Hikurangi Forest Farms Wakaroa Forest, Upper Waimata 3 July 2018

Compliance visit to assess whether or not an investigation is required

Introduction

Nineteen sites were assessed as requiring initial inspection by Gisborne District Council (GDC) (**Figure One below)**. The primary reason for the inspection was because a double box culvert bridge on Waimata Road downstream of this forest was inundated by woody debris and significant sediment by the storm that occurred on the 11-12th of June. This inundation resulted in the closure of the road, repair costs, and significant inconvenience to the residents north of the bridge.

These sites are located on several spurs south of Duncan Road. Shapefiles giving skid location, name/number, harvest areas, and roadway names were requested from Hikurangi Forest Farms (HFF) one week prior to the inspection but were not provided (Road names were provided subsequently).

Figure One. Aerial photograph of Hikurangi Forest Farms Wakaroa Forest showing Duncan road at top left and the forestry spur roads and sites to the south.

This site inspection was part of a bigger study into the event resulting in damage to the bridge on Waimata Road. The other elements were;

1. Overflights on 6th June, 3rd July and 7th July,
2. An assessment of woody debris at the bridge and upstream in Mangahouku Stream.

The inspection team comprised Dr Murry Cave, GDC Principal Science advisor, Scott Dobbie Compliance officer and Eamon Farrell drone operator. Andrew Costello attended representing HFF. This inspection was subsequently followed by an additional inspection on the 10th of July with Wiki Mooney and other BOPRC personnel attending.

Health and Safety Protocols

GDC operates a Remote and Lone working protocol which was adhered to for this inspection. This involves regular check ins with the office (Fitz-base), use of PPE and safety awareness. Safety observations are recorded in **Annex One** below.

Data Protocols

Data protocols are described in more detail in the Data Protocol Manual for the project. In summary, image data is obtained in a variety of formats, Canon RAW version 2, or jpeg, while video is recorded in .MOV format. Images are transferred to the Queens Birthday 2018 storms data manager and then stored in a secure area within both the GDC database "Objective", in a secure area on the GDC server while a photographic management software package "Aperture" is used for the primary database for photographs with these backed up to the secure area on the server. Jpeg image files from cellphones is transferred to flash memory sticks which are then labeled and stored after being copied to the Aperture, and Objective databases and likewise backed up to the secure server.

Site nomenclature

As noted above, the metadata requested of HFF has not been provided, but names for forestry roads leading off Duncan Road were subsequently provided during the visit on the 10th July . Consequently skid sites have been numbered starting from the corner of Bevan and Woolshed roads (**Figure Two**).

Summary of procedure

The party of four largely remained together throughout the inspection although Scott Dobbie and Eamon Farrell inspected the first 150m of Beavan Road while the Murry Cave and Andy Costello undertook a detailed examination of Site One.

The drone operator also often remained at specific locations where there was good line of site while the remaining officers and the company representative moved between sites. The drone operator videoed specific areas of interest at the direction of Dr Murry Cave with the flight registered with Airshare. Both GDC staff acted as spotters under the CAA s.101 rues.

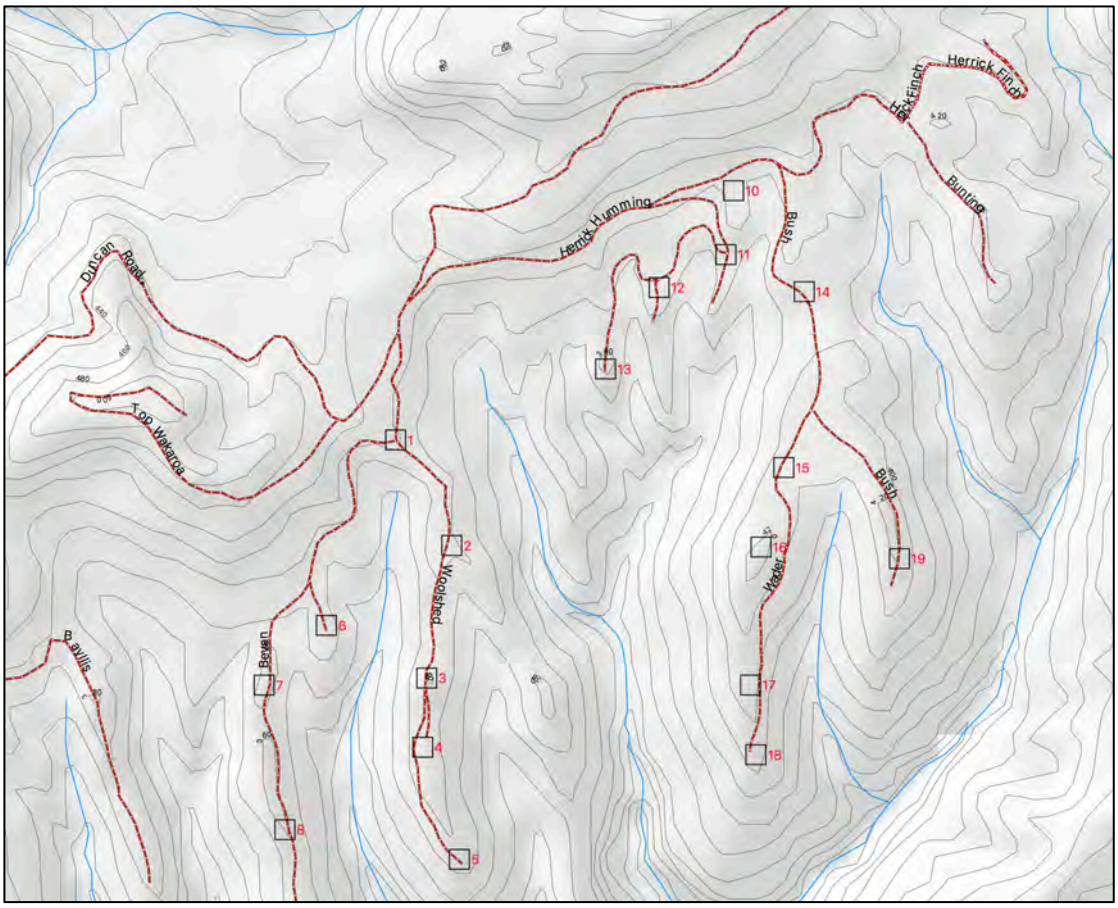

Figure Two. Road names and skid numbers assigned for sites south of Duncan Road.

Site One

Site One is located around 220m south of Duncan road on the intersection of Bevan and Woolshed Roads (**Figure Three**). The site condition based on GDC's newly acquired (summer 2017-18 aerial imagery) shows that slash and woody debris has been shed into the basins to both the east and south over time. To the east of the site is a water storage pond. To the west, a slope failure from Duncan Road to Bottom Road is Figured as Figure 27 by Cave *et al* (2017) and noted as a landing failure and a road edge collapse.

Additional failures of this Duncan Road site are evident and it is clear from comparing Figure 27 (ibid) and the observations from this inspection that no effort had been made to remediate the causes of the original failure. This is despite this and other sites being discussed at a workshop held on 28 August 2017 and the full report being made available to all forestry companies in November 2017.

Site One was traversed by first walking the edges of the site in a clockwise direction to gain an overview of the site. Specific features were then focused on and documented by notes and sketches in a field-book and by taking images using the Canon 7D Mkll DSLR (**Figures Four and Five**) as well as drone based video.

Figure Three. Location of Site One.

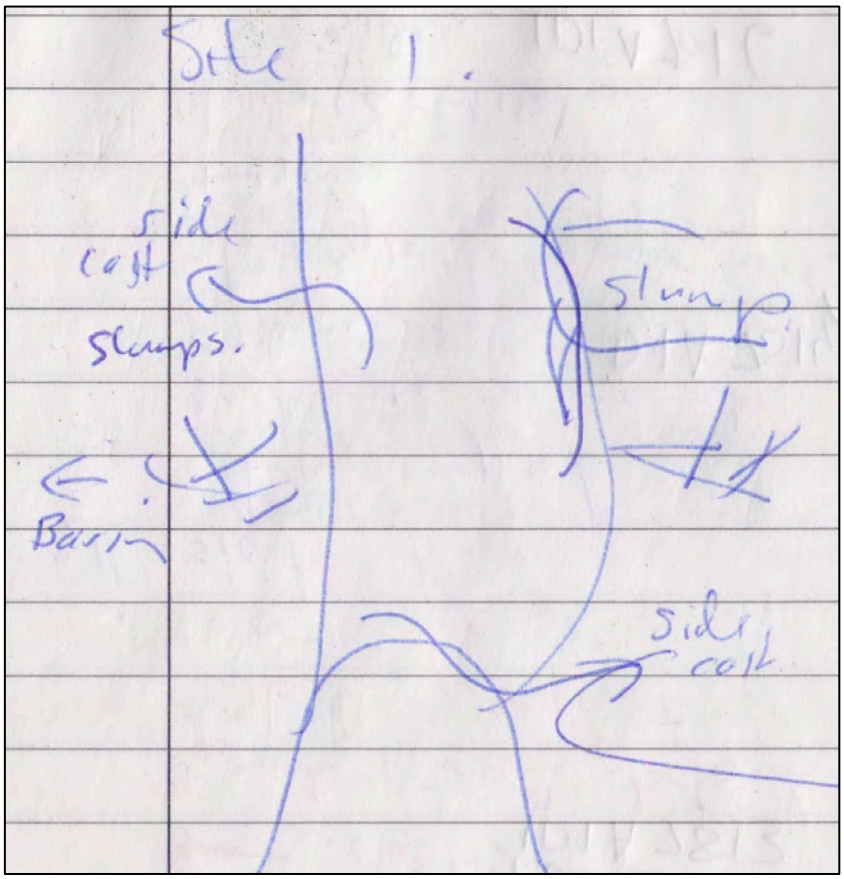

Figure Four. *Sketch of Site One showing some key features. Slash and woody waste is stowed on the eastern edge of the skid site with slash used to form a bench below the material on the edge of the skid (Image 1D1A7812) but there is considerable woody material comprising a mix of slash and cut logs below this bench that have slumped into the basin below. The western side of the site does not have a pile of woody material perched on the edge but considerable material has been displaced into the basin below (See* ***Figure Five****).*

Figure Five. *Aerial view of Site One looking south showing the slash pile on the eastern side of the site and the bench in slash beyond. Cut outs into side cast material are shown with the red arrows while slumps and slope failures are shown with the black arrows.*

The site is relatively benign in that there are basins both east and west that could capture woody material lost from the skid site. None-the-less, despite the sites' location at the top of the Waimata Catchment, the area experienced a large number of failures that were largely triggered at roadways or skid sites. The reliance of natural basins below skid sites to stop the migration of woody debris downstream into vulnerable catchments is not a good strategy since debris flows are capable of being mobilised beyond such basins and that certainly occurred in this event. A series of photographs were taken to demonstrate the nature of the site and are located on **Figure Six**.

Figure Six*. Aerial image of Site One showing the photo locations.*

Discussion on Photographs.

Figure Seven Image 1D1A7808*. View looking south east along Woolshed road from the edge of the woody debris pile on the northern side of Site One showing multiple failures originating at road level with one large slip in the foreground.*

Figure Eight Image 1D1A7809. *View looking west towards Duncan Road (top) and Bevan Road showing slope failure from log pile below Duncan Road to Bevan Road with logs blocking the lower Road.*

Figure Nine Image 1D1A7810 *View looking east from eastern side of Site One showing a headscarp for a significant debris flow immediately below the water storage dam (bottom left), relatively small slips originating on the middle part of the slope (middle ground), significant failure of skid site 13 (Top left), and slips from adjacent to roadways (top).*

Figure Ten,Image 1D1A7812. *View of eastern side of Site 1 showing slash material and logs perched below the skid. Failure from Herring Humming road is evident at top right.*

Figure Eleven Image 1D1A7813. *View of cutout on east side of Site One draining onto sidecast material.*

Figure Twelve. Image 1D1A7814. *View of the western site of Site One showing slash woody debris that has collapsed into the basin below. In the foreground the edge of the skid has displaced by 50-70cm. Slips from slash pile on Duncan Road in the background (see also Image 1D1A7809).*

Figure Thirteen. Image 1D1A87815. *View of large tension crack on the western side of Site One.*

Figure Fourteen. Image 1D1A7816*. View of cut out on western side of site one showing cut out directed onto side cast material. In the background (right) several slips originating from Woolshed Road are evident.*

Between Sites One and Two

There are several slope failures evident immediately below the road south east of Site One (**Figure Fifteen**). No culverts were found between Site One and Site Two while watercourses were in poor condition, and blocked by vegetation and slope wash material. Cut outs directed water over side-cast materials. A large slope failure that has generated a debris flow extending towards the valley floor (**Figure Sixteen**) is evident around 80m from Site one. The failure occurred where a cut out had directed water onto side cast material (**Figure Seventeen**) while the blocked watercourse resulted in water flowing across the road surface contributing to the storm water being discharged onto the side cast material below the road.

Figure Fifteen. *View of the area south east of Site One on Woolshed Road. No culverts were located along this part of the road.*

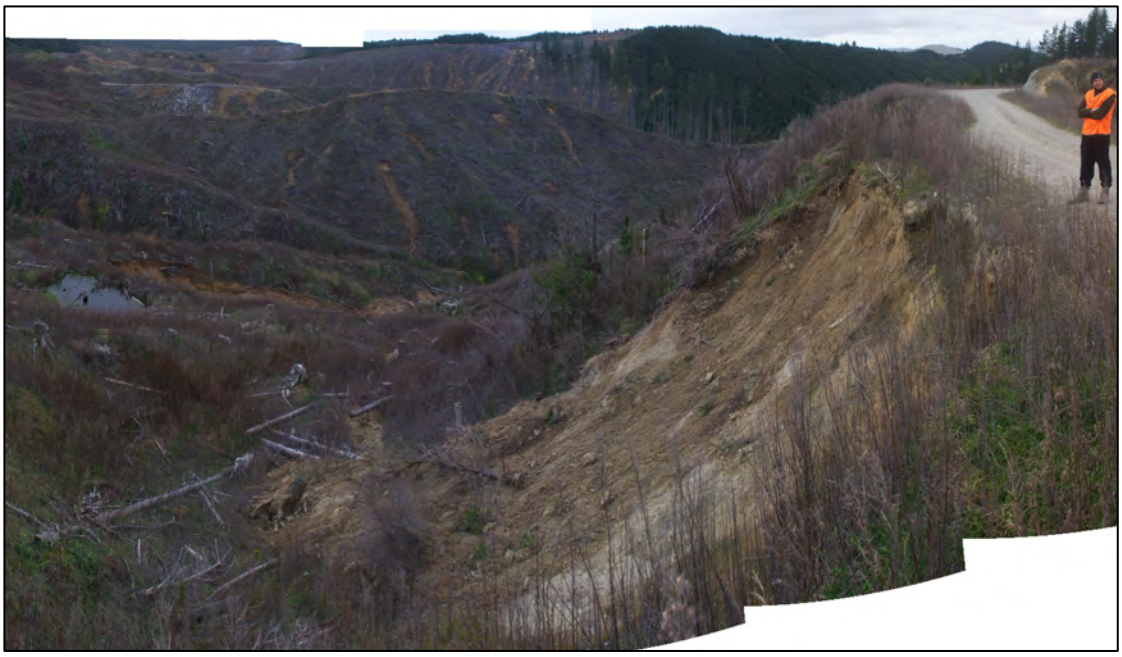

Figure Sixteen. *Significant slope failure south east of Site One that has occurred where a cut out has directed water onto side cast material [Image is a stitched together composite of images 1D1A7818 to 1D1A7822].*

Figure Seventeen*. View of headscarp of failure south of Site One on Woolshed Road. In the foreground some material has been placed to form a berm but where this berm is cut out water has been directed onto unstable side cast material leading to failure. On the opposite side of the water course has not been maintained and is full of vegetation and as a consequence water would have flowed across the road contributing to the failure. Site Two is visible in the background.*

Another significant slope failure is present around 200m south east of Site One and as was the case for the slope failure shown in **Figure Eighteen** has occurred where a cut out has directed water over the eastern side of the road.

Figure Eighteen. *Large slope failure around 200m south east of Site One resulting from water directed over the eastern side of the road. The image is a stitched composite of photographs 1D1A7834 to 1D1A7840.*

Site Two

Site Two is around 500m south east of Site One and is located on a short spur leading off Woolshed Road. The site has a significant failure on the eastern side where a large pile of woody debris sits on the edge of the skid site (**Figures Nineteen & Twenty**).

Figure Nineteen. *View of Site Two showing photograph locations.*

***Figure Twenty**. Image 1D1A1019 showing skid Site Two from Woolshed Road showing the failure on the eastern side of the skid and the logging debris perched on the edge.*

Closer examination of the site indicated that the pile of logging debris was overhanging the edge of the skid where the side cast material had collapsed below it. Tension cracks were also evident along the edge of the failed surface and these extended for some distance to the north (**Figure Twenty One**).

***Figure Twenty One.** Composite image (Images 1D1A7844 to 1D1A7847) showing the log pile overhanging the edge of the skid. A tension crack and part of the drainage channel is evident in the foreground.*

The debris flow extended from the skid site to the valley floor with some lateral failures due to cutting out of the toe of the slope as the debris flow moved down the gully.

There was a large drain constructed on the skid site which directed water around the debris pile and onto the sidecast material on the eastern edge of the skid site on which the debris pile was perched (**Figure Twenty Two**). The other end of this drain directed water onto side cast material on the other end of the logging debris.

Figure Twenty Two. *View of the skid with a drain directing water onto side cast material on the eastern and south eastern edge of the skid site.*

Sites Three and Four

Site Three is located 270m south of Site two of Woolshed Road while Site Four is a further 135 metres further south. There are no culverts on Woolshed Road between sites Two and Three but there is one cut out directing water onto the western side

around 130 metres south of Site Two. Both sites are older with substantial 5-7 year old replanted pine on the slopes adjacent. Site three has presumably been occupied twice since the western side has 5-7 year old pines on the slope below while the eastern side has been replanted recently (**Figure Twenty Three**).

Eastern side of Site Three

A number of large-scale failures are evident on the eastern side of the skid at Site Three. The first of these occur adjacent to each other while the third is slightly further south beyond a minor spur. These failures have been examined carefully with a series of photos taken along with drone video footage. A sketch of the site is shown in **Figure Twenty Four** below (see also **Figure Thirty Six** Below). The eastern side of the skid site has a drain cut which directs water onto side cast material which has failed (**Figure Twenty Five**).

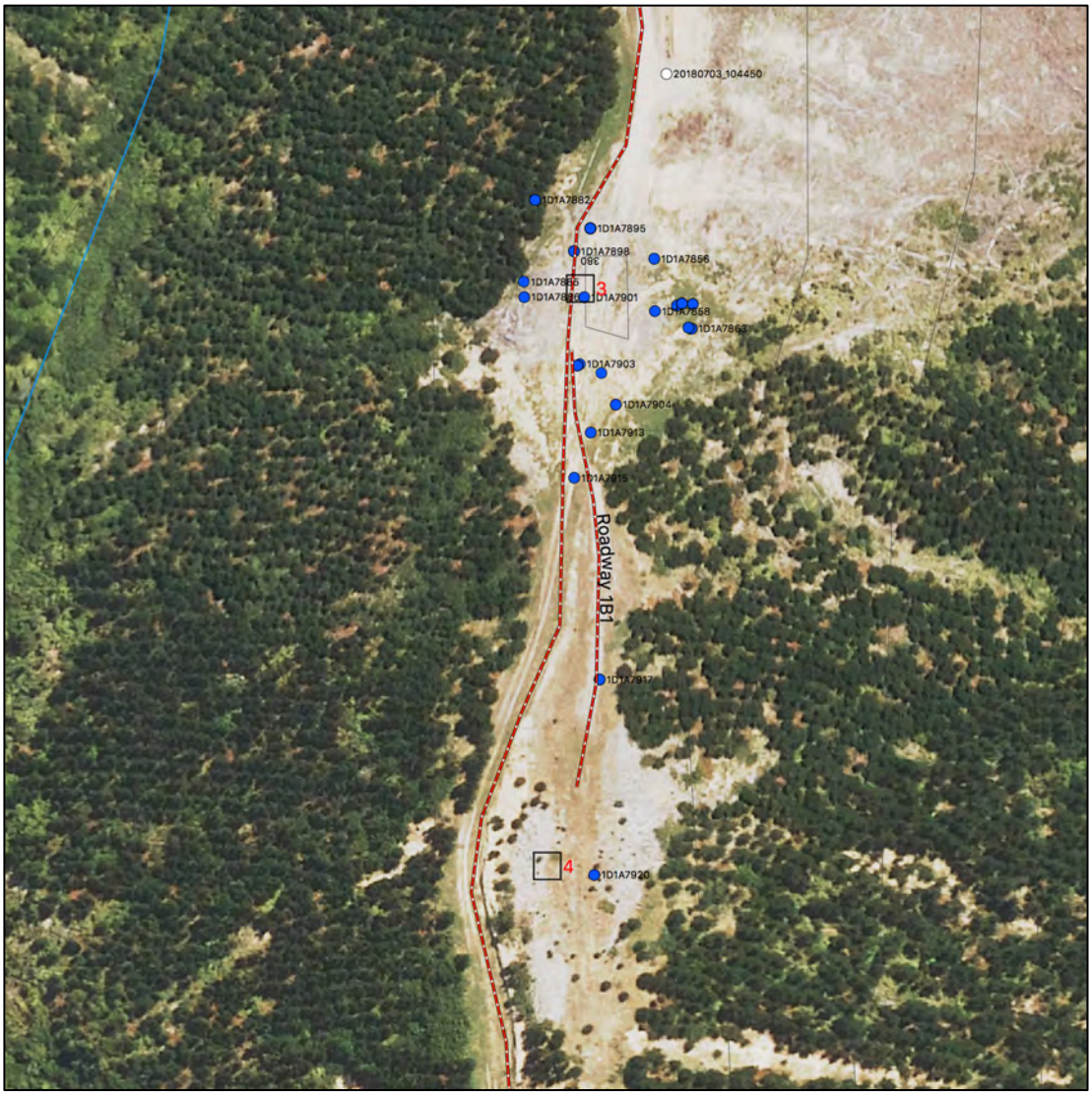

Figure Twenty Three. *View of Sites Three and Four showing approximate photograph locations.*

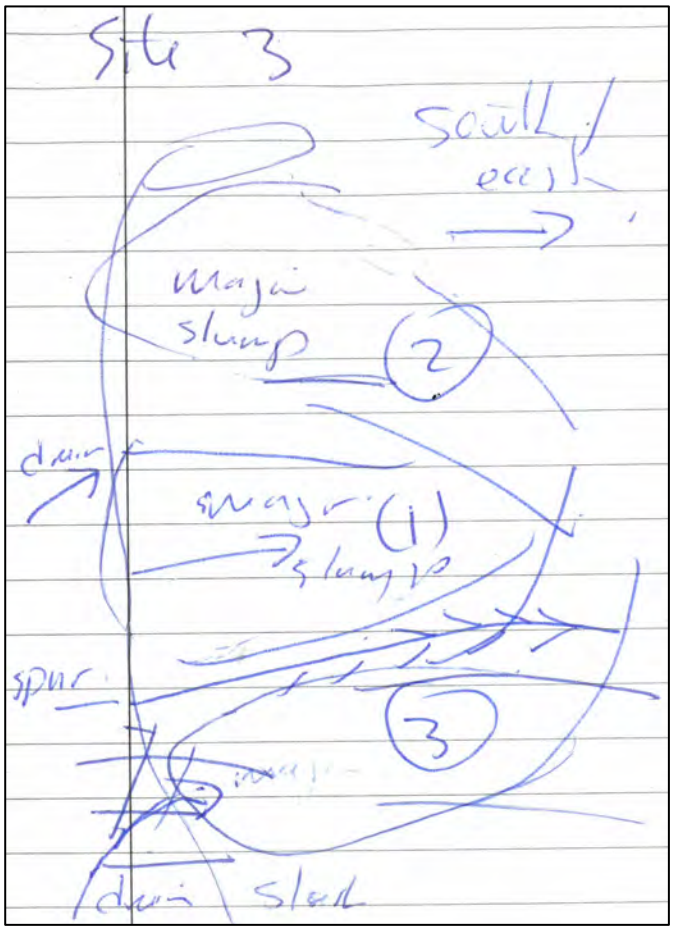

Figure Twenty Four. *Sketch map of the eastern side of Site Three showing the three slope failures and drainage points.*

Figure Twenty Five. *View of the logging debris pile perched on the eastern side edge of the skid at site 3 with a drain directing water onto side cast material.*

Discussion on Photographs eastern side of Site Three.

Figure twenty Six. Image 1D1A7858. *View of eastern side of Site Three showing failure number 2 (background and failure 1 (obscured middle ground) with person standing at low point where water drains onto side cast material that has failed.*

Figure Twenty Seven. Composite of images 1D1A7859 and 1D1A7860. *View of the headscarp of failure 2 on eastern side of Site 3.*

Figure Twenty Eight. Composite of Images 1D1A7868 to 1D1A77871 *View looking north showing the extensive failures that have occurred from the eastern side of Site Three.*

Figure Twenty Nine. Composite of Images 1D1A7880 and 1D1A7881 *view showing a tension crack at the edge of the gravel pad on the eastern side of Site three. Note the presence of woody material caught up in the gravel pad and the tension crack leading to a slope failure. Such cracks act like a channel directing water onto the side cast.*

Figure Thirty. *View of a drain cut through to side cast material on the south side of the skid. Note the poor house-keeping with wires left lying on the edge.*

Figure Thirty One. *View of the same area as in* ***Figure Thirty*** *showing the drain cut through to side cast material on the south side of the skid. Note the large tension crack cutting through the slope edge.*

Western Side of Site Three

There is a large pile of logging debris perched on the west side of Site Three (see **Figure Twenty Three** for location). As is the case with other skid sites in this area, drains have been cut around the debris pile which results in water being directed onto side cast material at the north end resulting in a slope failure (**Figures Thirty One and Thirty Two**).

Figure Thirty One. *Logging debris stowed on the western edge of Site Three with an obvious drain directing water over the edge of the skid onto side cast material in the foreground.*

Figure Thirty Two*. Drone footage of the slope failure and perched logs on the western side of Site Three.*

Close examination of the pile of logging debris showed that there was a large tension crack running through it's inside edge (**Figure Thirty Three**) and that it was at risk of failure making it too hazardous to estimate the extent of the debris flow on the ground. Consequently the GDC drone was used to provide a detailed view of the failure and assess whether or not it had migrated downstream from that point. This footage confirmed that large failure has generated a debris flow through 5-7 year old pines through to the valley floor (**Figure Thirty Four**) and that this had migrated downstream through the deeply incised gorge.

Figure Thirty Three. *View of a deep-seated tension crack running through the inside edge of the log pile.*

Figure Thirty Four. *Composite image (drone video screenshots) of the western side of Site Two debris flow from the headscarp to the toe of the slope in a deeply incised gorge in a tributary of Mangahouku Stream.*

Site Four

Site Four (see **Figure Twenty Three** for location) is around 130 metres south of Site Three and is located on a small spur track to Woolshed Road. There are log piles situated on either side of the skid site but that on the western side is perched over Woolshed Road which acts as a berm and thus attention was focused on the eastern side. As was the elsewhere within this forest, logging debris had been stowed on the edge of the skid site (**Figure Thirty Five)** and has generated a small slope failure (**Figure Thirty Six**).

Figure Thirty Five. *Composite image (1D1A7902-1D1A7924) showing logs perched on the edge of Site Four.*

Figure Thirty Six. *Screenshot from drone showing the Site Four failure (far left) and the three failures on the eastern side of Site Three.*

Site Eleven

Site Eleven is located on a spur from Herrick Humming Road some 770m east of Site One (**Figure Thirty Seven**) and was selected as significant slope failures could be observed from those western sites from Woolshed Road (**Figure Thirty Eight**). It had been planned to start at Site Thirteen and work back to Site Twelve but while transiting to Site Thirteen it was observed that a significant failure had occurred at Site Eleven so that became the initial site to be assessed.

Figure Thirty Seven. *Location of Site Eleven.*

Figure Thirty Eight. *View of eastern sites from Woolshed Road with Site Thirteen in the front and site Eleven behind.*

Site Eleven occupies a long spur leading south from a bend in Herrick Humming Road that leads to Sites Twelve and Thirteen (**Figures Thirty Nine and Forty**). At the beginning of the site there is a deep watercourse which directs water from the road onto the slope to the right of the skid site. This watercourse carries water for approximately 330m from a culvert on the road leading to the site (**Figure Forty One**). This culvert was the first culvert observed within the forestry operation during the visit apart from an old 500mm metal culvert below Duncan Road which predates forestry operations.

A 100m long drain has been cut longitudinally from this watercourse taking water to the southwestern end of the skid site. This drain progressively deepened towards the south (**Figure Forty Two**). A major slump was evident on the eastern side of this longitudinal drain where standing water has allowed water to flow through the slumped material (**Figures Forty Three and Forty Four**). Material has also slumped at the point where the drain discharges onto logging waste at the edge of the skid.

Figure Thirty Nine. *Aerial photograph of Site Eleven showing at the top a large watercourse that discharges onto the slope on the right, a long white line where a drain has been cut from the watercourse directing water through the middle of the skid site discharging onto the slope on the bottom left of the skid site.*

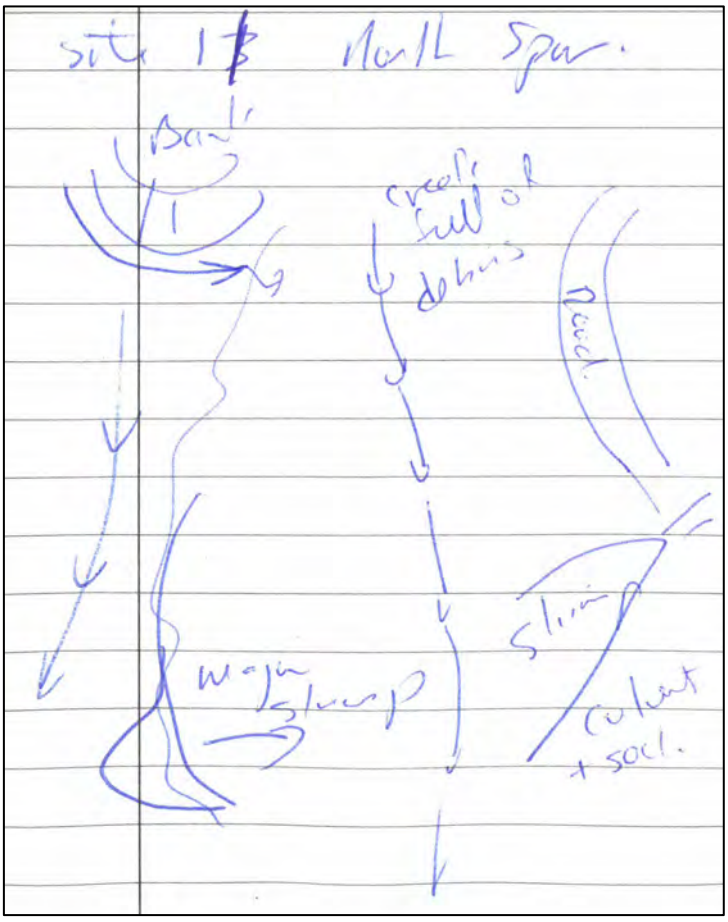

Figure Forty. *Sketch of Site Eleven showing the main features of the site and the surrounding environment. The watercourse receiving water from the road above is shown at top left while the longitudinal drain is shown below this at left. The road on the right with slumping and culvert with sock is shown on the right.*

Figure Forty One. *Composite Image (1D1A7958-1D1A7959) looking north west from Site Eleven showing a culvert with a sock directing stormwater onto slope materials which have washed away leaving bare rock. Further slope failures in side cast material is evident to the right of the culvert.*

Figure Forty Two. *View of the longitudinal drain cut through the middle of Site Eleven showing the deep incising through logging waste material.*

Figure Forty Three. *Composite image (1D1A7942-1D1A7944) showing the major slump of logging waste on the eastern side of Site Eleven. The major tension crack in the foreground extends south into the pile of logging debris with indications of incipient failure within this pile.*

Figure Forty Four. *Composite image (1D1A7947 to 1D1A7950) showing the longitudinal drain and the slumped material immediately to the east. Not the indications of standing water in the drain. During storm events this drain would carried significant volumes of water some of which would have been redirected across the skid site saturating the logging waste forming the base of the perched log pile that has slumped on the eastern side.*

Site Eleven provides a good view of the area further east particularly Bush Road. There are a significant number of extensive slope failures on side cast material triggered at the road edge (**Figure Forty Five**). Further south on Bush road a culvert discharges onto side cast material (**Figure Forty Six**). This area hasn't been examined in detail but was flown over by drone and subsequently visited on the 10th of July.

Figure Forty Five. *Composite image (1D1A7925 to 1D1A7930) showing the extent of slope failures in side cast material from Bush Road.*

Figure Forty Six. *Image 1D1A7965 showing a short section of sock from a culvert on Bush Road discharging water onto the top of side cast material on the slope resulting in the material failing.*

Discussion on Drone Footage at Site Eleven

Two drone flights were flown over Site Eleven and the surrounding slopes. The drone used was a Phantom 4 Pro operating in manual mode under the control of the drone pilot with acquisition of video rather than still images or vertical orthomoasic imagery. Selected screenshots of this footage has been captured and these are described below.

Figure Forty Seven. *Oblique aerial image looking north with Site Eleven out of picture on the left and Bush Road on the right. Extensive slope failures originating from the road surface have reached the valley floor.*

Figure Forty Eight. *A similar view to* ***Figure Forty Seven*** *showing additional detail including the cut stump caught up in the slope failure middle ground. The are no culverts observable on this length of road.*

Figure F*orty Nine.* *View of the north end of Site Eleven showing the watercourse at top the slope failures from the skid site and the longitudinal drain cutting south through the skid. The slope failures from the water course and that from Bush Road appear to the uppermost failures and have lead to significant erosion and downstream migration of logging debris and soil. Two of the Downstream slope failures appear to be toe failures.*

Figure Fifty. *View of Bush Road showing the sock attached to a culvert south of the slope failures shown in* ***Figure Forty Seven****. The stump shown in* ***Figure Forty Nine*** *is visible far left.*

Figure Fifty One. *View looking south with Bush Road out of picture on the left and Site Eleven out of picture on the right. Possible mid slope failures are shown but the valley floor has been highly cut out and the mid slope failures in the middle ground are connected to the valley floor and it is probably that these are toe failures resulting from when scouring on the valley floor undermined the slopes.*

Figure Fifty Two. *Near vertical shot of the middle part of Site Eleven showing the longitudinal drain adjacent to a major slope failure on the lefthand (east) side. A large tension crack is evident through the failed material and extends into the pile of logs at the top of the picture. It appears that the major mobilisation of debris down valley originated from this slope failure and the one adjacent but prior images also show failures to the valley floor upstream of this view and hence failure mechanisms may have been complex with a combination of headscarp and toe failures contributing.*

Figure Fifty Three. *A similar view to Figure Fifty One but clearly showing the deeply incised longitudinal drain and an enlarged deeper part of the drain adjacent to the tension crack on the left (east). The largest slope failure is shown at the bottom of the image. The large amount of logging waste left (east) of the tension crack indicates that a greater volume of material is at risk of mobilising.*

Figure Fifty Four. *Vertical view of the tension crack at Site Eleven and the longitudinal drain discharging onto the slope on the right (west) resulting in some slumping of logging waste and soil. Two enlarged areas within the drain are evident; one adjacent to the tension crack and the other approximately halfway from there to the discharge point.*

Figure Fifty Five. *Extensive toe failures in the stream between Site Eleven and Bush Road.*

Figure Fifty Six. *View of slope failure typically described as mid slope failures. The majority of these have headscarps associated with forestry activity. One at the middle left has originated from a rough track that cuts through the slash left on the slope and this will have directed water onto the area that failure. Right of that there are several slope failures where the headscarps coincide with the top of a bench and beyond that a failure from the edge of Bush Road. On the far right a large failure has occurred where a large volume of logging debris has been left perched on the top of the slope adjacent to Bush Road.*

Figure Fifty Seven. *Distant view looking north with Site Eleven on the left (west) and Bush Road on the right (east). The major failure that occurred where the culvert and short sock discharged onto side cast material is evident as the bright failure adjacent to Site Eleven while the failures shown in* ***Figure Fifty Six*** *are at bottom right. Extensive erosion of the valley floor and associated toe failures are also evident.*

Figure Fifty Eight. *A closer view of Site Eleven on the left and Bush Road highlighting the level of failures from Site Eleven and the bench below the perched material. On the far left the bench as caught the logging debris and has acted as an effective berm but in the middle ground the berm has not been an effective barrier and the slope failure has reached the valley floor. The major slope failure from the culvert and sock is on the right.*

Figure Fifty Nine. *View of Site Eleven with Site Twelve beyond and Site Thirteen at top left showing that similar failures on the roadway and skid sites to those at Site Eleven are present. This aspect provides a better view of the bench below Site Eleven and in particular suggests that there is a drainage flow line from the slip in the middle ground and the lower failure at bottom left. The undercutting of the surface of the skid site at the headscarp of the main failure is also evident at top right.*

Figure Sixty. *Close up view of the slope failure from Bush Road showing that this has occurred in side cast material as indicated by the soil caught up behind the trunks of the stumps at top middle.*

Conclusions

1. Extensive slope failures have occurred at all sites inspected.
2. No culverts were found between Duncan Road and Site Four on Woolshed Road.
3. Watercourses were poorly maintained and in some instances had directed water across the road surface onto side cast material.
4. Cut outs were employed at skid sites to direct water onto the slopes below but these frequently directed water onto side cast material.
5. Logging debris perched on the edges of skid sites was ubiquitous.
6. Perimeter drains were commonly employed to direct water around these perched piles but this has directed water onto side cast material and has facilitated failure of the perched piles.
7. Three culverts were found between Duncan Road and Bush Road adjacent to Site Eleven; the first of these was a substantial metal culvert installed on Duncan Road itself and predating forestry operations the remaining two had socks installed but had directed water onto sidecast materials resulting in slope failures.
8. Large slope failures were primarily associated with either roadways or skid sites and primarily occurred where water was directed off the surfaces onto vulnerable slopes which frequently contained side cast materials.
9. Debris flow activity and extensive scouring of the valley floor and migration of debris downstream.
10. This inspection and other associated work tracing logging debris upstream from the culvert at Uttings on Waimata Road indicates that this area was the source of the debris that resulted in damage at Uttings Bridge.

Recommendations

1. That Hikurangi Forest Farms (HFF) be asked to clear watercourses, and remove debris from all roads within the area inspected.
2. That HFF pull back logging debris from all inactive skid sites and place it in a location where it is safe from remobilisation until such time as it can be destroyed by burning or other means.
3. That were it can be safely and practicable done, HFF remove slash and logs from slopes and have this material stowed in an area safe from remobilisation.
4. That HFF install or reinstate berms are on the roadways to prevent the uncontrolled discharge of stormwater onto side cast or vulnerable ground.
5. The HFF repair existing culverts with adequate sided silt traps installed, and the socks are removed and replaced with fluming to hard ground.
6. That HFF install additional fit for purpose culverts are installed with fluming to hard ground to mitigate concentration of large volumes of water at particular sites during storm events.
7. That HFF install suitable slash catchers downstream of the forest to stop the migration of the extensive logging debris down Mangahouku Stream onto neighbouring properties.

8. That where practicable, HFF remove this extensive logging debris from the Mangahouku stream below the forest.

Annex One
Health and Safety

Late on the afternoon prior to the visit, Andrew Costello emailed the council flagging health and safety concerns particularly regarding footwear and noting that they may not have communicated their standard for personal protective equipment before.

Just a quick email requesting your help with an emerging issue. I'm conscious that we may not have communicated our standard for PPE before now and we're noticing a few different standards emerging. We'd appreciate it if during forest visits GDC staff would meet the same standard we require from others undertaking similar work. Our standard requirements are as follows.
HiViz top or vest (with day glow if after dark)
Safety Helmet (not a bump cap), don't always need to wear it but need to have it available (in the ute) in case you encounter a hazard or come near an operation.
Earmuffs if you're going to spend any time at an operation.
Safety-toe boots that lace up over the ankle (including orange forestry gumboots).
HFF don't require safety glasses unless a specific hazard exists. Other forest companies may be different.

Most GDC staff have been equipped with most of this equipment when they come to visit so it's not a big issue but one I think we should address regardless. If out of the ordinary things come up like wanting to wear waders for electric fishing I'm sure we'll be able to pragmatically risk manage it given a bit of notice.

This advice was too late to address any differences in H&S protocols between GDC and HFF, however, the specific team members who attended could comply. Given that the inspection team were not visiting active worksites, elements of the company requirement were not applicable but may well be for future inspections of operational sites.

A number of more general Health and Safety issues were identified which need to be considered as follows;

1. Duncan Road is a public road as is Waimata Road which gives access to Duncan Road. It is HFF's expectation on Waimata Road and a requirement on Duncan Road that road users maintain a radio watch and broadcast at specified points on Simplex channel 84. Gisborne District Councils' Remote and Lone worker protocols require regular contact between the remote worker/s and the Council base on a dedicated digital channel.

As both roads are public roads and not all members have access to radios let alone simplex radio channels, the requirement to use simplex channel 84 cannot have standing from a safety point of view. The onus is therefore on HFF as a user of that road to ensure that it and its contractors comply with normal traffic rules. GDC's

remote and lone worker protocols thus should have precedence for GDC staff over HFF's (or other forestry companies) requirements on public roads.

2. While travelling to the investigation site, the GDC vehicle operated with headlights on as well as flashing roof lights following the HFF vehicle which had neither flashing lights or head lights engaged. On the route a utility belonging to a forestry contractor was encountered travelling out of the area. This vehicle was travelling at speed and did not have any hazard lights/headlights on and had not broadcast its position on simplex channel 84.

3. At the exit point from Duncan Road to the spur roads to be inspected, the HFF vehicle pulled over and flagged the GDC vehicle forward to communicate the route ahead. To do so required the GDC vehicle to stop parallel to the HFF vehicle while remaining on Duncan road and thus exposed to any uncontrolled truck movements of loaded logging trucks existing the area from Duncan Road.

4. There were no vehicle safety concerns once the vehicles had exited Duncan Road and the inspection of sites one to nine. Once the vehicle escorting the GDC vehicle to a subset of those sites had been completed, however, the HFF vehicle escorted the GDC vehicle to the roadway providing access to sites ten to nineteen. There were two areas where the batter had failed resulting in the watercourse becoming blocked causing a landslide failure on the downslope side of the road.

One of these, in particular, was extremely wet and the gap between batter failure and the downslope failure very narrow. While traversing this narrow gap, the rear wheels of the GDC vehicle slid sideways towards the downslope failure. While the risk zone was traversed without incident, it would have prudent for the HFF vehicle in the lead to have stopped to assess the hazard. While on site 13, the HFF representative Andrew Costello was questioned regarding the post storm inspection and repair of the road to eliminate risk. Andrew responded by noting that areas of timber extraction had been prioritised and that no effort had been made to repair other roads. During the subsequent exit from sites ten to nineteen the HFF lead vehicle progressed as before but the GDC vehicle opted for a path which reduced the risks associated with the slope failure but resulted in the vehicle being exposed to damage from vegetation dislodged by the batter failure.

5. At most of the sites, woody debris had been placed at the edge of skid sites and a number had indications of slumping or headwall migration. Care was required when assessing these sites particularly when close to the edges. The GDC drone was used to gather detailed information in such instances.

5. As noted above as part of its inspection GDC utilised its Phantom 4 Pro drone to obtain details of areas which would otherwise be too risky to assess. The flights were controlled by Eamon Farrell who is a trainee drone operator for the council. The flights were operated under GDC's drone operations Standard Operating Procedures. Eamon Farrell had not completed his CAA 101 Rules training at the time of the inspection but operated under guidance of GDC personnel who had completed CAA 101 Sub Part E training and the other GDC staff present operated as

spotters during flights. The drone operations were registered with CAA under the Airshare system under the GDCs qualified operators username (**See attachment One**). GDC had previously received, reviewed and obtained approval to operate under HFF's Drone safety protocols and the HFF representative authorised GDC's use of a drone for the purposes of the inspection. Drone operations were safely completed consistent with the GDC SOP and the prior HFF drone safety protocol.

6. On existing the HFF forestry roads onto Duncan Road, the HFF lead vehicle executed a tight turn on a section of roadway characterised by its narrow width and slippery muddy surface. The GDC vehicle elected to head west on the road until a suitable wide and stable turning area was identified and then undertook a U turn to exit the site via Duncan Road. During this period the GDC vehicle used its roof mounted flashing lights and had its headlights on. Neither precaution was adopted by the HFF vehicle.