NEW ZEALAND
ARCHAEOLOGICAL
ASSOCIATION

ARCHAEOLOGY IN NEW ZEALAND

Archaeology and the Information Age

David Wilton
Volunteer, Coromandel Heritage Trust

Introduction

I would describe this as a *photo-article*, produced in an attempt to portray the high rate of change in the information technology world, and its relevance to archaeology. The article (pictorially) compares two key telecommunications technologies, some 140 years apart, but still providing the same basic physical-layer data services (i.e. a physical connection between two points which allows electrical current to flow: the electrical signals representing data, and information meaningful to humans).

My background in this field is two-fold: firstly, I worked most of my career in Information Technology (both telecommunications and computing). Secondly, I became interested in archaeology somewhat late in life (50s). A random decision to record the Old Wires (telegraph) Track in the Coromandel Ranges (Wilton 2010) led to the realisation that IT was another significant *material remains* domain that deserved archaeological study. Since then, I have studied, surveyed and/or recorded a number of IT sites and technologies, including visual communications, underwater cables and telegraph and telephone infrastructure. Recently, the laying of fibre optic cable around Thames and South Auckland, made me realise that this was another important information technology about to debut, and the roll-out needed to be recorded.

Background

A basic characteristic of living things is to *sense and respond to stimuli*. Thus, the collection, transmission and interpretation of data can be regarded as being as old as life itself! From the outset of human history (and pre-history), information technologies proliferated (Beers 2014); however, it is only since the discovery and harnessing of electrical power in the early 1800s that the so-called *Information Age* commenced. Probably the earliest electrical information technology was DC (direct current) telegraphy, which dates from around 1850. This allowed symbols, representing, for example, alphabetic characters, to be transmitted over metallic wires, tens or hundreds of kilometres long. About 20 years later, telephony (i.e. remote speech) was developed, and the roll-out of public telephone systems lagged telegraphy by about the same period, i.e. 20 years (Barber and Lord 1996). In recent times, transmission of the two forms of

communication have basically merged; being handled as digital streams which travel over the same carrier system (Meinell and Sack 2014). Some commentators define the commencement of the Information Age as being the 1950s, when the number of workers in the US primarily handling information in their jobs exceeded all other types of workers (e.g. industrial, agricultural). However, this is simplistic, and doesn't take into account the remarkable social effects that technologies such as telegraphy had during the industrial age of the 1800s - for example, time taken to pass messages to/from New Zealand from overseas went from days or weeks to minutes or hours (Robinson 1964). Another major milestone was the opening up of the Internet for commercial and personal use in the late 1980s. This network, or, 'network of networks', as it is often called, originated as a US Department of Defense research network in the 1960s, and some of the protocols developed in the 1970s (e.g. TCP) are still in use today (Wilton 2015).

One of the notable features since 1850 is the rate of change of information technologies. The Old Wires Track was completed in 1872, and was the final link in the (NZ) national telegraph network. Prior to its completion, messages were being carried across the 'gap' - the Coromandel Ranges - by horseback. In 1960, only 88 years later (and within an individual lifespan), NZ had a broadcast TV network and its first mainframe computer (Wilson 1994). Another 58 years on, fibre-optic cable is being laid in a nation-wide project. The remainder of this article will attempt to document the pace of change in information technology by comparing two specific telecommunications technologies: telegraph and fibre optics. It is hoped that it will also contribute to the archaeological record; particularly the recording of the fibre optic roll-out project. (All photos by the author, unless indicated).

Figure 1. ***Top****: Most telecommunications cables in the 19th and early 20th centuries were poled, i.e. above-ground. Manual methods were used, and working conditions were often difficult. (Auckland Library Heritage Image AWNS 19240417 p042)* ***Bottom****: Most modern cables (including fibre optics) are laid underground. This usually involves mechanical thrusting of a steerable probe up to 1-2m below ground level, over distances up to several hundreds of metres. The sun umbrella is not (primarily) to protect the operator from sunburn, but to stop bright light reflecting off the plasma display screens. Once the thrust is completed, a duct (as opposed to a cable) is attached to the probe and is drawn back through the tunnel. The cable is inserted in the duct later - see Fig 7 below. Photo: A. Barker.*

*Figure 2. **Left**: Thrusting. **Right**: Drawing duct back through thrust tunnel*

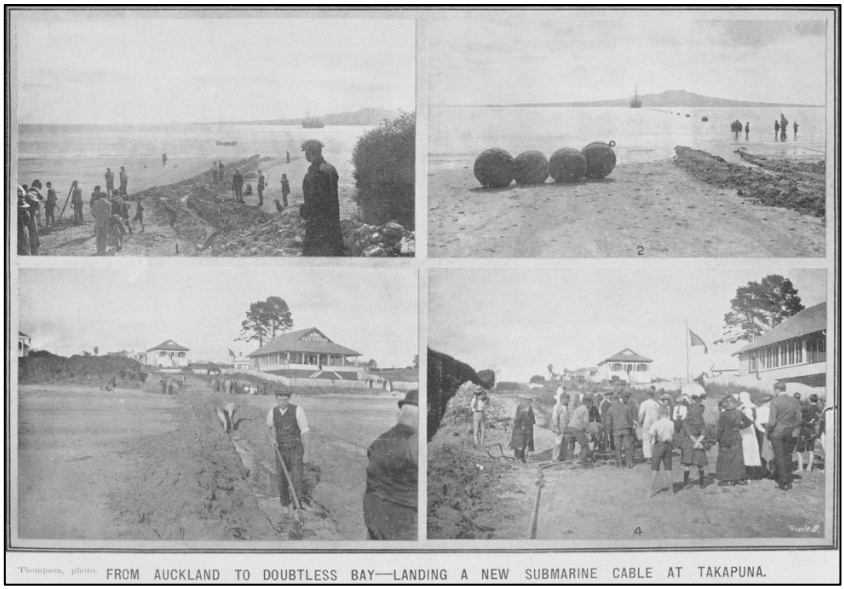

Figure 3. Submarine telegraph cable from Doubtless Bay (Northland) to Auckland being landed at Takapuna Beach (1912). The line was floated ashore, using standard fishing-net floats and was then buried in a shallow trench, dug manually in the sand. The cable extended an international route named the 'Red Line' (for British Commonwealth) - this particular line was laid from Vancouver to Norfolk Island, where it was split, with one leg going to the Gold Coast and the other to just north of Mangonui (a spot still known as Cable Bay, one of at least ten places with that name in NZ). (Auckland Library Heritage Images NZ Gazette 19121204 p0030)

*Figure 4. **Top**: Line construction camp near Dunedin, c.1885. Construction equipment consisted of picks, shovels, axes and temporary structures such as gins (three-legged temporary cranes). (Burton Bros photo, Te Papa on-line digital image collection). **Bottom**: Modern cable-laying and construction equipment (note the ubiquitous shovel is still used!). Despite the increased sophistication and labour-saving machinery, there is still a reasonable amount of environmental impact. Despite having detailed plans of other services in the area (the positions of which being indicated by colour-coded paint on the ground in advance), this particular crew managed to cut a water main, in the author's street in Wattle Downs. This produced a geyser 2-3m high and the water supply was cut for about three hours (Unfortunately, the author didn't have a camera when investigating!).*

*Figure 5. **Top**: 1870s telegraph cable from the Old Wires Track. It is effectively just steel No. 8 fencing wire. The join is a proper telecommunications join, with thin wire wrapped around overlapping sections of cable; the whole join then being welded or braised together (this prevents water getting between the conductors, which would increase resistance, and possibly affect communications properties). **Bottom**: Contemporary fibre optic duct, with one large and 26 smaller sub-ducts. Individual or multiple fibres can be drawn through all sub-ducts, although the larger centre tube is often filled with a non-fibre core to strengthen the cable. Not really obvious, but most large cables have two copper wires within the outer sheath - this is for fault-finding purposes. (A device called a megger is used to give an indication of how far along the line a break has been made - this doesn't work on fibre circuits).*

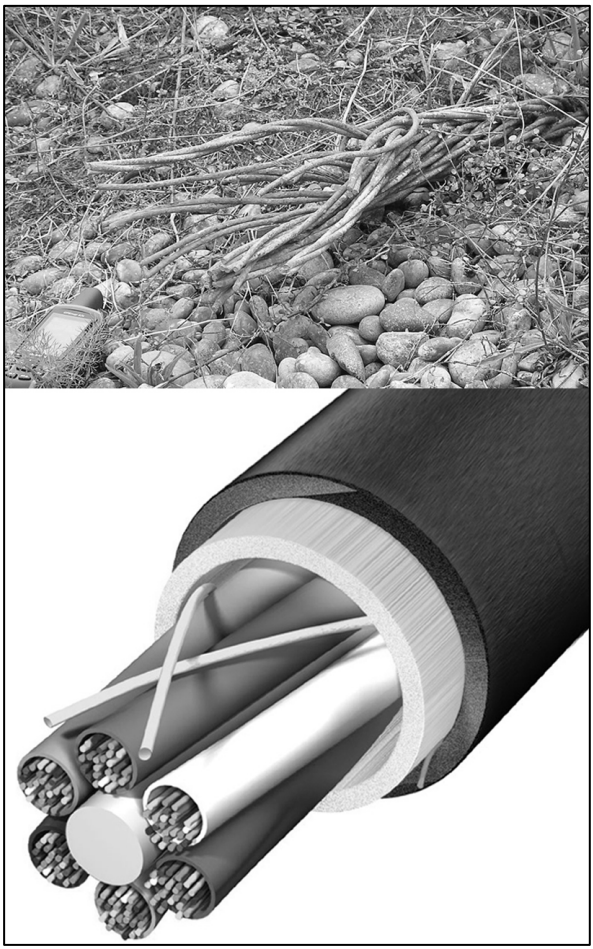

Figure 6. ***Top****: Cable coming ashore above the beach-line at Cable Bay, Puaka, near Nelson. Although there are multiple metallic strands, it appeared the cable was a single conductor; ie supported only a single telegraph circuit. There would have been a layer of insulation on the outside, but this has decomposed or been worn away. The cable may be part of NZ's first international telegraph circuit, to La Perouse in Sydney (completed 1876). However, there were other cables (including trans-Cook Strait) later terminating at the site.* ***Bottom****: Schematic view of individual fibres installed within a duct. The centre sub-duct has been filled with a strengthening core and the thin red wire between the insulation layers is probably the copper wire for fault-finding purposes. (Wikipedia)*

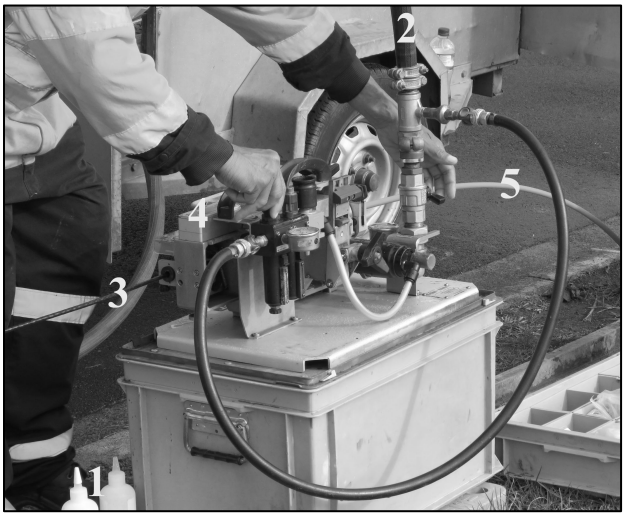

Figure 7. Individual (or multiple) fibres are installed in the ducts by 'blowing.' When ducts are installed, they are constructed to be air-tight. Lubricating gel is inserted from one end (1). A compressor on the back of the truck (2) raises an over-pressure in the duct. The fibre component (3) is fed between rollers (4) and into the duct (5). The fibre can be fed to a specific length, or until a 'stop' signal is received from the far end (this was being done by mobile phone, while the author was watching).

Figure 8. ***Left****: Final stages of cable installation on a pole; in this case, carrying multiple lines. This is probably a telephone installation, as telegraph wires that close would interfere with each other, at a high DC voltage. (Te Papa on-line digital image collection)* ***Right****: Restored telegraph pole on the Old Wires Track*

Figure 9. Although laying a fibre infrastructure underground tends to avoid visible environmental effects (top), it leads to a congested sub-surface (bottom) with attendant maintenance difficulties, and problems with future upgrades. (This is currently being experienced in many cities, with underground water and sewage reticulation requiring urgent replacement.)

Although fibre-optic technology is regarded as state-of-the-art, and is currently marketed extensively in NZ, it should be seen in the context of other information technologies, over the last 150 years or so. Many have come, blossomed (some with great social and economic benefits), then been overtaken by something bigger and better. Fibre is likely to be the same - the author predicts that within a few decades, some other technology (probably wireless) will have made fibre redundant, and the photos in this article will indeed become part of the archaeological record!

Acknowledgements

Grateful thanks to Althea Barker for supplying photos of Thames fibre-laying.

This paper is based on an article presented in The Treasury On-line Journal, June 2018.

References

Barber, L. and Lord, C. (1996). *Swift and Sure: A History of the Royal New Zealand Corps of Signals and Army Signalling in New Zealand*, New Zealand Signals Incorporated, Auckland.

Beers, W. (2014). Fire and Smoke: Ethnographic and Archaeological Evidence for Line-of-Sight Signaling in North America, *Papers of the Archaeological Society of New Mexico*, 23-32.

Meinell, C. and Sack, H. (2014). *Digital Communication: Communication, Multimedia, Security*, Springer.

Robinson, H. (1964). *A History of the Post Office in New Zealand*, R.E. Owen, Govt Printer, Wellington.

Wilson, A. C. (1994). *Wire and Wireless: A History of Telecommunications in New Zealand 1890-1987*, Dunmore Press, Palmerston North.

Wilton, D. (2010). NZAA Site Record T12/1347: The Old Wires Track: Hikutaia-Whangamata Telegraph Line (1872), NZ Archaeological Association, Wellington.

Wilton, D. (2015) Information Archaeology: an Archaeological Genre Whose Time Has Come? Two Cases Studies in "Early" Information Technology Download from https://massey.academia.edu/DavidWilton Accessed May 2018.