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Water and Soil Guideline for Pipeline Easements

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This publication outlines the procedures used by the Pipline Project of the Ministry of Works and Development in locating, constructing and reinstating a pipeline. Topics discussed include locating a line, legal requirements, construction, trenching and backfill procedures, and reinstatement and maintenance of a pipeline. It is written for those directly involved in laying a line and emphasises techniques recommended for the reinstatement and maintenance stages.

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MANAGEMENT GUIDELINES FOR PIPELINE EASEMENTS

INTRODUCTION

Since 1966 the Pipeline Project of the Ministry of Works and Development has laid between 1200 and 1300 km of pipe across a wide variety of terrain. Many more kilometres are likely to be laid in the years ahead.

In that time working procedures have been developed to make this process efficient, effective and sensitive to the needs of all parties involved, from the landowners, contractors, local bodies and others through to the clients. Laying a pipeline is not simply a matter of digging a trench, installing the pipe and filling in the hole. After the decision has been made to run a pipeline between two sites, the precise location of the line must be determined. This involves physical considerations and consultation with those who are likely to be affected.

Once a pipeline route is settled on, access, construction and reinstatement problems must be solved. Finally, maintenance of the easement should be an ongoing concern.

This publication outlines the installation procedures now used by the Pipeline Project. It is aimed at helping those directly involved in laying a line to appreciate their roles and rights in achieving a safe and functional end product. It complements the reports *A Guide to the Petroleum Pipeline Procedures* of the Ministry of Energy and *Environmental Guidelines for Gas and Petroleum Pipelines* of the Commission for the Environment[1] by discussing the restoration and easement maintenance procedures in more detail.

LOCATION OF THE LINE

When locating a pipeline route the major factors to consider are the safety of the public and pipeline, construction costs, and environmental and landowner considerations.

The first objective is to determine the practical routes. This is most easily done from a study of the appropriate maps, including topographical, cadastral, soil and land use capability maps. Routes can then be studied from the air and finally on the ground. Especially difficult sections such as river, road and rail crossings, steep and unstable areas, sections of rock and swamps are subject to special studies.

There are a number of groups, organisations and Government departments who are consulted for possible problems. These include landowners and the local offices of:

Ministry of Agriculture and Fisheries;

NZ Forest Service;

DSIR, Geological Survey and Soil Bureau;

Department of Lands and Survey;

Department of Internal Affairs, Wildlife Service;

Railways Corporation;

Ministry of Works and Development;

Department of Maori Affairs;

catchment authorities;

NZ Historic Places Trust;

Federated Farmers of NZ;

territorial local authorities.

Most of these will also submit comments for any environmental report. Early consultation will assist and speed up pipeline location and authorisation.

The line can then be pegged, surveyed and discussed with landowners and anyone else who may have specific interests that will need to be considered during and after construction.

1. These are available free from the Secretary, Ministry of Energy, Private Bag, Wellington, Attention: Oil and Gas Division; and the Commissioner, Commission for the Environment, P O Box 10–241, Wellington, respectively.

LEGAL AND OTHER REQUIREMENTS

The rights and requirements of those involved in the construction, operation and maintenance of a pipeline—landowner, contractor, Government and others—are outlined in the Petroleum Act 1937.

ACCESS TO LAND

Access to land may be required for investigation or for construction. The Act allows access to land for preliminary investigations, route location and engineering survey works. If reasonable notice is given to the landowner, officers who hold a survey warrant may enter onto the land, with the necessary equipment and assistance, to carry out preliminary investigations. There is provision in the Act for compensation to be paid to landowners who suffer loss or damage through this activity.

There are two methods by which access can be gained to carry out construction.

Consent

The Act allows holders of a Pipeline Authorisation to enter into an agreement with landowners for access to land for construction purposes.

If agreement cannot be reached, the authorisation holder may apply to the Minister of Energy for an Easement Certificate. This will give the holder a legal right to enter onto the land to carry out construction. The holder of the authorisation must first satisfy the Minister that he has made reasonable efforts to reach agreement but has not been able to do so. A landowner cannot withhold consent merely because agreement has not been reached on compensation.

Middle Line Notice

If a proposed pipeline is designated "of national importance", a notice defining the centre line of the pipeline may be gazetted and registered against titles to the land affected. This, subject to notice being given to landowners, allows a legal right of entry for construction purposes.

The effect of a Middle Line Notice is to define the centre line of the pipeline and an area 100 m on either side. Construction may not exceed an area 30 m wide, within the 200 m strip, without the prior consent of the Secretary of Energy. The authorisation holder and the landowner may agree on the provision of extra working areas where necessary.

The above methods enable entry to be gained to land from a legal road. If the terrain prevents movement along the easement, the authorisation holder may reach an agreement with the landowner to use private accessways.

WATER RIGHTS

The authorisation holder should approach the appropriate regional water board(s) to obtain the necessary rights to interfere with any water bodies along the chosen route.

EASEMENTS

When the work is finished the authorisation holder must prepare legal survey plans defining the final position of the pipeline. From these plans easement certificates or transfer documents are prepared and registered against the title to the land. All plans approved and held by the chief surveyor are available for examination at the map counter in the District Office of the Department of Lands and Survey.

If the pipeline has been constructed under the authority of a Middle Line Notice, this is cancelled on registration of the easement document. The easement certificate outlines the restrictions over the easement area which are intended to protect the pipeline.

COMPENSATION

Landowners are paid compensation for all loss and/or damage arising out of the construction of the pipeline through their land. Compensation is paid not only for the acquisition of the easement but also for disturbance losses, such as loss of grazing, loss of production and loss of hay for the period from the date of entry until it is expected that full pasture recovery will be achieved, which is usually 2 to 3 years after completion of reinstatement.

Landowners can seek both valuation and legal advice about claims and are entitled to reimbursement for reasonable costs incurred in obtaining this advice.

LIAISON

The Pipeline Project of Ministry of Works and Development tries to ensure that, as early as possible, landowners are fully informed about what is happening, why it is happening and, if possible, when and how it is happening. Project staff will inform landowners of all their rights and entitlements.

As early as possible, a liaison officer will call on landowners and lessees to advise them of what is happening. Closer to construction, the officer will call again to discuss the likely effects the work will have on farming operations and try to ensure that steps are taken to minimise disturbance. The liaison officer is on call during the construction period and contact phone numbers of both the contractor and the liaison officer are made available to the landowner or occupier.

After restoration has been completed the liaison officer will call on the landowner to discuss compensation. Usually, agreement is reached and arrangements are made for payment.

Often a further call on the landowner is needed to obtain his or her signature on a formal transfer document which will grant the pipeline authorisation holder an easement across the land.

RIGHT-OF-WAY CONSTRUCTION

The construction of the right-of-way (ROW) is important for the smooth operation of other construction phases, especially the restoration.

Initially the project engineer and the contractor walk the line to determine problem areas, realignments, material requirements such as culverts and logs for swamp crossings, off ROW access, and where areas of extra land are needed at critical points such as road, railway and river crossings.

Topsoil Treatment

In constructing the ROW the topsoil, in almost all cases, is stripped to 300 mm or the depth of topsoil, whichever is less. In swamps and very steep hillsides soil movement must be kept to a minimum. In these places it may be better not to strip topsoil.

Stripped topsoil is stockpiled to prevent mixing, during construction, with subsoil and to reduce losses through erosion. This is most effectively done by having the machines stockpile the topsoil on the working side while trenching material goes on the other. This also helps restrict operations to the ROW. Care must be taken to ensure that the stockpile is not crossed by machines and vehicles operating within the ROW, causing it to be flattened and distributed over a wide area so that it is contaminated or lost from further use.

If topsoil is lost or its structure damaged by overworking, compaction, or being worked when wet, an adequate vegetative cover is very difficult to re-establish and long-term soil problems can develop. This effect of loss or damage to topsoil is compounded each

time another pipeline is put in the same easement as an existing line. If care is not taken long-term damage can quickly result. Formation of the ROW should endeavour to keep soil movement to a minimum.

Where major cut operations are necessary care must be taken to ensure that the excess material is safely stockpiled and not just pushed over the side in a "cut and side-cast" operation. Spill material is unstable and can cause erosion problems with associated downstream sediment problems. Sediment traps may have to be built, watercourses, dams and water supplies cleaned out, and landowners compensated for silt damage.

Suitable stockpile areas should be sorted out before construction begins. They must be on dry stable ground and existing slips must not be loaded to create further problems. Where cut and stockpile operations are on very difficult sites, careful consideration should be given to whether reinstatement should be made to follow the contours that previously existed. In some cases it might be prudent to adopt easier, more stable contours with a view to enhancing the stability of the country traversed.

Adequate subsoil and surface drainage should be installed to ensure the material is kept reasonably dry and is not eroded.

The topsoil should be stripped from the site for the trenching material stockpile, the subsoil material brought in compacted in layers and, if it is to be a permanent site, topsoil spread and regrassed as soon as possible.

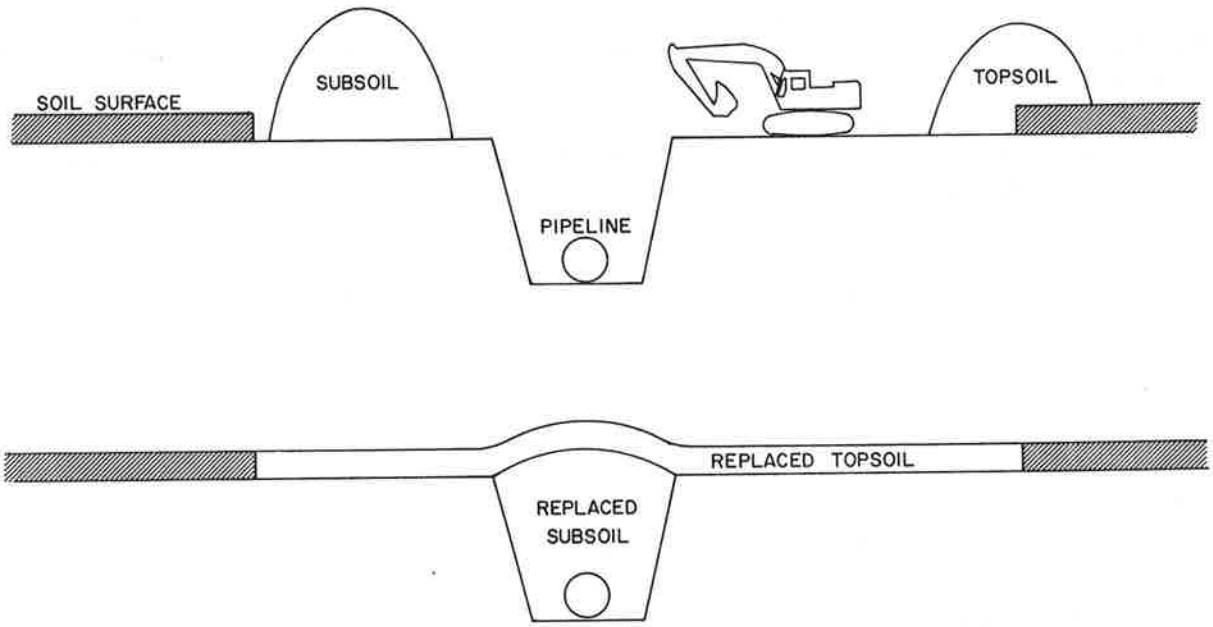


Figure 1: The recommended procedure for stripping, stockpiling and replacing topsoil and subsoil.

Water Control

Control of water on the ROW during construction is necessary if erosion is to be kept to a minimum and construction problems reduced. If the ROW is not damaged and dries quickly after heavy rain, construction delays, if any, are minimised.

Culverts should be laid in all small watercourses that carry water or will carry water after rain so that vehicles have access without running through the watercourse.

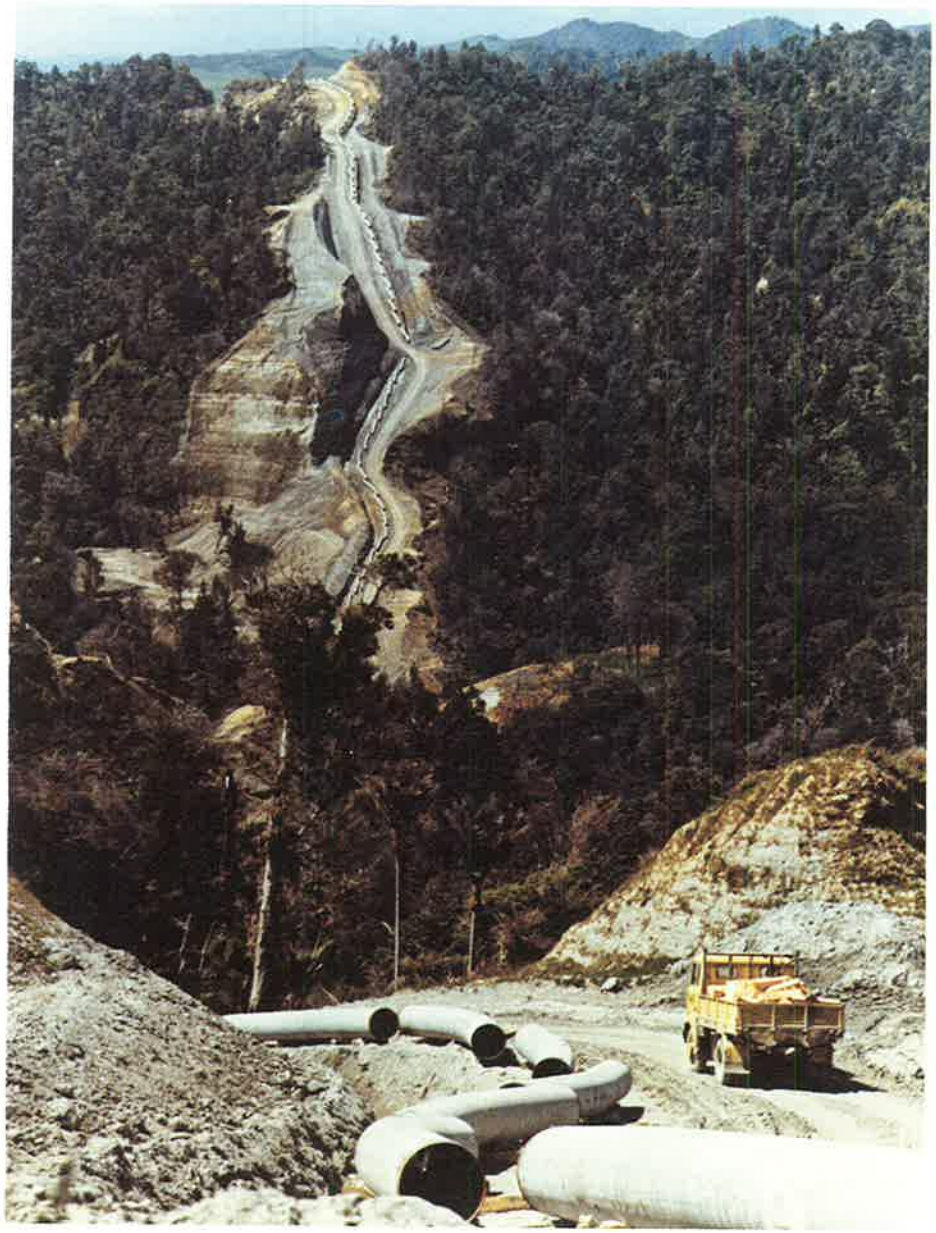
The culverts must be long enough to adequately span the accessway so that material from the ROW does not block them. Logs should be laid at right angles to the culvert to support material above the culvert.

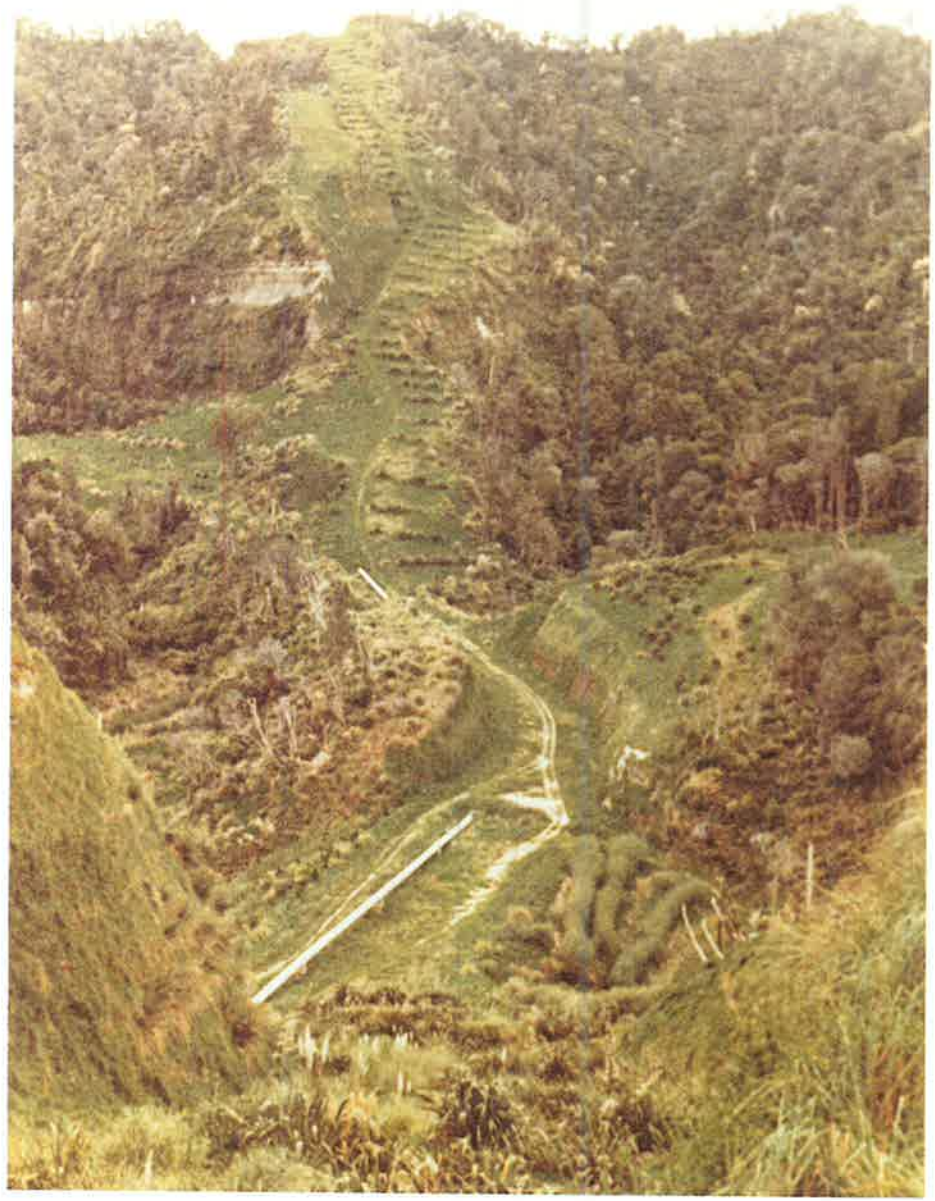
Figure 2: McKee oil lines near New Plymouth, 1984. Note the stockpile of topsoil on one side and trenching material of subsoil on the other, with the trench and the right-of-way between. Access to the right-of-way is had by leaving a gap in the stockpile of subsoil and a plug in the trench.

Figure 3: Kinleith—Kawerau natural gas line, 1982. At problem points, such as stream crossings, extra working areas must be allowed for. If they are not, then stripped topsoil may be lost and restoration become difficult.

Figure 4: A section of the Hawkes Bay natural gas line being laid near Ashhurst, 1983. Note the problems of using a restricted right-of-way through areas of cropping. Vehicles damage the topsoil by using it to gain access to the line.

Figure 5: Kinleith—Kawerau natural gas line, 1982. Foam breakers can be used to stop water flowing down the trench and to support backfill material.





Figures 6 and 7: During (1977) and after (1982). The Maui gas pipeline at Whitecliffs, north of New Plymouth.

Figure 8: Port loading line, New Plymouth, 1983. This face was difficult to reinstate. The top section, which is sand, was covered with plastic mesh and a wood fibre mulch and then seeded. The lower section was hydroseeded. The bench drains were planted with flax.

Culvert capacity must be adequate to take normal flood flows. Single large culverts are best, but if several smaller ones are to be used they should be in two tiers so that under normal flow conditions the lower pipes take the flow. The upper pipes act as overflows when high flows occur or the lower pipes become blocked.

Care must be taken to ensure that topsoil stockpiles and trenching activities do not block water channels.

Cut-off drains, (see appendix for design) should be put on all long, steep slopes especially near streams where downstream water users may be affected. They should not, if at all possible, cross or end in fill areas. If this cannot be avoided, suitable flumes or long, plastic tubing should be installed to prevent scouring.

Downstream water users should be notified when activities at streams are likely to cause discoloration. Lists of downstream water users can be obtained from the regional water board.

Maintenance of the ROW during and after construction is important both for reduction of downstream effects and to reduce construction problems.

TRENCHING AND BACKFILL

Trenching material must be kept separate from stockpiled topsoil.

Normal trench excavation should ensure a minimum cover of 1 m over the pipe. At stream, drain and swamp crossings a minimum cover of 1.5 m is required unless otherwise specified. The cover is normally measured from ground level but if the material is fill or unconsolidated ground, such as a swamp, or likely to scour then the point from which minimum depths are measured may be well below the ground surface.

At streams and rivers the minimum cover to present bed level should be maintained for the full width of the watercourse so that future stream bed changes do not endanger the buried pipeline.

In areas where horticulture is likely to be carried out a minimum cover of 2 m should be maintained so that restrictions on planting of trees and shrubs near the line are kept to a minimum. (Restrictions are imposed to protect the pipe coating from plant root damage.)

During trenching any tile or plastic drains that are cut should be temporarily reconnected and the position of the drain recorded, and marked at the sides of the ROW, so that after restoration the position can be determined. Alternatively, the exposed ends of drains may be adequately closed to prevent the entry of dirt and silt and possible subsequent blockages. All affected drains must be tested in the presence of the owner after reinstatement.

When the trench is backfilled, subsoil drains are to be relaid and supported on a solid structure, such as a timber or steel beam suitably bedded in firm ground, so that any settlement in the trench does not affect the grade of the drain. Once restoration is complete subsoil drains should be tested between points on either side of the ROW.

Backfill material should be compacted to a standard of compaction similar to that of the surrounding ground.

Where the pipeline traverses locations where scouring or washouts may occur, or where backfill is likely to be unstable (because of the presence of water, the nature of the backfill or the steepness of the slope), backfill retaining structures, such as soil-filled sacks or timber structures, are required.

Where porous padding material, such as coarse sand, is used the trench can act as a drainage channel with water coming to the surface at low spots. In these cases, clay plugs should be incorporated into the trench to prevent this flow.

A common problem is water running down the trench line and surfacing at low points such as stream banks. If this is likely to occur, subsoil drainage behind retaining structures under the pipe will be required. It is much easier to put these in at restoration than to try to fix the problem later. The retaining structures can be constructed from cement, soil bags or timber. These should be fixed into solid ground on either side of the trench.

REINSTATEMENT

The land should be reinstated, as nearly as practicable, to conditions that existed prior to construction.

The disturbed ground must first be prepared for the topsoil to be respread. Correct preparation is extremely important.

The subsoil surface that has been compacted during construction must be broken up by deep ripping to at least 300 mm. This ensures that no compacted layers are left which will impede drainage and it also helps to knit the layers together by breaking up compacted surfaces and leaving a rough broken surface for topsoil to be spread over.

Any additional tile or plastic pipe drainage to drain wet areas should be installed at this time because drainage can be a major long-term problem after construction of a pipeline.

The subsoil surface can be reinstated to the original contour after the pipeline has been laid and backfilled.

Where areas are to be rebuilt, such as banks, side cuts and stream banks, the material must be replaced in layers and compacted. If necessary, retaining structures, such as soil or cement bags, logs, rocks or cribwalls, should be used to support the fill material.

Once the subsoil grade is fully prepared the topsoil can be spread. Ground conditions should be dry when topsoil is spread or soil structure may be seriously affected. Wet topsoil is also more likely to be mixed with the subsoil. Every effort should be made to avoid mixing of the topsoil with the subsoil at this stage, for otherwise all the previous good work to conserve the topsoil may be wasted.

As soon as the topsoil is replaced every effort should be made to protect it from erosion by ensuring that adequate surface drainage is provided and regrassing is done as early as possible.

Control of surface water is the most important factor in controlling erosion.

Cutoff and contour drains should be put in as soon as possible and be constructed correctly. If they are not constructed correctly they can actually cause greater damage than might otherwise occur.

Unstable soils, such as sands, raw pumice and exposed subsoils, may need the addition of other materials to stabilise them and assist in the establishment of vegetation. There are a large number of materials which can be used. Each site is different and must be assessed on its own merits. Some of the possibilities are discussed below.

Topsoil is best if it is available at a reasonable price and is suitable. It is not much use on vertical cuts. A check should be made on the topsoil and its source to see that it is reasonable soil and does not contain weed seeds or other contaminants.

Hydroseeding is expensive but it is very effective on stable, steep, difficult sites such as vertical cuts. It is less effective on exposed sand dunes, unless other methods of stabilising the surface are also employed. Provided certified seed has been used, there should be no problems with weed seeds.

Mulches come in a great many types, their use depending mainly on availability and cost. Checks for contaminants or weed seeds, e.g., hay, chicken manure, dairy shed waste, woodchips (non-treated), must be made.

Mesh and mulch is usually used to protect reinstated surface until vegetation has "taken". A mesh to hold the mulch material may be required if there are problems holding the mulch in place as a result of wind, stock or other damage.

A mesh can be laid on the mulch or a commercial material combining both can be purchased. This combination can be useful for immediate soil protection in urgent cases.

Suitable mulches include straw, hay or silage. Wire or plastic mesh can be used but care must be taken to remove the mesh if it does not break down within a reasonable period.

Aerial oversowing and topdressing may be used for difficult areas. In most cases only a helicopter is accurate enough for seeding but fixed winged aircraft may be suitable for topdressing.

RE-ESTABLISHMENT OF VEGETATION

The re-establishment of vegetation is critical to the protection of the pipeline. The objective is to have a complete ground cover established as soon as possible after restoration. In most cases a grass and clover cover is best whether it is to be grazed or not. Other vegetation, such as oats, toi toi, flax, marram grass, lupins, trees and shrubs, have special applications in unstable areas but need to be combined with a complete grass cover.

The establishment of some vegetative cover should be carried out as soon as possible, no matter what the time of year. It is better to get some ground cover established, and possibly have to come back and oversow areas than to leave the site bare, prone to erosion, growing weeds and of no grazing value for an extended period. In most cases a reasonable cover can be established at any time of year with only some under/oversowing required at a more favourable time.

Restoration techniques and vegetation types are many in number and vary greatly from district to district. Local knowledge should be consulted for specific seed mixtures, fertiliser requirements and establishment methods.

The following should be able to help in this regard:

Ministry of Agriculture and Fisheries;

catchment authorities;

farm consultants;

Ministry of Works and Development;

Department of Lands and Survey;

NZ Forest Service;

local farmers;

stock and station company representatives.

Cultivation should be kept to a minimum as the topsoil has already been greatly disturbed by heavy machinery during construction with a serious loss of soil structure.

The objective in cultivation should be to obtain a smooth, even surface that fits the surrounding contour. No depressions likely to hold water should be left and the edges of the working area should fit smoothly with the undisturbed ground. Any settlement that occurs should be made good without delay.

The seed used should be certified seed of high quality species. A heavier seeding rate with more than the usual variety of species may be necessary to compensate for poor soil conditions. If cheap seed is used it is likely a poor strike will result with the possible introduction of weeds, which will cause additional cost and create long-term problems.

On country of easy contour normal agricultural seeding methods—seed, harrow and rolling—should be used to establish the seed.

MAINTENANCE

If drains are to operate correctly for any length of time, they must be maintained. Silt will wash into drains and stock may damage the banks and cause material to fall into and block the drains. On critical areas the slopes should be fenced off from stock and extra stabilising material, such as flax or toi toi, planted on the banks.

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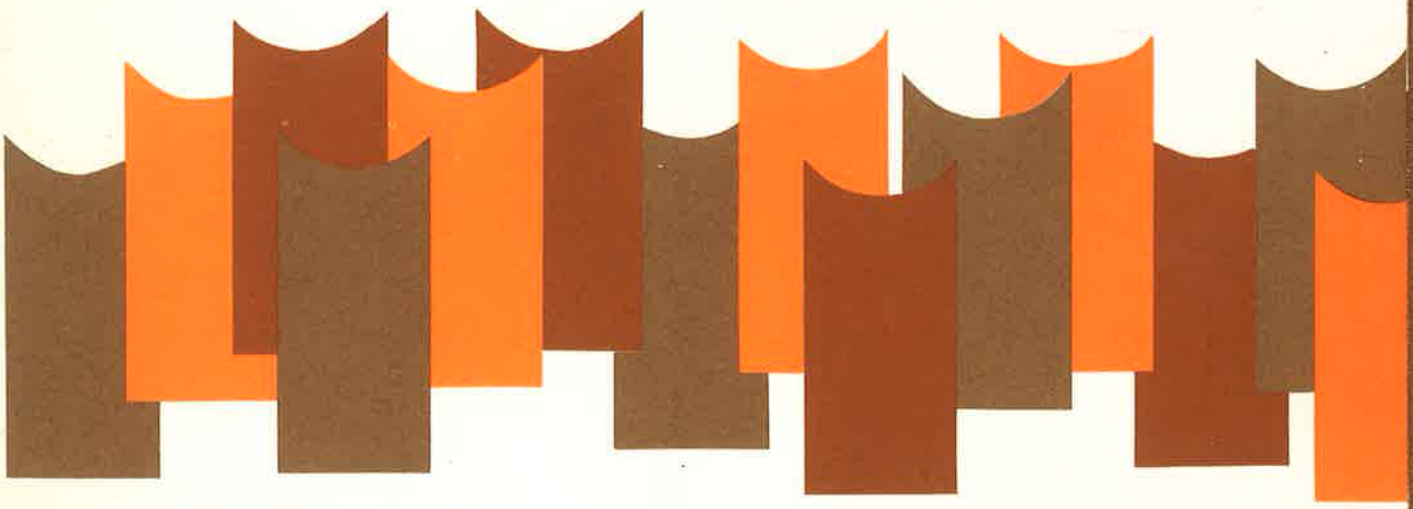
75.	Correlation of North Island regional LUC units from the NZLRI. ($6)	1985
76.	Ocean Outfall Handbook.	1985



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