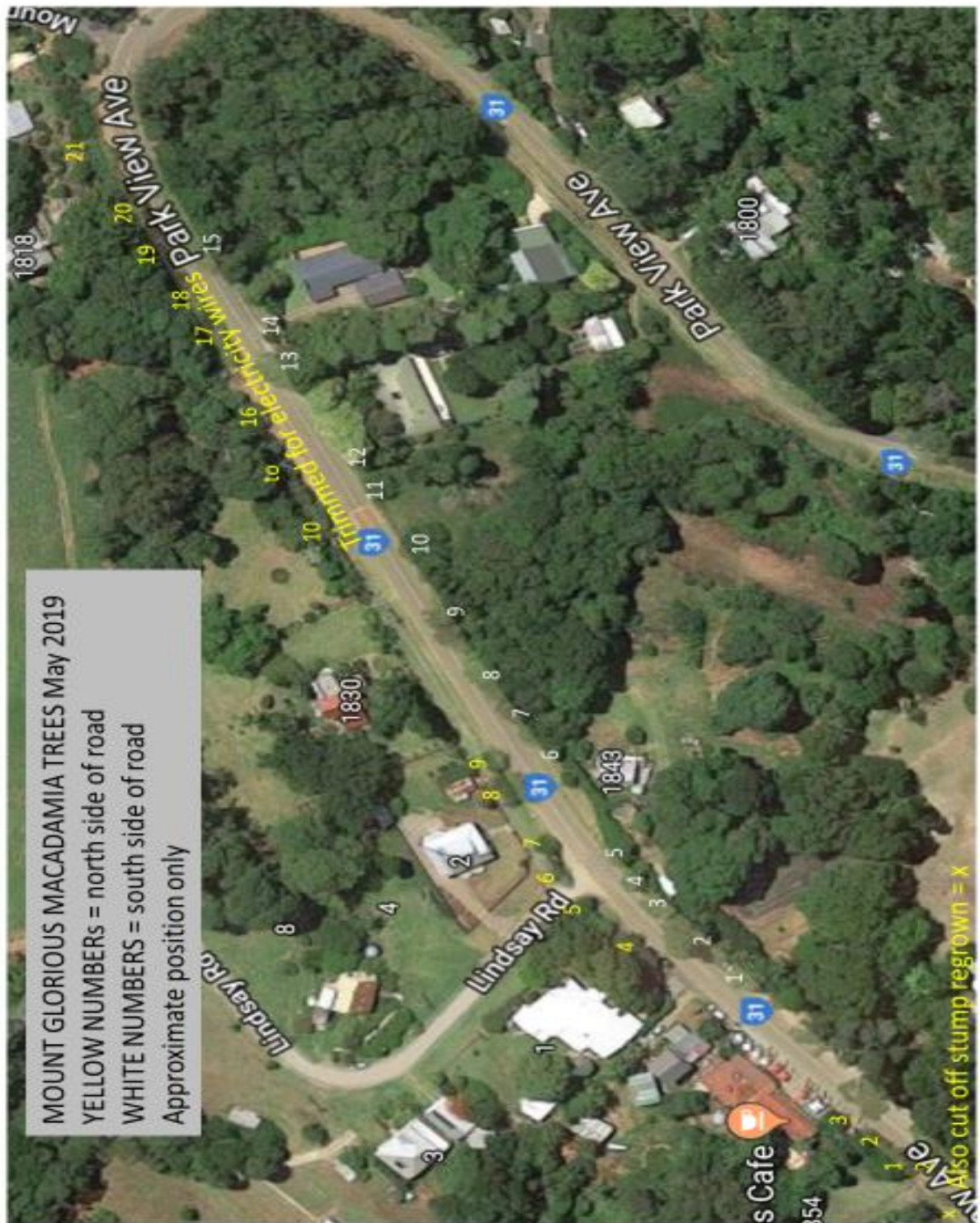
Regional location map (reference: <https://www.mountglorious.com.au/>)

Distribution of trees

There is no known map of the original plantings, but the current distribution indicates that the trees were spaced at approximately 10 m apart (with numerous gaps now). The map on the following page shows the locations of approximately 20 trees identified along the northern side of the road, and 15 trees along the southern side. A series of photographs, showing the overall appearance of each identified macadamia tree, accompanies these notes as an Appendix. The trees are labelled on the map as north side or south side (e.g. 07 S, 16 N etc.).

The surviving trees are of uncertain age. The evenly-spaced largest mature trees may well be survivors of the original plantings. Others have evidently established over many years from seeds below the original plantings. As far as it appears to be

known⁸ and from my own observations in botanical surveys in two areas adjacent to the planting area, no *M.integrifolia* or *M. ternifolia* trees are present in the immediately local natural rainforest, and the natural distribution of the roadside *M. tetraphyllas* is far to the south.



Base map: Google Earth

⁸ Sue Phillips, personal communication 2019

Present condition of surviving trees

The condition of the trees as inspected in May 2019 is quite variable, but the main issues of concern relate to:

1. local covering of the canopy by tendrillar vines (particularly *Cissus hypoglauca*) which have extended from some tall, species-rich, rainforest that has re-established over 90 years or more on adjoining private land, following a temporary clearing for crops during the original settlement.
2. severe annual lopping of all trees under roadside powerlines, which has created a hedge effect where the Macadamias compete with abundant regrowth. There are good nut-producing shrub-like Macadamias even within the trimmed belt.
3. growth of parasitic mistletoe on trunks and branches
4. general poor health arising from dry spells, grass & mowing, age, fragile branches etc.

Examples of these issues are shown in the following photographs:





Nuts collected in May 2019 at Mt Glorious Qld

Top: range of types

Centre: Hole made by rats in a maturing nut

Bottom: Two sets of flat-sided “double nuts” which occasionally develop within a single shell.

Botanical and further comments

Although the trees appear to be mainly *Macadamia tetraphylla*, natural and induced crosses are known between this species (which has a quite limited natural location on either side of the Queensland-NSW Border Ranges) and the related, much more widely distributed, species *M.integrifolia*. Subsequent selections of the nuts for commercial use (after cooking, and usually salting) will have included the products of such crosses. Numerous new selections for breeding of plantation stock are constantly sought. The chief objects appear to be to maximise the fresh crisp taste,

minimise shell thickness, and enhance the quality and market appeal of future commercial crops.

In the early 1900s, Herbert Rumsey had explored and recorded variations in local macadamia species between Brisbane and Lismore.⁹ In 1915, he had visited Hawaii to advise on possible plantings, and provided 10,000 seeds for the US Department of Agriculture on the mainland and on Hawaii. He mentions earlier trials by the Department of Horticulture in Hawaii, of trees raised from seeds sourced from Queensland. Seeds from these trees were used for one planting there in 1918. While the first commercial plantings of nuts in Hawaii have recently been shown to have been derived from a single tree¹⁰, the originally planted nuts at Mt Glorious may have come from various parents. These trees have quite widely variable leaf characteristics, and nuts that differ in size, thickness of shell, and the frequency of “double nuts” - i.e. two hemispherical nuts in a single shell (see photo on page 8).

Macadamia nuts as food and the future benefits of genetic analysis

Although macadamia nuts are known to contain minor amounts of a cyanogenic glycoside, a potential precursor of cyanide, this is believed to peak during the ripening process, and there appear to be no records of ill-effects from human consumption of the ripened nuts. Dahler *et al.*¹¹ (cited by Hegarty *et al.*¹²) reported low concentrations (0.15 $\mu\text{mol g}^{-1}$ fresh weight) in cotyledons of mature *M. integrifolia* and *M. tetraphylla* seeds, corresponding to the edibility of the seeds of these two commercial species. This contrasted with the much higher level (9.6 $\mu\text{mol g}^{-1}$) in the inedible *M. ternifolia* seeds. Levels in cotyledons of all three species rose dramatically during germination. But she estimated that a 70 kg human would need to eat 60 kg of the (later) mature seeds of either commercial species to suffer a fatal reaction, due to the residual cyanogen constituent. Many other commonly-consumed kernels of nuts- e.g.those of almonds and peaches- release similar or greater quantities of cyanide on being chewed and swallowed, with only very excessive consumption reportedly causing symptoms. However, severe reactions to ingesting whole, unbroken macadamia nuts often occur in dogs, with some reported fatalities. McKenzie¹³ reports that this result is not due to the presence of a cyanogenic glycoside, and that both raw and roasted kernels can affect dogs, regardless of their age or size. However, he adds that bowel blockage by whole nuts can be a separate, more serious hazard in dogs.

⁹ Rumsey,H.J.(1927). Australian Nuts and Nut Growing in Australia. Angus and Robertson, Sydney.

¹⁰ <https://www.abc.net.au/radio/sunshine/programs/south-queensland-drive/one-macadamia-tree-spawned-3b-industry/11161876> and related original sources

¹¹Dahler JM (1995) Quantification of cyanogenetic glycosides in seedlings of three Macadamia (Proteaceae) species. Australian Journal of Botany 43: 619-628.

¹² Hegarty MP, Hegarty EE & RBH Wills (2001) Food Safety of Australian Plant Bushfoods. RIRDC project AGP-iA

¹³ McKenzie, R (2012). *Australia's Poisonous Plants, Fungi and Cyanobacteria*. CSIRO Publishing, Clayton Vic. Australia.

The following is a summary of recent assessment of the cyanogen issue in edible foods:¹⁴ “All of the economically most important cyanogenic nuts and seeds (i.e., almonds, macadamia nuts, lima beans, and flaxseed) contain health-promoting compositions of fatty acids, minerals, vitamins, and carbohydrates. Taking into consideration the possible health risk arising from consumption of inappropriately processed plant materials or the selection of highly cyanogenic crop plant genotypes, cyanogenic nuts and seeds represent excellent food sources”. Some Macadamia species and their close relatives are nevertheless considered unsafe to eat, and only nuts of the two widely cultivated species, *M. integrifolia* and *M. tetraphylla* have a reliable history of commercial use as food.

Various studies of the genome of Macadamia species, with edible or known toxic properties, are now being pursued in several countries. I am not familiar with the whole range of current findings, but a Chinese study has identified the whole chloroplast genome sequence of *Macadamia tetraphylla* (Proteaceae)¹⁵. Sequencing of samples of *M.integrifolia* from various locations have been undertaken. Similar investigation of tissue samples from the cluster of original and younger trees at Mt Glorious would appear to be rewarding, as they appear to be predominantly *M. tetraphylla* of up to 90 years old and have grown and reproduced in isolation far from the nearest natural distribution of this species. I did not record any *M. integrifolia* in a full survey of rainforest in an area of Brisbane Forest Park immediately adjacent to the west of the planting area, but it is known to occur in locations at lower altitudes some distance away.

Continuing studies of genetic variations in macadamias will ensure their continuing safe use as human food, enable minimising of the cyanide potential where known toxic Macadamia species may have been incorporated in the genomes of some cultivars and selections, and enable the general continuation in improvement in the commercial potential of the macadamia industry. Although there is a hearsay report of a small collection of material from the Mt Glorious street trees some years ago, I have been unable to verify this, and there may be confusion with a wide-ranging 2019 collection of tissue samples from macadamias at many other sites in the same region and elsewhere, which were used for genomic studies of the origins of commercial macadamia species¹⁶.

¹⁴ Ballhorn, DJ (2011) pp. 129-136 in “Nuts and Seeds in Health and Disease Prevention”. DOI: [10.1016/B978-0-12-375688-6.10014-3](https://doi.org/10.1016/B978-0-12-375688-6.10014-3)

¹⁵ Jin Liu *et al.* (2018). *The whole chloroplast genome sequence of Macadamia tetraphylla* (Proteaceae) mitochondrial DNA .Part B 3(2). <https://www.tandfonline.com/doi/full/10.10180//238023802359.2018>.

¹⁶ Nock CJ *et al.* (March 2019). Wild origins of macadamia domestication identified through intraspecific chloroplast genome sequencing. *Frontiers in Plant Science* Vol 10: article 334.

Recommendations

I would be grateful if there could be discussion and some suggestions/solutions to achieve the following:

1. **Publicise the heritage value of the plantings** for residents and visitors to the area, including the landowners along the footpath planting.
2. **Consider the availability and merit of government protection status**, such as “significant trees” and seek advice from people with relevant experience or procedural knowledge.
3. Enlist **practical and ongoing support** to clear vines and mistletoe off the worst affected trees and improve their condition, either voluntary, funded, government-supported, or sponsored (or a mixture of these).
4. **Discuss trimming procedures** with energy transmission line maintenance office to give Macadamias trees a better chance to thrive.
5. **Include tissue samples** from the oldest trees in future sampling for genome analyses.

Conclusions

The trees are part of Mount Glorious history and represent an early step forward for the Macadamia development story in Australia. They have brought enjoyment to locals and tourists for many decades and could continue to do so.

This short report provides an introduction and brief description of the surviving Macadamia trees, but further study would be welcomed.

With over nine decades passing since the trees were planted as an experiment, this would be an ideal time to recognise and conserve the remaining trees so that they will survive for future centuries.

At the present time, just a small amount of effort could improve the viability of these trees. They will then provide ongoing, rare and valuable genetic information for use in future selections to maximise the commercial advantage of macadamia products.

Appendix – Individual Macadamia trees, Mount Glorious
Taken in May 2019, tree identification locations as shown on aerial map on P6.

Trees on north side of Mount Glorious Road (from west to east)



01 N
 West of café – also regrown stump in distance (star)



02 N
 West of café



03 N
 Front of café at phone booth



04 N
 Between café and Lindsay Road



05 N
 West corner Lindsay Road



06 N
 East corner Lindsay Road



07 N
 East side of Lindsay Road



08 N
 East side of Lindsay Road



09 N
 East side of Lindsay Road



10 N to 16 N approximately
 Hedge-trimmed for powerlines



10 N to 14 N approximately
 Some tall bits not trimmed



15 N
 Example within trimmed hedge



Example within trimmed hedge



Example closer to road, producing



Example trimmed regularly



West of no 1818 driveway



East of 1818 driveway



Example closer to main road corner (trimmed)

Trees on the south side of Mount Glorious Road (from west to east)



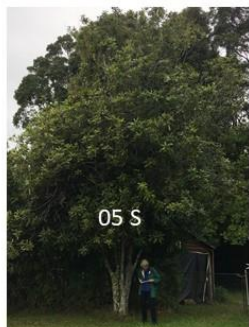
Opposite café – stone wall



Carter footpath west of gate



Carter footpath west of gate



Carter footpath east of gate



Carter footpath east of house



Carter footpath east of house



Carter footpath scrub



Carter footpath behind hoop pine



West corner new block built



Prolific tree on new block



East corner new block



West side of driveway



East side of driveway



Last tree before corner

Acknowledgments

The author wishes to thank the following people who have offered advice and assistance in preparing this report:

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