Session 6
Paper (d)

HARVEST PLANNING ON THE COROMANDEL PENINSULA

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PHYSICAL CHARACTERISTICS

The topography of the Coromandel region is characterised by rolling to steep terrain of volcanic origin, which has been subjected to massive, severe natural erosion. This process has resulted in a tortured and castellated topography which is bisected by many streams and deep gullies. The forested hill country gives way to fertile alluvial flats and numerous shallow estuaries along the coast.

The soils found in the area generally originate from the Whangamata or the Tairua-Waihi ash showers. The development of the soil distribution pattern has been influenced largely by the topography. On flattish areas deep ash beds have accumulated and generally remained intact except near streams. On intermediate slopes the depth of these beds varies from complete absence to several feet. On very steep slopes much of the ash is gone leaving only broken rock mixed with clay.

In addition to the Coromandel clays there are also minor areas of wind blown sand, while areas of peat and alluvium have also been formed. There are the occasional pockets of "rotten pumice", swamp, rock outcrops, razor back ridges and truncated spurs, all of which cause problems when planning and executing harvesting operations.

The climate of the area is characterised by frequent high intensity but highly localised rain storms, often of tropical origin. The return period for a rainfall event of 133mm in 24 hrs is estimated to be only 2 years.

Because of this climatic pattern and the soil types of the area, mass movement erosion is always a threat.

THE FOREST RESOURCE

There is approximately 21,500 hectares of stocked Forest in Coromandel area, with 91% of this being *P. radiata*. The age class distribution for radiata pine is skewed markedly to the left with less than five percent of the resource over 30 years of age. "Other Softwoods", by comparison, have 75 percent of their total over 30, see graph 1.

The State holdings are shown in table 1 and account for around 78 percent of the total resource. Graph 2 shows a possible clearfell scenario for the State radiata holdings of the area. A dramatic increase in production is forecast for the region over the next decade with the estimated number of logging crews required increasing from the current two gangs to around seven or eight full time hauler operations.

LOGGING SYSTEMS

Currently the State has two full time contract Logging crews working in Tairua Forest. Mike Pomare has a Ground based system while Ross Sutton has a Madill 071 Hauler gang.

The Ground based operation has been used to log most of the flat basins and to pull roadlines. However the majority of the areas coming on stream

GRAPH 1

NET PRODUCTIVE STOCKED AREA

Coromandel (as at 1/4/87)

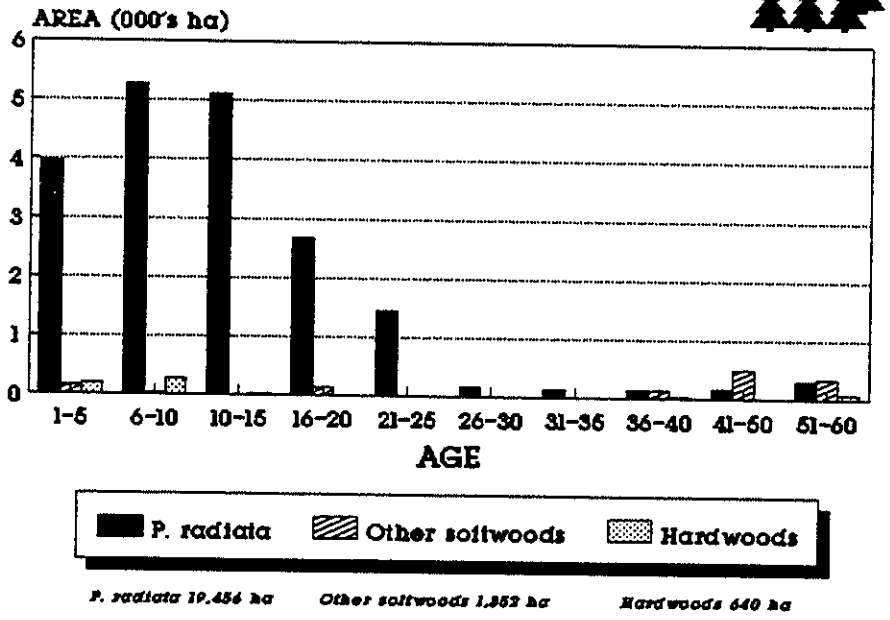


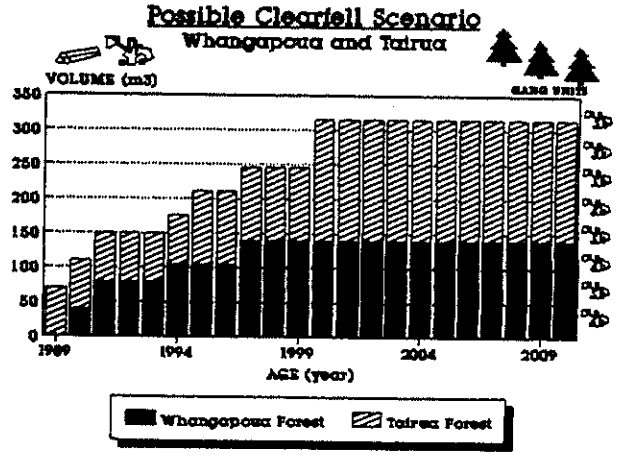
TABLE 1

EXOTIC RESOURCE

Source - A National Exotic Forest Description System

TOTAL STOCKED AREA	**21,500 ha**	
Radiata	*19,500 ha*	*(91%)*
Other Exotic Softwoods	*1,350 ha*	*(6%)*
Hardwoods	*650 ha*	*(3%)*
TAIRUA FOREST		
Radiata	*8,058 ha*	
Other Exotic Softwoods	*967 ha*	
Hardwoods	*264 ha*	
WHANGAPOUA FOREST		
Radiata	*7,586 ha*	

GRAPH 2



in the near future will be in "Hauler country". The last major areas of Tractor logging are predominantly stocked in southern pines at Tairua Forest, while Whangapoua Forest has only isolated areas suitable for Ground based systems.

The Madill 071 has proved to be the most suitable machine for the current logging operations. It is suited to the Coromandel topography as it operates a skyline system providing the deflection necessary to harvest much of the area. It is capable of holding 500 metres of Skyline allowing reduced road densities in country where road construction is both difficult and expensive. This machine is of medium size and is therefore suitable for the "transition" and "new" crop which are currently being logged. It is capable of operating on relatively small landings when required, thus allowing greater flexibility when planning the operations.

The main draw backs with the system as it exists at present include the relatively smalltower of the 071, and the use of a rubber tyred loader with the Hauler. It is thought that an additional couple of metres of height on the tower would increase the productivity of this machine and increase the options available for skid placement. The introduction of a knuckle boom loader would appear, according to the latest research, to allow the system to work on smaller landings and with increased efficiency.

Until recently there was also a Madill 009 working in Tairua Forest. However with the diminishing volume of mature radiata pine in the Forest, and consequently a reduced level of cut, the smaller average piece size of the younger crop now being logged and the requirement for skyline systems with the capability of reaching 450 - 500 metres on settings, the large 009 was considered to be unsuitable for current and future requirements.

CONSTRAINTS ON HARVESTING

The main constraint on Logging operations in the Coromandel area is the Physical environment. The topography of the region is the major determinant of road and skid location and also of the logging systems which can successfully be used in any given area.

Because of the high intensity rainfall, the associated soil saturation, the increase in run-off and consequent loss of soil cohesion, there is always the possibility of flooding and downstream siltation. This process could be accelerated by insensitive logging practices.

Several major catchments drain from Tairua Forest into the Whangamata and Wharekawa harbours, and at Whangapoua Forest, six main water courses drain into the Whangapoua Harbour. This harbour has been identified as suitable to be registered as a Protected Marine Area by the Department of Conservation.

Generally the distance from a catchment head to the point where it joins into a harbour or estuary is very short, typically only three to four kilometres. Therefore any operations carried out in the catchment are immediately impacting on the estuarine flora and fauna.

An important wetland has also been identified by the Department of Conservation on the Waingaro Stream. Therefore any activity likely to increase the sources of sediment in this Forest requires careful planning and management.

Another concern for many people in the area is the effect harvesting and roading has on the environment through the release of soluble sulphate salts from the soils. Exposure of the soils to air causes oxidation of some minerals which can turn the ground and surface water acidic.

The orange colour seen in many Coromandel streams is caused by this iron-hydroxide "flock", and has an adverse effect on aquatic life.

Another major constraint on logging in the area is the age-class distribution and species mix of the resource, particularly at Tairua. The annual radiata volume cut is greater than that which one Logging crew could hope to harvest under the Coromandel conditions, however it is not great enough to sustain two full time crews. Therefore, to keep both logging crews producing wood at an acceptable unit rate of cost, Timberlands must rely on harvesting some of the "Other Species" present.

The market for other pine species is not strong. A large proportion of this material is only suitable for pulp. Some butt logs are acceptable for peelers and a few smaller mills use the sawlogs for low grade products, however the stumpage achieved is not great. This means that a certain amount of the logging at Tairua serves primarily as a "negative cost" land clearing operation.

Export is another option for the non radiata species, however the low quality of a large proportion of the resource, the distance to Mt Maunganui, the poor "storage" characteristics of some species and the fact that the Chinese market is now effectively closed means that this is a less than optimal solution.

Another problem often faced at Tairua is that a significant proportion of the mature radiata stands are the remains of previously logged areas. It appears that large areas of the Tairua "Old Crop" were harvested with very little of the planning at the time focusing on how the remaining areas would be logged.

These remnant stands are often those areas which contained the poorer quality trees, are in the difficult to reach compartments, are stocked with more than one species or are located where roading is difficult.

Consequently harvesting is now often located in small, difficult settings and frequently surrounded by immature radiata stands. These constraints reduce the options available for harvest planning and increase the costs of the operations. Small settings usually mean that landings are under-utilised. Often, with the wisdom of hindsight, it is apparent that better placement of the skidsites when the original logging was conducted could have reduced the total number of landings required now. Hauler settings surrounded by immature stands of radiata are less than ideal as the location of anchor points becomes a problem, and the installation of Deadmen is an expensive and often difficult option.

Roading in the Tairua terrain is usually an expensive operation. At present the construction of additional logging roads is occasionally necessary because of the location of some of the earlier roads. These were planned to allow the harvest of the immediately utilisable resource, however they are not always suitable for the logging of the residual stands in the same area.

Another major expense of logging in the Coromandel is the cost of road maintenance. To allow all season truck access, considerable quantities of metal must be used particularly in the "wet season".
The size of the market, the distance to this market and the scale of the logging operation all create problems when planning for harvest. The loss or closure of one customer, no matter how small, can have a very real impact on the economics of the logging operation, both to the Forest owner and the Contractor.

There is very little flexibility in scheduling uplift or in quitting any over-production. Therefore the contractors are sometimes operating on a quota rather than a true "target", as over production can not be absorbed into the relatively small production volume from the Forest. This means that the actual cost of logging an area could increase above that theoretically possible, because full production cannot always be sold. Therefore a careful balance must be maintained between the volume of production from individual crews within a single Forest and also the total production from other Forests feeding that same market.

THE COROMANDEL CHALLENGE

The challenge is to profitably market, harvest and re-establish the tree crop in a manner which is environmentally acceptable to all parties.

The Coromandel region has several well organised, intelligent, and vocal "Watchdog" groups which will take a great deal of interest in the Harvest activities at Whangapoua when it comes on stream. Forest activities are also subject to section 34 notices from the Hauraki Catchment Board and therefore considerable care must be exercised in the planning and execution of all operations.

Logging over the next five years at Tairua will be occurring directly behind Whangamata township where the population swells to around 60,000 people over the summer period. The consideration of the visual impact of the Harvest operations in this area is therefore very important, as many of these holiday residents are not familiar with Forest operations. The public are used to seeing a background of fully forested hills, patches of bare cut-over and roading scars will be very visible and possibly not welcomed.

PLANNING TO AVOID PROBLEMS

To help minimise any problems and undoubted protest by the locals at Whangapoua Forest, Auckland District decided to seek help from the Forest Research Institute with the initial harvest planning of Whangapoua Forest. This approach:

i) Allowed the planning of a sizeable block of Forest ensuring that a "near optimal" strategy was developed for the total area.

ii) Allowed the use of various experts in the different fields of harvest planning thus giving credibility to our planning.

iii) Showed that Timberlands is concerned about the environment and had consulted the experts for advice.

iv) Overcame a shortage of manpower and allowed the planning to be carried out with minimal time delays.

v) Allowed the use of computer technology to test possible setting layouts well in advance of any construction.

vi) Drew on a wider pool of knowledge and experience than was currently available within our own organisation.

The first step in this planning exercise was to contact the Forest Land-Use Impacts Section of the Forestry Research Centre. This group was commissioned to produce a report identifying the environmental impacts likely to be associated with the logging and to suggest guidelines to minimise the impact of harvesting on these values.

The report identified the main values likely to be affected by harvesting as:

i) The highly productive alluvial farmlands and coastal flats.

ii) Whangapoua harbour

iii) The Waingaro wetland

iv) The quantity and quality of water available to Matarangi Beach housing development.

v) Significant populations of uncommon forest and wetland birds

vi) Two species of a rare native frog.

The guidelines developed as a result included:

i) Logging by hauler operating upslope to ridge-top landings on slopes > 12 degrees.

ii) Coupe size to be governed by landing site and use of riparian reserves as boundaries.

iii) Initial logging to use existing roads; new roading to follow ridge-tops where possible.

iv) Riparian strips on all significant watercourses.

v) Harvesting to break up large age-class plantings in steep headwater areas to reduce the impact of streams coalescing on the flood plain.

vi) Harvesting to be restricted in any one major catchment to ensure that adequate cover is maintained.

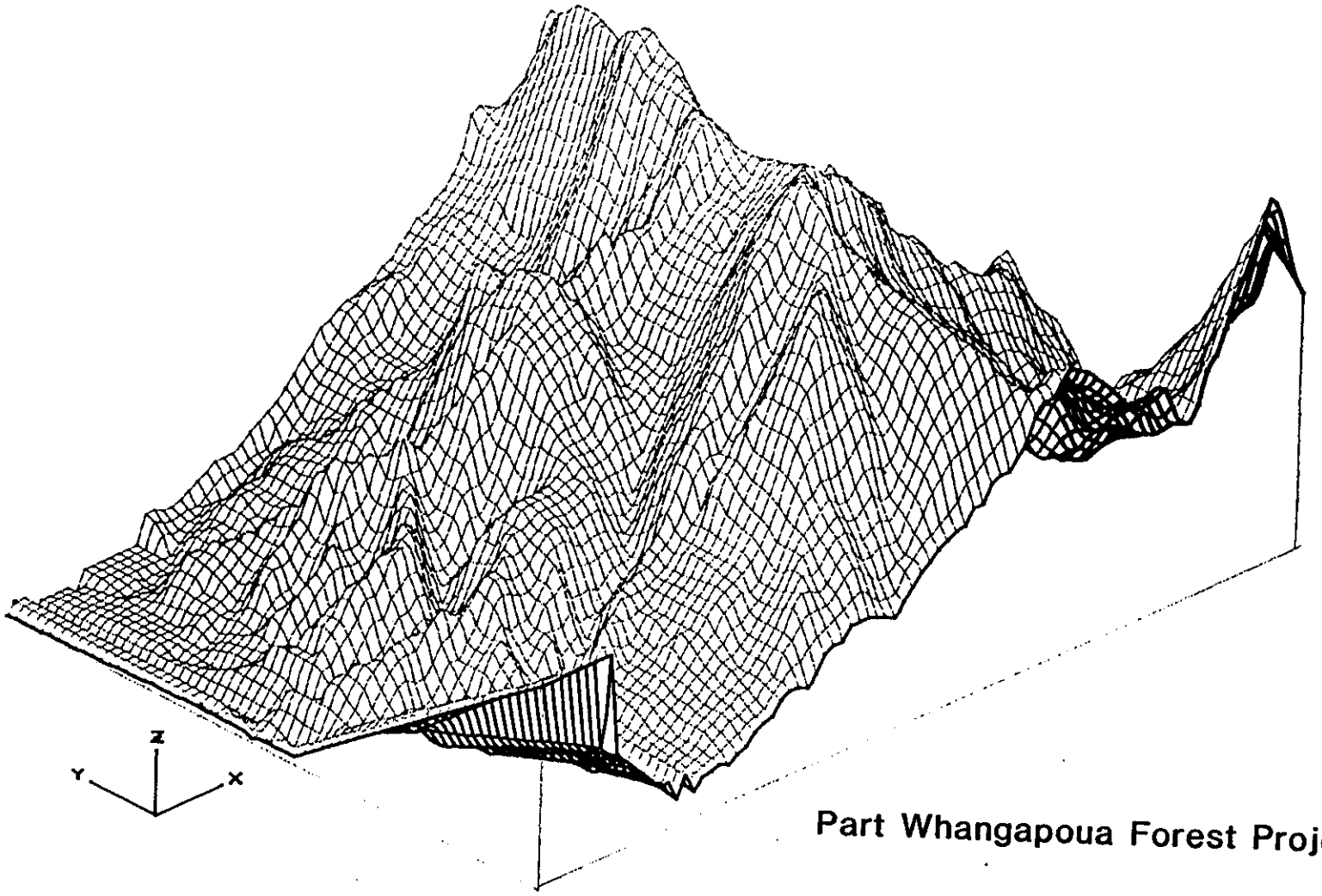
Once this report had been completed, the Harvest Planning Group at FRI developed a least cost and lowest impact harvest plan within the constraints identified.

A major tool used in the development of the plan was the computer based Cable Hauler Planning Package (CHPP). Relevant topographical maps were digitised to produce Digital Terrain Maps (DTM) of the area see figure 1. Once the topographical information had been entered, profiles could then be run from all potential skid locations. This allowed the analysis of such parameters as extraction limits in terms of both volume and distance (figure 2). Considerable time was spent on the ground verifying and checking the maps to ensure that a true representation of the area was achieved in each case.

The main advantage of the CHPP is that it allows quick checking of numerous profiles from a landing varying such parameters as tail hold and tower height or even the effect of moving the proposed skid to a new location. The plan presented to Timberlands includes maps of each setting and skid location, the average haul distance and maximum haul distance for each setting and an indication of any potential problem areas within the setting which may need tail trees to be rigged, or the skyline anchored beyond the setting boundary. A spreadsheet driven setting schedule was developed which allows easy rescheduling of settings if market or operational conditions change. It also keeps track of the percentage of each of the three major catchments which are scheduled to be clearfelled over the five year period.

A madill 171 or similar was selected as the appropriate machine for the Forest. This was based on the height of the tower and the general machine specifications. It meant that a fairly low intensity road network could be used while machine productivity could still be expected to be high.

Graphical Presentation of a DTM



Part Whangapoua Forest Project Area

Z: 18.0 TO 280.0

FIGURE 1

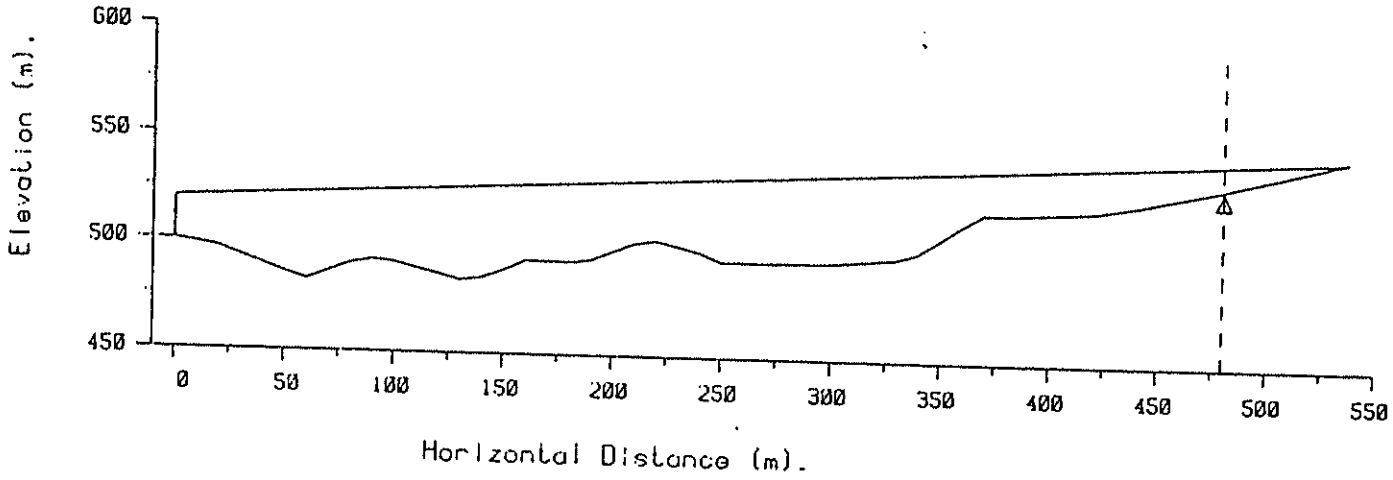
EXAMPLE PROFILE

Landing # X Profile # Y

2.8 cubic metres can be hauled over the first 480 metres of the profile.

The tail tree is at 537 metres.

The ground point limiting the haul volume is at 480 metres.



Ground profile with skyline chord plotted to the tail tree location with the greatest haul distance

FIGURE 3

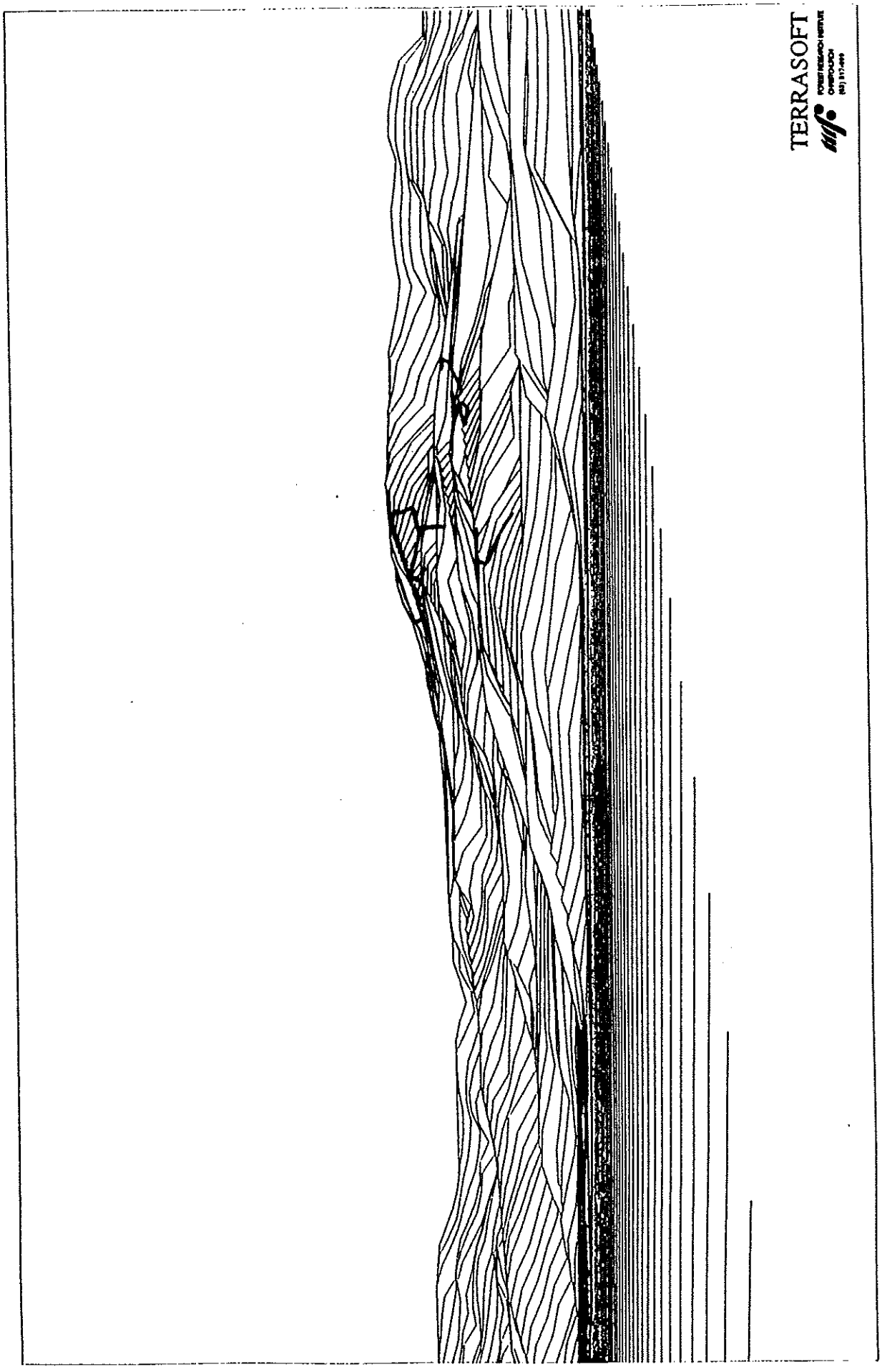
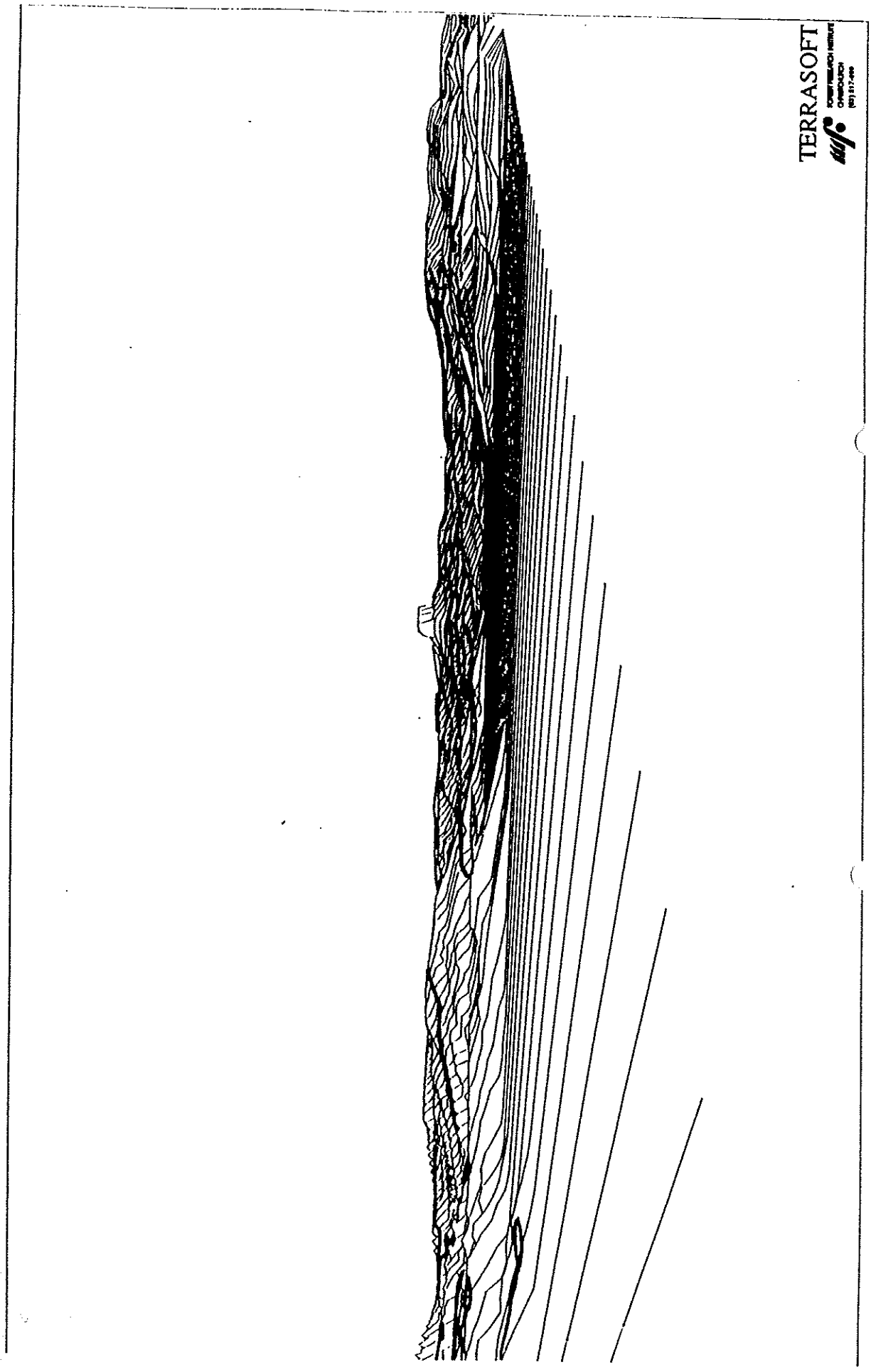

TERRASOFT
Whangapoua Forest - Coromandel
View from State Highway 25 (Alt 75m asl.)
looking south-west towards compartments 5, 6 and 7

FIGURE 4



Whangaoua Forest - Coromandel
View from State Highway 25 (Alt. 75m asl.)
looking south-west towards Castle Rock

If a machine such as the Madill 071 was used, additional roading would be necessary as the shorter tower would reduce potential deflection, and therefore payload, on many of the settings.

Logging costs were estimated based on a new Madill for the main extraction unit and productivity figures derived from some work carried out by R. Prebble in Oregon. Roading and Skid construction and maintenance costs were estimated based on Tairua Forest.

Roading is visually one of the most distinctive features of a harvesting operation. Therefore viewplots were prepared by thew FRC Land-Use Impacts Group using the TERRASOFT computer package see figures 3 & 4. These allow the determination of the visual impacts of proposed roads, landings, and harvest boundaries.

CONCLUSIONS

Over the next decade a large number of "new" areas are going to come on stream for harvesting. Many of these areas are steep and will have environmental constraints similar to those found in the Coromandel. A few lessons can be learned from the experiences in the Coromandel.

1/ Correct and thorough planning of all harvest related activities is absolutely necessary in environmentally sensitive areas. If the Industry wishes to be able to operate with minimal constraints placed upon it from external bodies, then it must be seen to be acting in a responsible manner. More and more people are becoming aware of their environment and most are experts on how it should be managed.

Other benefits which flow from this level of planning include:

i) Reduced costs of logging. By carrying out an economic analysis of the various options identified at the planning stage, it is possible to settle upon the best combination of multiple time period roading and extraction costs which will minimise total harvest costs.

ii) A better level of understanding of the problems being faced by the Contractor at any given time.

iii) The ability to anticipate any problems and take the necessary action to minimise the impact.

2/ The use of computer based tools such as the Cable Hauler Planning Package, LOGGERPC, PROYARDER, Network analysis and spreadsheets allow a much greater level of detail to be included in the planning phase. However Field inspection is still vitally important especially where the planner has relied heavily on topographic maps in developing the plan. The results of computer analysis can only be as accurate as the maps themselves.

To make use of these tools a far greater emphasis must be placed on training the planners. Courses such as the NZFEI and the Harvest planning course must be supported by the industry to ensure enough people have the necessary skills for future planning. As the terrain becomes more difficult, so too does the logging planning.

3/ More care must be given to road location and construction methods. Greater use of trained engineers will be necessary in many areas to allow minimal impact roading. The requirement for roads to be located on ridge tops will generally mean steeper grades. To allow trucks

passage over these roads better gradability will be required. This can be achieved by:

i) Improved surface drainage
ii) Better running surfaces
iii) Minimal bends and optimal super elevation.
iv) Use of optimal Rig configurations
v) Reduced truck tyre pressures

4/ Harvesting is going to cost more in the future. Road and Skid construction in steep rock and clay soils is very expensive. Hauler logging equipment is expensive to purchase and operate. Many of the machines currently operating in New Zealand are old and near the end of their economic life. To purchase new technology machines with the required configuration, tower heights and line speeds, Contractors are going to require the support of the Forest Companies. Although expensive these machines are capable of very high production rates if the planning and execution of the operation is well thought out.

5/ Logging Contractors are going to have to work more closely with the harvest planners to ensure optimal gang productivity. A greater understanding of the advantages and disadvantages of various logging systems and equipment, particularly carriages will be necessary to achieve the levels of productivity needed to allow economic harvesting of many areas.