

2010 Fish Passage Evaluations for Closed Bottom Structures

Performed under FIA Contract:

Project # 4031505

Prepared by:

Mike Viveiros, BSc, R.P.F., BIT

Field Staff:

Brad Lavigne

Paul Spenser

Darryl Person

Aaron Wood

Matt Peasgood

Eric McCormick

TABLE OF CONTENTS

List of Tables

List of Figures

- 1.0 Executive Summary**
- 2.0 Background**
 - 2.1 Closed Bottom Structures Background**
 - 2.1.1 Obstacle Significance**
 - 2.1.2 Causes of Obstructions**
 - 2.1.2.1 Water Velocity**
 - 2.1.2.2 Water Depth**
 - 2.1.2.3 Raised Outlets**
 - 2.1.2.4 Debris**
 - 2.1.3 Habitat loss**
 - 2.1.4 Spawning**
 - 2.1.5 Rearing**
 - 2.1.6 Food**
 - 2.1.7 Stream Instability**
 - 2.1.8 Culvert Failure**
- 3.0 Project Area Background**
- 4.0 Introduction**
- 5.0 Methods**
 - 5.1 Pre-work Planning**
 - 5.2 Field Assessment**
 - 5.3 Data Interpretation**
- 6.0 Culvert Shapes**
- 7.0 Discussion and Recommendations**
 - 7.1 Discussion**
 - 7.2 Recommendations**
- 8.0 Appendix 1 – CD containing Photos arranged by site I.D.**
- 10.0 Appendix 2 – CD with Site locations on Map.**

LIST OF TABLES

Table 1 – Copper River Watershed Site descriptions.

LIST OF FIGURES

Figure 1 - Map of Copper (Zymoetz) Watershed.

Figure 2 – Sample Site Card for Fish Passage.

Figure 3 – Fish Passage Ratings for 199 Fish Streams in Copper River Watershed.

1.0 Executive Summary

In the summer and fall of 2010, 636 sites in the Copper (Zymoetz) River watershed were field assessed for the determination of fish passage through closed bottom structures (culverts). Of these 636 sites, only 199 sites were found to have both a culvert and a possibility of containing fish. These crossings were rated and assessed using the field guide: "Field Assessment for Fish Passage Determination of Closed Bottomed Structures" (B.C. Ministry of Environment, 2008). All sites identified on the maps were examined and their descriptions are detailed in Table 1. Many sites either had no structures in place (deactivated), did not exist. In these cases the road or stream shown on map did not exist, or the crossing in place was not a closed bottom structure meaning they were a bridge, wood box culvert, arch pipe or some other type of open bottom structure. These site locations and short description were recorded, but they were not assessed as there was not a closed structure in place.

On sites with fish habitat values, recommendations such as replacing culverts with open bottom structures, permanently deactivating the crossing or embedding the culvert are reviewed on a site by site basis.

2.0 Background

2.1 Closed bottom Assessment Background

A closed bottom structure or culvert can have a significant detrimental impact on the fisheries resource by preventing or inhibiting the upstream migration of fish (Dane, 1978). Obstacles at culvert locations are usually the result of poor design or installation (Dane, 1978). Some causes of obstacles are obvious but others can be more difficult to detect. There are different types of obstacles and they are defined below in order to understand their importance to culvert design.

Three types of obstacles are used to describe a barrier to fish (Dane, 1978):

- a) Total: Impassable to all fish all of the time.
- b) Partial: Impassable to some of the fish all of the time.
- c) Temporary: Impassable to all of the fish some of the time.

With proper care in installation and design, culverts should not be a total obstruction to fish passage. For the most part, culverts tend to be either partial or temporary obstructions.

A partial obstacle is one which prevents movement of a particular species at all times. This type of barrier will determine the types of fish found upstream as it limits the types of fish that can traverse this barrier.

A temporary obstacle is one that changes from passable to impassable depending on factors such as stream volume or flow or debris.

2.1.1 Obstacle Significance

Types and timing of obstacles are important for fish, particularly salmon. Salmon are genetically programmed to begin the spawning phase of their life cycle and once this mechanism is started, it is incapable of change (Dane, 1978).

This spawning cycle is a complex process and is greatly influenced by external factors. Any interruption or delay during the upstream migration can severely affect the result of the spawning process.

Factors that affect the spawning cycle as a result of these obstructions are things like:

- a) Excessive energy is used to reach the spawning grounds or they may not reach the prime spawning grounds at all, forcing them to use poorer quality areas which will limit the spawning success.
- b) Increased chances of injury, disease or predation.
- c) Water conditions can cause the eggs or fry to floods, droughts or lack of food sources.

The severity of the impact depends greatly on the location the time of the delay the obstruction causes, the stresses caused by the obstacle and the number of additional obstacles the fish must encounter before it reaches the spawning grounds. Although each obstruction may not be a total barrier, the accumulative stress could result in a premature end to its migration (Gauley, 1960).

2.1.2 Causes of Obstructions

2.1.2.1 Water Velocity

In contrast to a stream, a culvert presents a hydraulically efficient water channel. The culvert cross sectional area and roughness are usually less than the channel it replaces. As a result, the water velocity is usually increased more than the original channel. This increase in velocity can be an obstacle in that it can be greater than the speed at which the fish can swim.

2.1.2.2 Water Depth

Low water levels expose fish to predation and contact with the stream bottom. Low water levels result in poor respiration because the gills are not fully submerged resulting in oxygen starvation and reducing the ability to maintain activity.

Culverts cause low water levels because they are designed to provide maximum flow with no provisions for conditions during low flow periods. Flow depth is further reduced by the cross sectional shape of the culvert. For instance, wide, flat bottom culverts such as boxes, horizontal ellipses, or pipe arches have a lower depth per unit of discharge than a round pipe.

2.1.2.3 Raised outlets

Raised outlet creates obstructions in that the level of the outlet is greater than the jumping ability of the fish. Culverts tend to scour out the outlet stream channel creating raised outlets. Depending on species fish can jump several feet over an obstacle. Studies have found that a minimum pool depth to fall height of 1.25:1 is necessary for fish to overcome this obstacle (Stuart, 1962).

2.1.2.4 Debris

Because culverts are a restriction in the stream channel, they are susceptible to debris accumulation. Debris forms a barrier to movement or creates a high velocity area through which fish cannot pass.

2.1.3 Habitat Loss

Culverts result in habitat loss because the natural stream bed is replaced by a metal or concrete structure. Also, because the structure affects the stream hydraulics, the spawning, rearing, and food production of the stream can be affected by areas not directly affected by the structure (Dane, 1978).

2.1.4 Spawning

Spawning areas are made up of a specific combination of water velocity, water depth, and gravel composition. Culverts affect a streams spawning quality by:

- a) Displacing natural stream beds. Material usually found in the culvert is too large, too unstable or not deep enough to be utilized for spawning.
- b) By cutting off natural stream channels, the structure can remove other usable areas.
- c) Natural features such as gravel bars and riffles can be eroded.
- d) Debris can be deposited on spawning areas
- e) Silt from cut bank erosion can be deposited on the eggs.
- f) Water flow instabilities can destroy eggs deposited in the gravel.

- g) Upstream ponding can elevate water levels too deep for spawning. Ponding also forces fish to spawn in pond edges where the eggs are exposed during times when water level drops. Also, ponding causes silt deposition on eggs due to reduced water velocities.

2.1.5 Rearing

The rearing capability of a stream to support fish populations can also be greatly affected by culverts. Culverts affect rearing by:

- a) Displacing the natural stream properties with provide areas where the fry can rest.
- b) Cutting off natural bends and side channels
- c) Changes in water velocities carrying silt and gravel and depositing it in pools used by rearing fish.
- d) Culverts installed below stream grade lowers the water level and eliminate pools. Conversely, ponding can move rearing fish into flooded areas which cause them to be stranded when the water recedes.

2.1.6 Food

The fish food chain is highly dependent on the aquatic environment. Algae and periphyton need sunlight to being the chain as well as a stable gravel substrate to live. Aquatic insects feed on these primary producers which are then fed upon the fish.

A culvert cuts off any sunlight. As well, the absence and instability of a gravel substrate does not allow organisms to live within it. The instability of the channel material above and below the culvert as well as the erosion and siltation problems is also detrimental to these primary food chain organisms.

2.1.7 Stream Instability

A culvert presents a fixed and unyielding influence on the material in which it is placed. This influence creates an imbalance the stream hydrology and forces the stream to readjust itself to regain equilibrium (Dryden & Jessup, 1974). When culverts are installed high discharges can cause extensive scouring at the outlet and downstream deposition.

2.1.8 Culvert Failure

Failure of a culvert can cause damage to both the nearby stream and to areas downstream. Failures usually result in large quantities of fill material being deposited and washed downstream destroying spawning and rearing habitat. Failures usually occur as a result of over topping of fill due to improper sizing, culvert collapse because of over-loading, fill failure as a result of erosion, or blockages, and failures from natural events such as floods.

3.0 Project Area Background

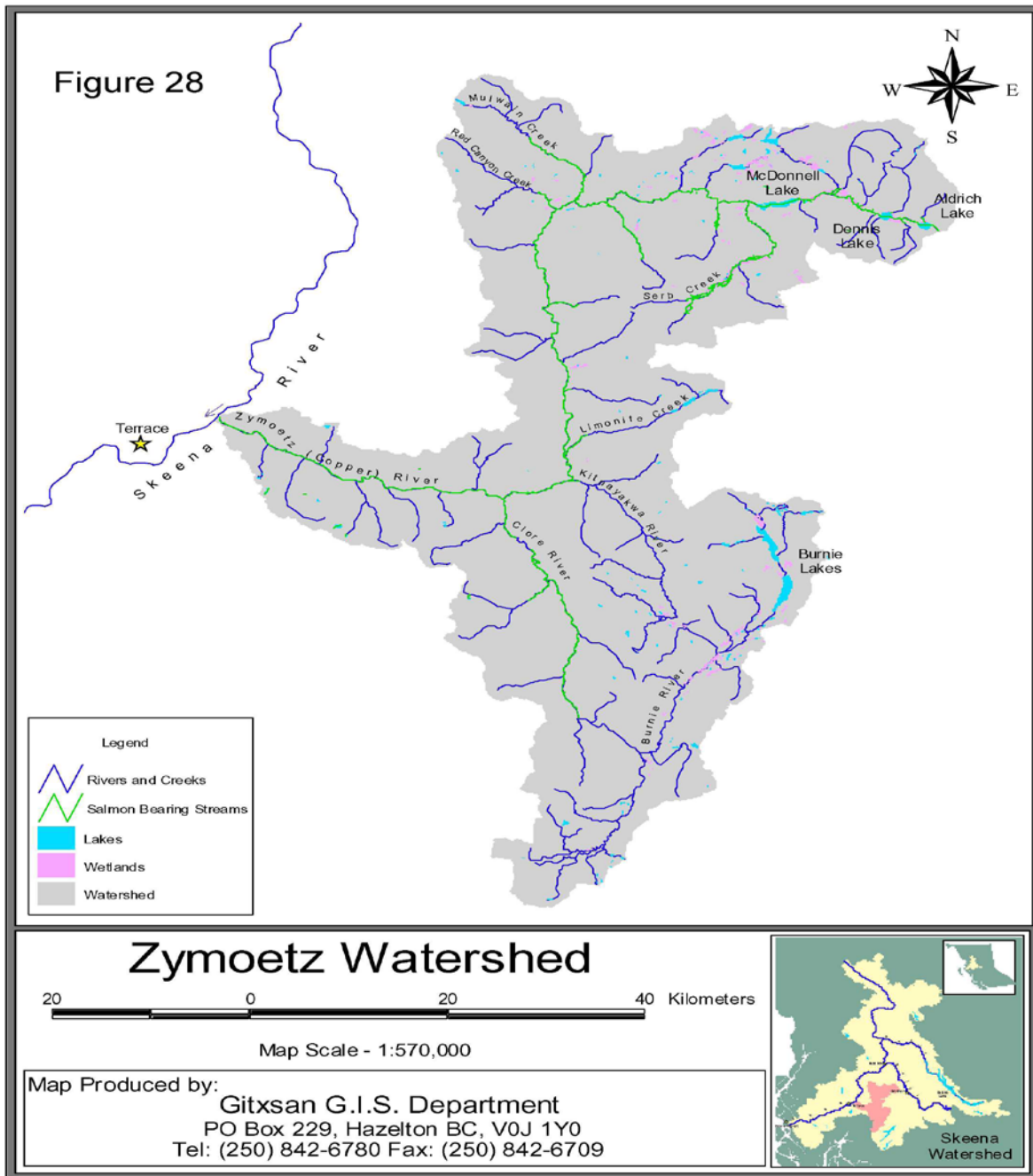
The Copper River Watershed is located in northwest British Columbia, in the south central portion of the Skeena River Watershed. The Copper River (Gazetted Name: Zymoetz), flows generally westerly into the Skeena River left bank, approximately 8 km north-east of Terrace, B.C. The headwater lakes in the north are approximately 20 km southwest of Smithers, B.C.

The Copper River is a sixth order system that drains a watershed of approximately 3,028 square kilometres. It is a major tributary of the Skeena River contributing approximately 10% of the flow (Kerby 1984). The Copper River main stem arises from a chain of headwater lakes – Aldrich, Dennis, and McDonnell Lakes – and flows approximately 120 km to the confluence with the Skeena River. The Copper drains a portion of the Bulkley Ranges of the Hazleton Mountains with approximately 20 salmon bearing streams and their tributaries. Elevation ranges from 120 m at the Skeena – Copper confluence, to 2740 m in the Howson Range. McDonnell Lake is situated at 830 m.

Snowmelt controls the hydrology with a mean annual discharge for the system of 105 m³/sec. Monthly mean discharges range from a low in March of 25.7 m³/sec to a high in June of 358 m³/sec. The river shows a prolonged late May/early June discharge peak due to snowmelt and in most years one or more fall floods following rainstorms. In about 40% of the years the annual peak flood is one of the fall storm events.

The headwaters of the Copper Watershed include Hudson Bay Mountain (2250m) near Smithers, the glaciated Howson Range, the Burnie Lakes basin, and the northern slopes of Atna Peak at the head of the Clore River. Important tributaries are Clore River, draining 625 km², Kitnayakwa Creek with a drainage area of 274 km², and Limonite Creek draining 83 km².

Figure 1: Map of Copper (Zymoetz) Watershed.



4.0 Introduction

In the summer and fall of 2010 B.C. Timber Sales conducted. Funding for this project was provided by the Forest Investment Account.

The scope of the project included all roads and crossings within the Copper River drainage. The project area consisted of all accessible FSRs and non-permitted forest roads in the four mentioned drainages. In many cases, streams or crossings were not accessible due to restrictions such as completely brushed in roads or the stream or crossing is located on or accessed through private property. For others the stream or crossing no longer existed either through channel abandonment by the stream or the crossing was completely removed. All areas which were accessible by either 4x4 truck, quads, or by foot were assessed.

The water quality evaluations were carried out in between July 8th and November 10th of 2009. The objective was to assess and rate the crossings and structures for sediment delivery risk. Further to the assessment, site specific remediation recommendations where necessary were also performed. The intention of this survey was to identify all roads and crossing which pose a significant sediment delivery risk to downstream water quality and fish habitat.

The Copper River and its tributaries support a very highly diverse and abundant fish population. They support all anadromous fish populations native to British Columbia (BC Ministry of Environment FISS Database) and include:

- Coho Salmon
- Chum Salmon
- Pink Salmon
- Chinook Salmon
- Sockeye Salmon
- Steelhead/Rainbow Trout
- Cutthroat Trout
- Dolly Varden
- Bull Trout
- Mountain Whitefish

Stream crossings are generally grouped into two main types—open bottom structures (OBS) and closed bottom structures (CBS). Open bottom structures include bridges and open bottom culverts (log and arch culverts). The most common closed bottom structures used on fish streams are corrugated pipes (primarily metal), which are ideally embedded to retain stream substrate and to provide fish habitat and passage.

If CBS are not embedded and are placed on excessive slopes or where they constrict the natural stream channel, then one or more of the following conditions may jeopardize fish passage:

- a) An elevation drop at the outlet (downstream end of the culvert)
- b) Excessive velocities and (or) turbulence inside the culvert
- c) An area of high water velocity acceleration at the inlet

Crossing structures such as culverts which are placed incorrectly severely restrict fish passage by creating either excessive water velocities within the structure and/or plunge falls at the outlets.

Velocity barriers exist when the speed of the moving water in the culvert or structure is greater than the swimming ability of fish at any or all life stages (Parker 2000, adapted from Katopolis and Gervais, 1991). Open culverts should not have slopes exceeding 0.5% for culverts greater than 24m in length and 1.0% for culverts less than 24 m.

Salmonid juveniles cannot swim through water flowing in excess of 0.5 m/sec (McCarthy, 2009). Adult salmonids have difficulty swimming in velocities of 6 m/sec.

Barriers caused by excessive height exist when it exceeds the ability of the fish to jump it at any or all life stages (Parker 2000, adapted from Whyte et. al., 1997). General guidelines state that the pool at the outfall must be at least 1.3 times the jump height. Juvenile salmonids would have difficult jumping heights over 0.5 meters (McCarthy, 2009). Adult salmonid maximum jump heights vary with species and vary from 1.5 to 3.4 meters.

Evaluation methods outlined in the field guide focuses more on closed bottomed structures because of problems associated with these structures if they are not properly designed and installed (Slaney and Zaldokas, 1997). The assessment is based on the water flow dynamics within, above and below the crossing structure that are necessary to provide safe fish passage. Fish passage presence cannot be proven with these assessments but they do provide the information necessary to determine the effectiveness of fish passage and the impact of the structure on fish passage at the locations

5.0 Methods

5.1 Pre-work Planning

Before entering the field, 1:20,000 map-sheets were produced for the entire project area detailing the stream crossings and roads. Site numbers were assigned to each site in numerical order. Knowing that every site may not be captured on the map, it was determined that crossings not located on the map would be assigned an alphabetical designation with the number of the last mapped stream crossing. Example: if the last stream number was 54 then the not mapped stream up the road from stream 54 would be labelled stream 54A.

5.2 Field Assessment of Fish Passage Determination

At sites pre-determined to be fish bearing an Assessment for Fish Passage Determination assessment was done. Using the same field equipment and the Field Assessment for Fish Passage Determination of Closed Bottom Structures field Guide, the assessor performed the following:

At sites determined to be fish-bearing, the evaluator:

- a) Records date, site identification, crew, GPS coordinate (UTM), stream name, road name and distance marker, Forest District, and crossing type.
- b) Determines extent of embedment of structure, amount of substrate in culvert (percent of length), and determine if material is representative of that found in the natural channel.
- c) Record structure dimensions such as diameter and length.
- d) Records culvert slope to nearest percent and if less than 4% then record slope to nearest 0.1% with a level
- e) Measures downstream channel widths as per Fish Stream Identification Guidebook (B.C. Ministry of Forests, 1998).
- f) Records outlet drop (in cm).

Further information is recorded in order to identify possible remedial actions and to assist in prioritization. This information is:

- a) Outlet Residual pool depth. Recorded as the depth of the pool created at the outfall of the structure.
- b) Record downstream slope.
- c) Evaluate and rate the habitat value of the crossing site and record as High, Moderate or Low. Note also the value of the habitat upstream of the structure as this will allow the value of the habitat gained by improving fish passage at the structure.
- d) Depth of fill above the structure. This measurement is used to estimate the cost of removal.
- e) Record the valley fill. This measure of stream bed composition allows for determination in whether an open or closed bottom structure is suitable for replacement.
- f) Record where or not beaver activity is present.
- g) Record whether or not inlet drop is present.
- h) Record backwatering (damming up).
- i) Record if fish sighted.
- j) Recommend appropriate fix or remediation to the site.
- k) Photo documentation.
- l) Record any relevant comments appropriate to the site.

5.3 Data Interpretation

Data is summarized and displayed in Table 1. Sites which require some action are shaded in grey to allow them to be separated from sites with no fish or action required

Data from the field cards were summarized and displayed on graphs using Microsoft Excel. Crossing score was calculated as the total of the values of each site (in cubic meters). Calculations are outlined in the field form. Each site is then graded based on the cumulative scores produced at the site and ranked according to the Field Assessment rating system.

- 0-14 Passable
- 15-19 Potential Barrier
- >20 Barrier

Figure 2: Sample Site Card:

Location and Overview Information					
Project No:		Date of Inspection		Crossing ID No:	
Crew:		Coordinates:	10U	E	N
Road Name:		Road Km Mark:		Forest Service Road ID No:	
MOFR District:					
Field Observations and Measurements					
Crossing Type: RC PA EC EA OT		Culvert Dimensions: (mm)		Culvert Length (m)	
Embedded: YES NO		If NO, to what % embedded: 0 25 50 100		Resemble Channel: YES NO	
Backwatered % of CV: 0 25 50 75 100		Depth of Fill: (cm)		Outlet Drop: (cm)	
D/S Elevation: (m)		U/S Elevation (m)		Inlet Drop: YES NO	
Outlet Residual Pool depth: (cm)		D/S Channel Width: (m)		D/S Stream Slope: (%)	
Valley Fill: DF SF BR		Beaver Activity: YES NO		Habitat Value: LOW MOD HIGH	
Fish Sighted: YES NO FPC		Species:		Location of Fish: U/S D/S C V	
Culvert Fix: RM OBS SS EM BW		Length and/or span: (m)			
Photos:					
Photo No:	Description:	Photo No:	Description (if present at site)		
	Stream Name		Beaver activity, fences or cages		
	Culvert Outlet		Multiple culverts at crossing		
	Culvert Barrel		Backwater due to D/S weir, lake or wetland		
	D/S of Culvert – away from road, natural conditions		Fish Species		
	U/S of Culvert – away from road natural conditions				
Minnow Traps					
Location 1: U/S D/S		Time IN:	Time OUT:		
Depth: (cm)		Species Caught/#:	Photo Number:		
Location2: U/S D/S		Time IN:	Time OUT:		
Depth: (cm)		Species Caught/#:	Photo Number:		
Additional Comments:					

Fish Barrier Scoring and Results:													
Risk	Embedded	Value	Outlet Drop	Value	Slope	Value	SWR	Value	Length	Value		Cumulative Score	RESULT
Low	>30cm or >20% of dia and discontinuous	0	<15 cm	0	<1%	0	<1.0	0	<15m	0		0-14	Passable
Mod	<30 cm or 20% of dia	5	15-30 cm	5	1-3%	5	1.0-1.3	3	15-30m	3		15-19	Potential Barrier
High	No embed	10	>30 cm	10	>3%	10	>1.3	6	>30m	6		>20	Barrier

6.0 Culvert Shape

This section is included to provide the information used to make the recommendations.

Culvert shape plays an important role in determining the water flow and influence fish passage at a site. Some shapes are mentioned in this report and are explained below:

a) Bottomless Arch

A bottomless arch is a structure which resembles a bridge. It retains the natural stream substrate and conditions present in the stream. Other components of a natural stream are impacted such as food production, rearing and spawning due to material movement and loss of light. Culvert sizing is a crucial factor in that the advantages of retaining the natural stream bed can be cancelled out if the culvert is undersized.

b) Box Culverts

Box culverts are usually made of wood. They also resemble a bridge and allow a crossing to be installed that does not restrict the channel width or flow characteristics.

c) Pipe Arch

Pipe arches are similar to the bottomless arch. They both allow similar stream and flow characteristics. They are advantageous in that both may be used in areas of low fill. The pipe arches wide, flat profile allows for an advantage in upstream migration in that by backwatering the structure an increase in tail water elevation results and reduces velocities in the pipe.

d) Horizontal Ellipse

The squat profile of this structure makes it useful in low fill situations. Unlike the pipe arch, the widest part of the cross section is in the middle rather than the lower section, which results in flow characteristics between that of a pipe arch and a round pipe. The shape results in a deeper water depth during low water times, but does not provide a broad a bottom area.

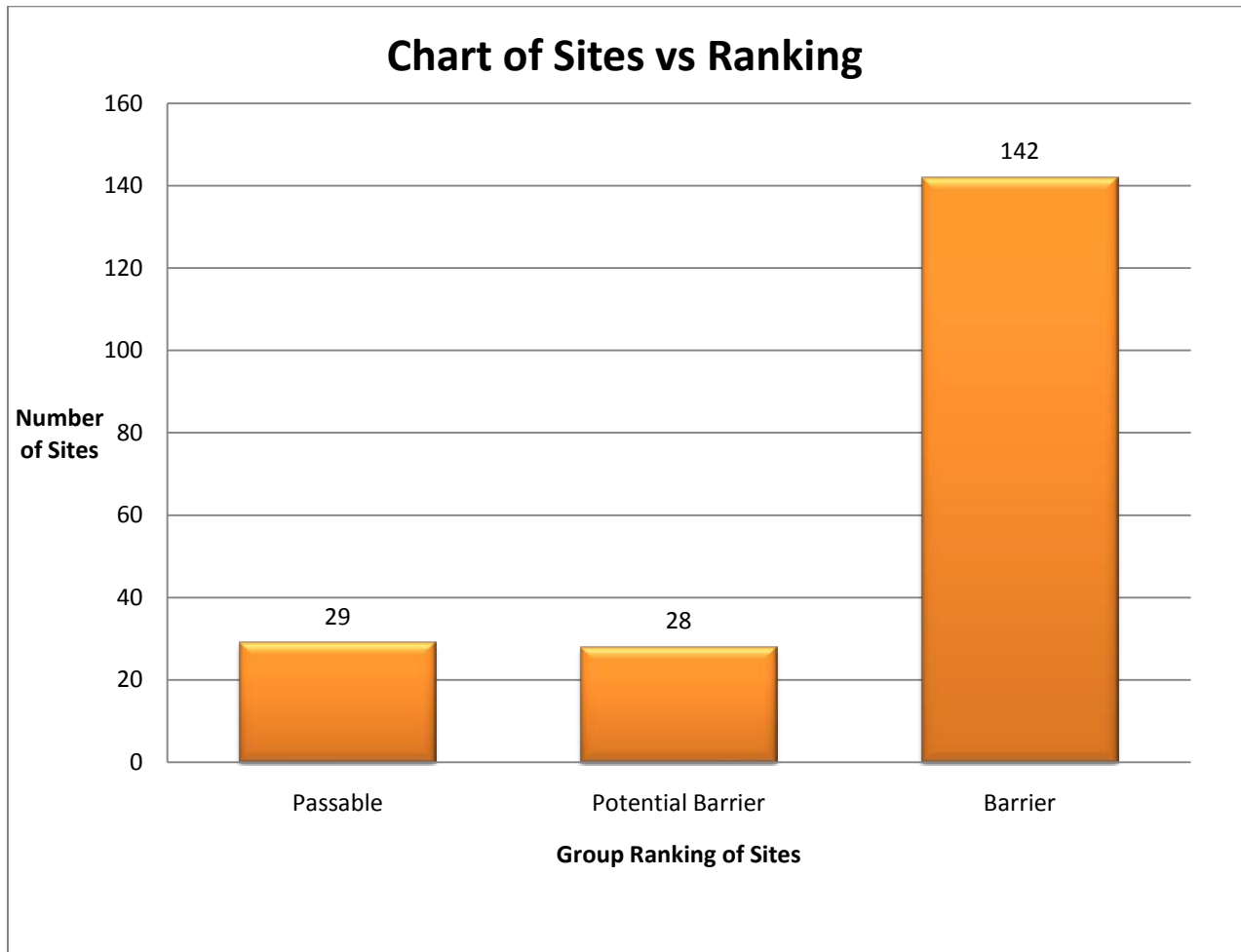
7.0 Results

A total of 636 sites in the Copper River watershed were fully assessed for fish passage using the assessment for closed bottom structures. Sites of passable ranking were found at 29 sites. Sites which rated as having a potential barrier were found at 28 sites. Sites which rated as having a definite barrier were found at 142 sites (See Tables 1 and Figures 3).

Figure 3 show that there is a high proportion of 'Barrier' sites. Much of the forest development in the Copper River drainage occurred over 30 years ago. Since that time, many of the roads and areas have over grown and self-stabilized. While the heavily over-grown roads created access problems for much of the project, they have effectively stabilized the cut and fill slopes along the roads. As well, many of the streams have stabilized into their new channels and any fine sediment has long since eroded away.

Old roads were found to have streams which in many cases cut through and around old drainage structures and re-established a stream channel through the old road. It is also worth noting and will explain further the reason for so many 'Barrier' sites, is that many roads are built at the toe of slope on hill/mountainsides. This results in a much lower gradient on the downstream side than on the upstream side. Roads are often built using this 'cut and fill' method as the steep upslope provides the material for the 'fill' on the lower. The product of this method as outlined above is that the down slope stream channel is of low gradient while the upslope stream channel is often steep or gullied. Many of the "Barrier" sites exhibited this character and even though they were classed as being "Barrier" upgrading or converting the structure would provide very little if any additional upstream fish habitat. Some will be improved by upgrading the structures and they have been identified to how much habitat would be improved in Table 1.

Figure 3 – Fish Passage rating for 199 Fish Streams in Copper River Watershed.



8.0 Discussion and Recommendations

8.1 Discussion

One of the major problems encountered in the completion of this project was that many of the sites listed to be visited were completely inaccessible. Maps showing the sites to be visited were compiled as a result of photo interpretation and historical road data. Unfortunately, many of the roads and sites were not able to be reached. Many times spur or branch roads had deteriorated so badly due to heavy ingrown brush or washed out that sites further up the road were not practical to access. Also, in many locations identified as stream crossings, the stream had completely changed location, dried up or was just a minor cross drain.

8.2 Recommendations

While a large percentage of the sites surveyed did not conducive to fish passage, many of them should have some form of work be it maintenance, removal or replacement in order to preserve downstream water quality into areas that do hold fish.

Usually, erosion below a culvert is caused by a sudden release of water (usually from a blockage), high velocities generated by undersized pipes, or by poor alignment of the structure. To minimize these problems and reduce erosion several factors should be considered:

- a) Avoid located structure at or near any bends in the stream.
- b) Avoid aligning the structure so that the flow of water is directed a bank. If this is not possible, the structure should be skewed to compensate.
- c) Build a basin at the culvert outlet to allow the water velocity to dissipate. Length and width should be twice the diameter of the culvert. Pool depth should be 0.6 m below the elevation of the culvert outlet.
- d) Disturbed cuts and fills should be properly armoured during construction. Armour should also protect the natural bank when improper alignment cannot be avoided.
- e) Culvert inlet and outlet undermining can be avoided by constructing walls attached to the bottom of the culvert and extending into the streambed. Aprons at the outlet and inlet should be avoided.

Other methods of erosion protection can take the form of large boulders, preferable shot rock overlying filter blanket or gravel.

Table 1: Copper River Watershed Crossings-Action required on shaded boxes.

<u>Site ID#</u>	<u>Rating</u>	<u>Crossing Type</u>	<u>Road Reference</u>	<u>Watershed</u>	<u>Easting</u>	<u>Northing</u>	<u>Recommendations</u>
1013, 1012,1007, 1008, 1009	n/a	n/a	Stub road off 42 km Kleanza	Kleanza	n/a	n/a	Stub road completely brushed in with steep slopes below road.
1010	n/a	Bridge	42 km Kleanza	Kleanza	566895	6053435	24 meter bridge over fish-bearing stream-No action required.
1011	n/a	WBC	41 km Kleanza	Kleanza	566812	6054936	Wood box culvert: No fish habitat due to stream slopes of greater than 20% for 750 m below road crossing.
1006	n/a	600 mm	40 km Kleanza	Kleanza	566896	6053441	Dry, brushed in channel. No habitat, water, or scour observed.
1003	26	1000 mm	39.3 km Kleanza	Kleanza	567031	6052506	No treatment. Low likelihood of fish presence due to significant downstream gradient. Small amount of upstream habitat (~150 m).
1005	36	1000 mm	39.5 km Kleanza	Kleanza	566958	6052760	No treatment. No habitat and significant barriers to fish above and below crossing.
1004	28	1000 mm	39.3 km Kleanza	Kleanza	566990	6052548	No treatment. Low likelihood of fish presence with significant downstream gradient and possible 10 m of

							upstream habitat.
1000 1001	n/a	n/a	37 km Kleanza	Kleanza	568129	6050722	No stream or crossing present
1002	36	2x900mm	38.5 km Kleanza	Kleanza	567455	6051917	No treatment. Very poor habitat due to steep slopes on either side of crossing.
4120	n/a	WBC	1.2 km Br. 850 Limonite	Copper	567932	6040705	Wood box culvert. Crossing not assessed.
4181	n/a	WBC	1.0 km Br. 850 Limonite	Copper	567925	6040868	Wood box culvert. Crossing not assessed.
4180	n/a	Bridge	0.2 km Br. 850 Limonite	Copper	568268	6041692	Bridge. Crossing not assessed.
4192	n/a	WBC	0.2 km Br. 800 Limonite	Copper	568225	6041965	Wood box Culvert. Crossing not assessed.
4214	30	600 mm	0.4 km Br. 800 Limonite	Copper	569981	6042461	No defined channel upstream or downstream. Not likely fish present.
4213	n/a	n/a	0.4 km Br. 800 Limonite	Copper	n/a	n/a	No stream or crossing at this site.
4359	n/a	n/a	Br. 1350 Limonite	Copper	n/a	n/a	No culvert in road. Crossing has been deactivated.
4361	18	600 mm	Br. 1300 Limonite	Copper	569319	6047668	No defined channel. No action required.
4366	n/a	n/a	Spur off Br.1300 Limonite	Copper	n/a	n/a	No stream or crossing found.

4364	15	800 mm	60.5 km Limonite	Copper	569019	6047655	No channel exists. Pipe is also plugged.
4337	n/a	n/a	Br. 1300	Copper	569860	6046629	Wood box culvert. Crossing not assessed.
4244	n/a	n/a	54.2 km Copper	Copper	568771	6042518	No stream or crossing found.
4236	n/a	n/a	54.5 km Copper	Copper	568718	6042703	No stream or crossing found.
4257	n/a	n/a	54.5 km Copper	Copper	568638	6043218	No stream or crossing found.
4270	n/a	n/a	55 km Copper	Copper	568712	6043690	No stream or crossing found.
4339	34	2000 mm	58 km Limonite	Copper	568735	6046877	Major barrier on outflow side (3 m drop) 40-50% grade
4313	39	2000 mm	57.5 km Limonite	Copper	569557	6044997	1 m drop on inlet side. Should level out inlet and fill pipe with gravel.
4311	n/a	WBC	57 km Limonite	Copper	569644	6044782	Wood box culvert. Crossing not assessed.
4309	n/a	n/a	Stub off Limonite 57 km	Copper	n/a	n/a	Site does not cross stub.
4310	n/a	WBC	57 km Limonite	Copper	569547	6044764	Wood box culvert. Crossing not assessed.
4285	n/a	WBC	1.5 km on Br.1200	Copper	569447	6044049	Wood box culvert. Crossing not assessed.
4261	15	800 mm	55 km Limonite	Copper	570245	6043337	Place 30 cm of gravel in pipe to reduce velocity.
4231	34	1000 mm	54.5 km Limonite	Copper	570189	6042931	Eliminate outlet drop and embed pipe.
4235	18	600 mm	54 km Limonite	Copper	570520	6042810	Embed pipe and place gravel inside.

4233	n/a	n/a	53 km Limonite	Copper	536444	6042779	Bridge
4250	n/a	n/a	3.5 km Telkwa	Copper	575058	6043322	Bridge.
4241	18	2000 mm	3.5 km Telkwa	Copper	574873	6043119	Place boulders at residual pool to eliminate outlet drop.
4240	n/a	n/a	2.5 km Telkwa	Copper	574720	6043058	Rock fill at crossing with no creek present.
4196	n/a	n/a	52 km Limonite	Copper	570887	6042115	Bridge. Crossing not assessed.
4232	42	600 mm	Br 550 Telkwa	Copper	573643	6042862	No channel above pipe. Channel is 10m up road. Need to move pipe up road 10m and drop pipe to channel bed (embed).
4080	29	800 mm	49 km Limonite	Copper	569515	6039737	Significant barrier (4 m drop) below outlet.
4084	n/a	n/a	48.5 km Limonite	Copper	569962	6039820	No creek above crossing. No action required.
4082	39	600 mm	48 km Limonite	Copper	510382	6089799	Conduct fish survey of creek to determine presence. If fish found, need to lower and embed pipe.
4061	21	600 mm	47.5 km Limonite	Copper	570833	6039511	Pipe located 100 further up road than shown on map. Embed pipe and line with gravel.
4062	n/a	n/a	47.5 km Limonite	Copper	570901	6039436	No stream or crossing found.
4042	24	800 mm	47 km Limonite	Copper	571030	6039017	Embed pipe and line with gravel.
4028	23	600 mm	46.5 km Limonite	Copper	571183	6038826	Embed pipe.
3998	33	600 mm	46 km Limonite	Copper	571115	6038346	Downstream barrier (falls) No fish.

3994	39	600 mm	46 km Limonite	Copper	570798	6038140	Downstream barrier. Large outlet drop and brushed in channel.
3616	n/a	WBC	9.7 km Kitnyakwa	Copper	576418	6031512	Wood box culvert. Crossing not assessed.
3643	n/a	WBC	9.7 km Kitnyakwa	Copper	575865	6032437	Wood box culvert. Crossing not assessed.
3660	n/a	WBC	8.2 km Kitnyakwa	Copper	575466	6032758	Wood box culvert. Crossing not assessed.
3683	n/a	n/a	7.7 km Kitnyakwa	Copper	574923	6033278	No stream or crossing found.
3887	n/a	Bridge	2.5 km Kitnyakwa	Copper	571942	6086415	Bridge. Crossing not assessed.
3932	n/a	n/a	44 km Limonite	Copper	569986	6037011	Map shows creek crossing at 44.3 on Kitnyakwa. Stream actually drains under WBC at 44.2 on M/L. Large beaver dam has diverted stream 10m from inlet.
3599	n/a	n/a	10.5 km spur on Kitnyakwa	Copper	576496	6030387	Road deactivated-no crossing located.
3650	n/a	n/a	8.5 km Kitnyakwa	Copper	575720	6032533	No stream or crossing found.
3682	n/a	n/a	Spur at 6.8 km off Kitnyakwa	Copper	574712	6033240	Road deactivated: No crossing present.
3838	n/a	n/a	4.2 km Kitnyakwa	Copper	573003	6035704	No crossing or stream- Stream appears below road (subsurface flow?).
3839	n/a	n/a	0.5 km Br.500 Kitnyakwa	Copper	572734	6035701	No stream or crossing found.
3851	n/a	Bridge	0.5 km Br. 200	Copper	571710	6035530	Bridge: Crossing not assessed.

3675A	15	2x900 mm	3.5 km Kitnyakwa	Copper	574263	6033000	Survey for fish-If fish present then embed pipes. Marginal habitat above pipes.
3675B	15	700	3.5 km Kitnyakwa	Copper	574263	6033000	Survey for fish-If fish present then embed pipe. Marginal habitat above pipe.
3702	8	600	2.5 km Kitnyakwa	Copper	573842	6033721	Significant barrier above crossing (50% slope for 50 m). Pipe is 50% plugged. Pipe should be cleaned for water quality.
3717	n/a	n/a	Br.500 Kitnyakwa	Copper	573840	6033718	Significant steep barrier below. No habitat above.
3719	10	600	Kitnyakwa	Copper	573838	6033893	No habitat above pipe.
3718	n/a	n/a	Br 500 Kitnyakwa Stub Left	Copper	n/a	n/a	Stub is not built to creek as shown on map. Creek is 20 m beyond end of stub.
3970	n/a	n/a	Spur at 42.5 km on Copper M/L	Copper	569238	6037198	Crossing is on old logging spur. Bridge used to cross it but bridge has been removed. No action required.
3926	n/a	n/a	42 km Copper M/L	Copper	n/a	n/a	No stream or crossing found.
3918	n/a	n/a	41.7 km Copper M/L	Copper	n/a	n/a	No stream or crossing found.
3909	n/a	n/a	41.5 km Copper M/L	Copper	n/a	n/a	No stream or crossing found.
3881	n/a	n/a	41 km Copper M/L	Copper	n/a	n/a	No stream or crossing found.
3893	39	1000 mm	41.1 km Copper M/L	Copper	545674	6034576	Steep (>30%) cobble/grass creek bed above inlet. No habitat.
3846	n/a	n/a	39.5 km Copper M/L	Copper	566479	6085549	Bridge: No action required.

3843	21	1200 mm	39.4 km Copper M/L	Copper	566372	6035500	No habitat. Outlet perched 2 m above bed. No habitat above pipe.
3817	34	1000 mm	38 km Copper M/L	Copper	585067	6035126	No habitat above pipe. Nearly vertical channel for 10m just before inlet.
3493	n/a	n/a	20.8 km Kitnyakwa	Copper	578710	6024101	Road is not built therefore no crossing. Felled right of way only (very old).
3471	n/a	n/a	22.2 km Kitnyakwa	Copper	579175	6022899	Road is not built. No crossing.
3494	11	1000 mm	20.3 km Kitnyakwa	Copper	578902	6024487	10 cm of embedded material in pipe. Passable. No treatment recommended. Low to no habitat upstream.
3500	23	700 mm	19.1 km Kitnyakwa	Copper	579352	6025451	>20% slope above and below culvert. Very low probability of fish presence. No treatment.
3501	23	1000 mm	19.1 km Kitnyakwa	Copper	579352	6025449	>20% slope above and below culvert. Low probability of fish presence.
3514	n/a	n/a	Spur off 17.5 km Kitnyakwa	Copper	278678	6027016	Bridge or culverts removed. No assessment required.
3518	26	800 mm	16.9 km Kitnyakwa	Copper	057909 7	6027212	Low fish habitat and steep gradients (>40%) above and below culvert. No treatment.
3840	15	600 mm	4 km Kitnyakwa	Copper	572832	6035736	Low probability of fish due to canyon below (barrier to Kitnyakwa River). No defined channel upstream with channel being multiple seepages.

3836	25	500 mm	0.3 K km Kitnyakwa	Copper	572787	6035678	Significant barrier into Kitnyakwa River (canyon). No treatment.
3814	15	500 mm	0.5 km Br 500 Kitnyakwa	Copper	573002	6035411	Significant downstream barrier (canyon). No flow at time of measurement and no defined upstream channel.
3705	26	600 mm	1 km Br 300 Kitnyakwa	Copper	573415	6033711	Significant barrier below (canyon). No habitat. 2 pipes on location (600 & 800). 800 mm pipe plugged. No treatment.
3708	36	600 mm	0.8 km on Br 300 Kitnyakwa (crossing on stub)	Copper	573590	6033728	Barrier below (canyon). Inlet and outlet crushed (barely functional). Recommend removing culvert for functionality reasons. No fish.
3706	36	700 mm	0.2 km Br 300 Kitnyakwa	Copper	573801	6033690	Crushed inlet. Remove culvert and cross ditch. No fish due to steep gradients above and below.
4426	n/a	n/a	34.5 km Kleanza	Kleanza	n/a	n/a	No stream or crossing found.
4397	19	1400 mm	32.5 km Kleanza	Kleanza	565731	6048429	Creek is dry. No habitat value.
4399	30	1600	31.2 km Kleanza	Kleanza	565248	6048426	Low value gain upstream. 100 m upstream channel slope increases >30%.
4389	33	450	31.2 km Kleanza	Kleanza	564678	6048290	No habitat value gained from improvement. No work required.
4391	n/a	n/a	Spur at 36 km Kleanza	Kleanza	567965	6049124	Located on in-block spur logged 1985. Road permanently deactivated with no structures. Road completely brushed with 8-10 m alder. No access.

4392	n/a	n/a	Spur at 36 km Kleanza	Kleanza	567965	6049124	Located on in-block spur logged 1985. Road permanently deactivated with no structures. Road completely brushed win with 8-10 m alder. No access.
4393	n/a	n/a	Spur at 36 km Kleanza	Kleanza	567965	6049124	Located on in-block spur logged 1985. Road permanently deactivated with no structures. Road completely brushed win with 8-10 m alder. No access.
4408	n/a	n/a	Spur at 36 km Kleanza	Kleanza	567965	6049124	Located on in-block spur logged 1985. Road permanently deactivated with no structures. Road completely brushed win with 8-10 m alder. No access.
4415	n/a	n/a	Spur at 36 km Kleanza	Kleanza	567965	6049124	Located on in-block spur logged 1985. Road permanently deactivated with no structures. Road completely brushed win with 8-10 m alder. No access.
4413	n/a	n/a	Spur at 36 km Kleanza	Kleanza	567965	6049124	Located on in-block spur logged 1985. Road permanently deactivated with no structures. Road completely brushed win with 8-10 m alder. No access.
4375	n/a	n/a	29.4-31 km Kleanza	Kleanza	n/a	n/a	No stream or crossing found.
4376	n/a	n/a	29.4-31 km Kleanza	Kleanza	n/a	n/a	No stream or crossing found.
4377	n/a	n/a	29.4-31 km Kleanza	Kleanza	n/a	n/a	No stream or crossing found.
4378	n/a	n/a	29.4-31 km Kleanza	Kleanza	n/a	n/a	No stream or crossing found.
4379	n/a	n/a	29.4-31 km Kleanza	Kleanza	n/a	n/a	No stream or crossing found.
4381	n/a	n/a	29.4-31 km Kleanza	Kleanza	n/a	n/a	No stream or crossing found.

4382	n/a	n/a	29.4-31 km Kleanza	Kleanza	n/a	n/a	No stream or crossing found.
4385	n/a	n/a	29.4-31 km Kleanza	Kleanza	n/a	n/a	No stream or crossing found.
4386	n/a	n/a	29.4-31 km Kleanza	Kleanza	n/a	n/a	No stream or crossing found.
4387	n/a	n/a	29.4-31 km Kleanza	Kleanza	n/a	n/a	No stream or crossing found.
4396	n/a	n/a	29.4-31 km Kleanza	Kleanza	n/a	n/a	No stream or crossing found.
4374	26	900 mm	29.4 km Kleanza	Kleanza	563191	6047890	Has a new culvert as of 2010. No water in channel.
4335	n/a	n/a	5 km No Gold	Kleanza	n/a	n/a	Site is on a planned road. Road is not constructed therefore plot does not exist.
4370	36	800 mm	2.5 km No Gold	Kleanza	565060	6047636	No habitat value. No action required.
4373	n/a	Bridge	2.3 No Gold	Kleanza	564841	6047723	16 m Bridge.
4372	28	800	2 km No Gold	Kleanza	564557	6047715	Low value to no habitat presence. No action required.
4363	n/a	n/a	1.8 km No Gold Spur	Kleanza	564562	6047563	Crossing located in old block and road permanently deactivated with pipes pulled.
4355	n/a	n/a	1.8 km No Gold Spur	Kleanza	564562	6047563	Crossing located in old block and road permanently deactivated with pipes pulled.
4367	n/a	n/a	1.2 km No Gold	Kleanza	563682	6047564	No stream or crossing found.
4365	36	1000 mm	1.0 km No Gold	Kleanza	563471	6047533	Very low habitat value up and down stream. (22% slopes). No action.
4360	36	1200 mm	0.8 km No Gold	Kleanza	563352	6047512	Very low habitat value. Up and downstream slopes of

							>20%. Also has series of downstream waterfalls.
4373	n/a	n/a	29 km Kleanza	Kleanza	n/a	n/a	No stream or crossing found.
3827,3751, 3759,3767, 3767,3787, 3778,3778, 3784,3783, 3788,3801 3804,3812 3810,3826 3829,3831 3831,3831 3835,3835 3828,3832 3834	n/a	n/a	30-36 km Copper	Copper	n/a	n/a	No stream or crossings found at these locations.
3757	23	900 mm	34.5 C km Copper	Copper	562552	6034279	Poor to no fish habitat. Steep slopes (>22%) upstream. Dry seasonal creek.
3763	23	900 mm	33 km Copper	Copper	561453	6034423	No fish habitat. Just a cross drain.
3770	34	2x800 mm	33 km Copper	Copper	561267	6034546	Need to add material at outlet side of pipes to create residual pool at discharge.
3798	n/a	n/a	32.6 km Copper	Copper	561120	6034707	No work required. No upstream habitat and stream is ephemeral
3833	23	600 mm	31 km Copper	Copper	559561	6035080	No fish habitat and no defined channel. Dry at time of

							survey.
3833b	18	2x900 and 600 mm	30.5 km Copper	Copper	559100	6035083	No work required. New cross drain for wetland.
3820,3819 3725,3924 3711,3697	n/a	n/a	31.2 km Copper spur	Copper	n/a	n/a	No access. Road permanently deactivated into this old block logged in 1989.
3844	n/a	n/a	29 km Copper	Copper	n/a	n/a	No culverts found within 200 m of mapped location.
3861	n/a	n/a	27.2 km Copper	Copper	555890	6035364	Concrete decked bridge.
3854	n/a	n/a	27.2 km Copper	Copper	555929	6035284	Upstream of 3861. No habitat (exposed NG Line)
3863	n/a	n/a	26.8 km Copper	Copper	n/a	n/a	No stream or crossing found.
3859	n/a	n/a	26.85 km Copper	Copper	n/a	n/a	No stream or crossing found.
3865	n/a	n/a	26.5 km Copper	Copper	n/a	n/a	No stream or crossing located.
3862	n/a	n/a	26.55 Copper	Copper	n/a	n/a	No stream or crossing found.
3866	n/a	n/a	25.9 km Copper	Copper	n/a	n/a	No stream or crossing found.
3868	36	450 mm	25.8 km Copper	Copper	554565	6035417	Creek dry at time of survey. Has second overflow pipe of 700 mm. D/S steep bank and 65 cm outlet drop. Discontinuous upstream channel. No work.
3867	16	600 mm	25.1 km Copper	Copper	553746	6035379	Dry stream. Potential for fish passage at high water. 150% slope upstream. No work recommended.

3878	33	500 mm	24. km 5 Copper	Copper	n/a	n/a	No upstream habitat. >90% slopes upstream. Culvert in poor condition. May want to replace.
3879	n/a	n/a	23.9 km Copper	Copper	n/a	n/a	No stream or crossing found.
3875	30	600 mm	23.7 km Copper	Copper	n/a	n/a	Dry creek. Fish barrier (>50% slope) both above and below crossing. No work needed.
3876	n/a	n/a	23.2 km Copper	Copper	n/a	n/a	No stream or crossing found.
4242	n/a	n/a	Br. 500	Telkwa Pass	574890	6043075	Old PNG access road. No structures in place.
4242A	36	600 mm	Br. 550 3.6 Km	Telkwa Pass	574966	6043150	Pipe plugged by beavers. Road surface flooded. Install 1x2 box culvert to deter beavers.
4238	n/a	n/a	Br.550 3.4 Km	Telkwa Pass	n/a	n/a	No stream or crossing found.
4239	n/a	n/a	Br.550 3.4 km	Telkwa Pass	n/a	n/a	No stream or crossing found.
4229	n/a	n/a	Hydro line above Br.550 at 2.4 Km	Telkwa Pass	n/a	n/a	No stream or crossing found.
4226	n/a	n/a	Hydro line above Br.550 at 2.4 km	Telkwa Pass	n/a	n/a	No stream or crossing found.
4195	n/a	n/a	Hydro line on Limonite 52 km	Limonite	n/a	n/a	No stream or crossing found.

4529	n/a	n/a	58 km Kleanza	Kleanza	565236	6068041	30 meter concrete bridge.
4508	21	900 mm	Br.2000 at 54 km on Kleanza M/l	Kleanza	563435	6066502	No fish habitat.
4517	n/a	n/a	2 km on Br.2000 at 54 Kleanza	Kleanza	564187	6066753	3 m wood box culvert in poor condition.
4516	n/a	n/a	2 km on Br.2000 at 54 Kleanza	Kleanza	56480	6066821	No habitat. Much of u/s & d/s flow through moss and horsetails.
3911	n/a	n/a	21.5 km Copper	Copper	550612	6035759	Steel girder wood deck bridge.
3913	n/a	n/a	21.2 km Copper	Copper	550359	6035753	Wood box culvert. No assessment.
3975	n/a	n/a	19.8 km Copper	Copper	549521	6036829	No stream or crossing located.
3980	n/a	n/a	19.1 km Copper	Copper	548722	6036857	Low likelihood of fish. No habitat above pipe (>55% slopes). Poorly defined stream channel. No action.
3957	n/a	n/a	1.2 km up Matson Creek road from 21.5 Copper M/L	Copper	548920	6036522	No stream or crossing located.
3895	n/a	n/a	1.2 km up Matson Creek road from 21.5 Copper M/L	Copper	550624	6035543	Gas pipeline right of way. No structures on site.

3795	n/a	n/a	400 m up old spur left from approx 4.9 km on R10401A jct from 18.5 k on Copper M/L	Copper	551990	6034251	Road not passable due to thick overgrown brush.
3969	n/a	n/a	17.4 km Copper	Copper	547336	6036636	Steel girder bridge with cedar cribbing. Chinook salmon observed spawning under bridge.
3974	21	600 mm	16.5 km Copper	Copper	546511	6036672	Recommend remove culvert and replace with open bottom structure. Beaver activity d/s (not interfering). 100-200 m of decent Coho habitat u/s.
3940	n/a	n/a	1.2 km Simpson	Copper	547398	6036154	Former bridge location. Bridge has been removed.
3938	n/a	n/a	Old spur from 1.2 km on Simpson M/l from 16.5 on Copper M/L	Copper	547453	6035958	No structure. Stream is running down road and braided. Spur road is very old and overgrown. No habitat or fish access.
3931	n/a	n/a	350m up from old spur that jcts at Simpson M/L	Copper	547530	6035853	No crossing. Road has been washed away by Simpson Creek.
3941	n/a	n/a	1.2 km Simpson	Copper	547381	6036131	Gas pipeline crossing not stream crossing.
3906	n/a	n/a	750m up from old spur that jcts at Simpson M/L	Copper	547701	6035516	No crossing. Road has been washed away by Simpson creek.
3943	n/a	n/a	1.2 km Simpson	Copper	547306	6036229	Gas pipeline crossing not stream crossing.
3846	30	600 mm	1.4 km Simpson	Copper	547182	6036272	Fish barrier (high drop and falls) below pipe. No

							action required.
3864	n/a	n/a	1.3 km Simpson then 1.3 K up old brushed in spur.	Copper	548037	6035049	No access. Road completely grown in and washed away in parts.
3799	n/a	n/a	2.2 km up spur off 1.2 K Simpson	Copper	548298	6034182	Heli access only. Road washed out and brushed in.
3803	n/a	n/a	Near 2.2 km up spur off 1.2 K Simpson	Copper	545327	6034222	Heli access only. Road washed out and brushed in.
3806	n/a	n/a	Near 2.2 km up spur off 1.2 K Simpson	Copper	548401	6034245	Heli access only. Road washed out and brushed in.
3985	n/a	n/a	16.4 km Copper	Copper	545791	6036881	Steel girder bridge. (Simpson Creek)
4005	n/a	n/a	15 km Copper	Copper	545291	6037254	No stream or crossing found.
4012	n/a	n/a	100 m up spur from 14.6 km Copper	Copper	544958	6037383	Pipe at crossing has been pulled. Dry creek bed.
4009	n/a	n/a	14.9 km Copper	Copper	545239	6037291	No stream or crossing found.
3997	n/a	n/a	100 m above 14.9 km Copper	Copper	545201	6037158	No stream or crossing found.
3995	n/a	n/a	150 m above 15 on Copper	Copper	545320	6037130	No stream or crossing found.
4019	20	2x1200 mm	14.6 km Copper	Copper	544980	6037412	No habitat. Channel is coarse cobble and dry.

4021	10	800 mm	14.5 km Copper	Copper	544910	6037446	No habitat. Steep u/s and d/s. No action.
4033	18	1200 and 800 mm	14.2 km Copper	Copper	544638	6037719	Recommend removing and replacing culvert as it has holes and crushed outlet. Maintenance only. No habitat (>35% slopes).
4059	31	1600 and 900 mm	13.2 km Copper	Copper	544196	6038222	Dry at time of survey. Gradient defaults to fish classification. Actual site conditions suggest not. (Large angular cobble/no flow/limited access to river only at high floods).
4067	21	800 mm	13.1 km Copper	Copper	544146	6038306	100-200 m of habitat upstream. Dry at time of survey. Poor quality habitat.
4071	n/a	n/a	13 km Copper	Copper	543852	6038401	No crossing found.
4063	n/a	n/a	100 m above 13.4 km Copper	Copper	544088	6038282	Crossing on natural gas pipeline right of way. No structure in place.
4056	n/a	n/a	13.5 km Copper	Copper	544203	6038259	No stream or crossing found.
4097	13	600 mm	Br. 611300 6 N. Copper	Copper	546641	6039305	No habitat. Pipe at 800 m elevation.
4100	n/a	n/a	Br.611300 6 km N. Copper	Copper	546568	6039271	Cross drain. No structure. Road permanently deactivated.
4267	33	900 mm	2.5 km N Copper	Copper	540752	6042378	Dry steep downstream slopes. No habitat.
4215	28	900 mm	5 km N. Copper	Copper	539103	6041141	Outlet drop 40 cm. D/s slope >50%. Dry channel with no habitat.

4272	n/a	n/a	Br. Q7400 (1 km N Copper)	Copper	538418	6042373	Bridge removed. Permanently deactivated.
4277	n/a	n/a	3.3 km N. Copper	Copper	538080	6042554	15 m bridge.
4283	n/a	n/a	3 km N. Copper	Copper	537917	6042657	15 m bridge.
4315	n/a	n/a	Br off 1 km N. Copper.	Copper	535661	6043557	Dry stream. Pipe elevated. Wood box culvert required.
4305	21	900	0.8 km N. Copper	Copper	535619	6043275	Replace pipe with 1500 mm x 10 m and embed. Prescription required.
3886,3953 3958,3982 4022,4026 4053,4065	n/a	n/a	18 Mile Creek (N.Copper)	Copper	n/a	n/a	18 Mile Creek road completely brushed in (old) No access.
4091,4264 4287,4291	n/a	n/a	N. Copper block spurs.	Copper	n/a	n/a	All spur roads completely grown in and permanently deactivated.
3552	31	950 mm	27.1 km Williams	Copper	555155	6028359	Steep upstream slopes (dry) with low habitat value downstream.
3548	11	2x850 mm	27.05 km Williams	Copper	555071	6028309	No work required. Possibly clean out brush on intake.
3549	31	1200 mm	27 km Williams	Copper	555006	6028253	Freshly logged block by Coast Tsimpian Resources. Logs piled in stream blocking all fish access. Should do fish survey to determine presence and use. If positive

							then should change out to box culvert or other bottomless structure.
3549A,3549B, 3549C,3549D, 3549E,3549F	n/a	n/a	n/a	Copper	n/a	n/a	Locations on spur/winter road. Road completely deactivated and all structures have been pulled out.
3363	n/a	n/a	33 km Clore	Copper	568997	6004804	32m concrete decked bridge.
3373	n/a	n/a	31 km Clore	Copper	569222	6008048	24m concrete decked bridge.
3384	n/a	n/a	29 km Clore	Copper	567694	6010629	22m bridge.
3394	n/a	n/a	27 km Clore	Copper	567728	6012027	1x3m wood box culvert in good condition.
3399	n/a	n/a	22.8 km Clore	Copper	568360	6015671	16m bridge.
3400	n/a	n/a	22 km Clore	Copper	568836	6016139	9 m wood bridge. Good condition.
3402	26	1000 mm	20.3 km Clore	Copper	568562	6017435	Replace and embed larger diameter pipe (1500mm) Should do fish survey first and if positive then implement action.
3403,3407, 3434,3454, 3474	n/a	n/a	14-20 km Clore	Copper	n/a	n/a	No stream or crossing found.
3411	n/a	n/a	18.7 km Clore	Copper	568206	6019030	New 13m bridge.
3428	n/a	n/a	18.4 km Clore	Copper	568330	6020276	16m bridge.
3467	20	600 mm	2 km Br. 14000	Copper	566226	6022139	Fish survey required. If positive install 1000 mm pipe

							and place 30% gravel inside.
3469	30	700 mm	1. km 8 Br. 14000	Copper	566187	6022223	Fish survey required. If positive replace pipe with wood box culvert (1x3 m).
3458,3460 3436,3437 3431,3432	n/a	n/a	1.2 km Br. 14000	Copper	n/a	n/a	Sites are on old in block spur off Br.14000. Road completely brushed in and deactivated. No structures.
3472	30	600 mm	1.5 km Br. 14000	Copper	566252	6022238	Fish survey required. If positive replace with 1x3 wood box culvert.
3487	10	800 mm	0.7 km Br. 14000	Copper	567282	6022715	Passable. No work required.
3464	36	1200 mm	2.5 km Thomas	Copper	565445	6021965	Fish survey required. If positive then replace with 1x4 box culvert.
3466	33	1000 mm	20.3 km Thomas	Copper	565579	6022097	Fish survey required. If positive then replace with 1x3 box culvert.
3426	26	700	2 km Thomas	Copper	565996	6022485	Fish survey required. If positive then replace with 1x3 box culvert.
3482	n/a	n/a	Thomas	Copper	n/a	n/a	No crossing or stream exists.
3492	n/a	n/a	13.8 Clore	Copper	566651	6023575	34m bridge in good condition.
3463,3449 3441,3452 ,3451,348 3487	n/a	n/a	Thomas branch road off 13.5 km Clore.	Copper	n/a	n/a	No access. Road is heavily overgrown.

3497	n/a	n/a	0.2 km Clore Br.700	Copper	566052	6024586	1x3 Wood box culvert in good condition.
3498	26	900 mm	12.1 km Clore	Copper	566171	6024603	Fish survey required. If positive then replace pipe with 1x4 wood box culvert. Upstream values are low with series of short (50 cm) waterfalls.
3506, 3511	n/a	n/a	Clore	Copper	n/a	n/a	No stream or crossing found.
3510	n/a	n/a	10.4 km Clore	Copper	565340	6026003	17m bridge.
3522,3525 3544, 3559	n/a	n/a	9.7 km Clore	Copper	564988	6026717	1x1 wood box culvert in good condition.
3525	31	700 mm	9.5 km Clore	Copper	564993	6026874	Fish survey required. If fish found replace pipe with 1x3 wood box culvert.
3531	33	700 mm	1.5 km Clore Br.2200	Copper	564558	6027305	No fish habitat. Steep u/s and d/s slopes.
3442,3542B 3542B,3532	n/a	n/a	Clore	Copper	n/a	n/a	No stream or crossing located.
3539	5	700 mm	1 km Clore Br.2200	Copper	564053	6027814	No action. Pipe is in good condition joining two wetlands.
3541	26	600 mm	0.5 km Clore Br.2200	Copper	563845	6027973	Fish survey required. If positive change pipe to 1200 mm and embed with gravel to mimic stream.
4515	23	800 mm	46. km 5 Kleanza	Copper	565011	6067205	Fish survey required. If positive change pipe to 1000mm and embed with gravel.
4508	n/a	n/a	45.7 km Kleanza	Copper	565204	6066316	18m bridge.

4491	n/a	n/a	53 km Kleanza	Copper	565016	6064388	Wood box culvert. No action required.
4490	n/a	n/a	52.7 km Kleanza	Copper	564974	6084141	Wood box culvert. No action required.
4487	n/a	n/a	52.2 km Kleanza	Copper	564978	6063722	28m concrete bridge.
4488	23	800 mm	51.6 km Kleanza	Copper	565090	6063224	Pipe in good condition. Fish survey should be conducted to confirm fish.
4487	25	600 mm	51.5 km Kleanza	Copper	564986	6063190	Fish survey required. If fish present should change pipe out to 1000mm and decrease pipe slope as well as embed pipe.
4484,4485	n/a	n/a	48.8 km Kleanza Left spur.	Copper	565493	6062576	Crossings on deactivated road. Structures pulled.
4479	23	700 mm	48.5 km Kleanza	Copper	565622 3	6061978	Fish survey required. If positive replace pipe with 800 mm, embed pipe and lessen present pipe slope.
1028	29	800 mm	47 km Kleanza	Copper	565891	6060882	Fish survey required. If positive replace with 1000mm pipe and lessen pipe slope.
1027	29	1000 mm	46.5 km Kleanza	Copper	565931	6060448	Fish Survey required. If positive replace pipe with an open bottom structure.
1026	n/a	n/a	46 km Kleanza	Copper	565901	6059959	Concrete decked bridge.
1025	n/a	n/a	45.5 km Kleanza	Copper	565827	6059522	Fish survey required. If positive replace pipe with open bottom structure.
1024	39	n/a	44.5 km Kleanza Spur right road	Copper	566066	6058630	Fish Survey required. If positive replace pipe with open bottom structure.

1023	n/a	n/a	44.5 km Kleanza	Copper	565866	6058442	Wood box culvert in good condition.
1022	n/a	n/a	44.4 km Kleanza	Copper	565867	6058401	Wood box culvert in good condition.
1021	8	1000 mm	44.2 km Kleanza	Copper	565920	6058225	Fish survey required. No habitat above crossing. If survey positive replace pipe with open bottom structure.
1020,1015 1016	n/a	n/a	n/a	Copper	n/a	n/a	No streams or crossing at these sites.
1019	28	1000 mm	43.6 km Kleanza	Copper	566193	6057650	Fish survey required. No habitat above crossing.
1019	22	800 mm	42.5 km Kleanza	Copper	566714	6056675	Pipe split. Failure on fill side. Pipe 50% plugged. Fish survey required. If positive replace pipe with wood box culvert. Should clean pipe now to maintain water quality.
1017	33	800 mm	42.4 km Kleanza	Copper	566668	6056568	Pipe plugged 60%. Fish survey required. If positive replace pipe with open bottom structure.
1014	n/a	n/a	39 km Kleanza	Copper	566881	6056215	Wood box culvert.
4249,43504 356,4358 4357,4347 4345,4344 4336,4334 4359,4331 4308,4268 4262,4253	n/a	n/a	Telkwa Pass road	Copper	n/a	n/a	No structures on road. All structures have been removed and water is running over road.

4251,4259 4245,4243 4248,4246, 4247							
4035	n/a	n/a	46.5 km Copper Spur left	Copper	570841	6038876	No access. Road completely brushed in. No structures on road.
4025	n/a	n/a	46.5 km Copper Spur left 500 m	Copper	570975	6038614	Wood box culvert in poor condition. No habitat. Should be removed.
4036	n/a	n/a	46.5 km Copper Spur left	Copper	570762	6038887	No access.
4038,4078	n/a	n/a	46.2 km Copper Spur right	Copper	n/a	n/a	No stream or crossing found.
4307	n/a	n/a	4.8 km Telkwa Pass	Copper	578890	6044919	Wood box culvert in fair condition.
4273	n/a	n/a	3.2 km Telkwa Pass km	Copper	578219	6044303	1x2 wood box culvert in poor condition.
3623,3637	n/a	n/a	5.5 km Clore east	Copper	n/a	n/a	Road completely brushed in.
3653	21	450 mm	4.9 km Clore east	Copper	404133	6032034	Low fish value. U/s and d/s slopes >50%. Ephemeral creek.
3652	n/a	n/a	4.5 km Clore east	Copper	n/a	n/a	No stream or crossing found.
3362	36	2x600 mm	4.1 km Clore East	Copper	563839	6032293	Natural barriers above and below crossing (>40% slope). No action required.

3665	n/a	n/a	3.7 km Clore 501	Copper	563190	6032418	2x4m wood box culvert in poor condition. Road partially deactivated. No action.
3406	n/a	n/a	3 km Br. 17000 Clore	Copper	569126	6018253	Pipe present but not visible. Buried under road/slash debris. Clean out required.
3410	n/a	n/a	2.2 km Br.17000 Clore	Copper	n/a	n/a	No structure on site.
3412	n/a	n/a	1.2 km Br.17000 Clore	Copper	568597	6019176	Two consecutive 12m wood bridges.
3417,3427	n/a	n/a	0.8 km Br 17000 Clore	Copper	n/a	n/a	No access. Road completely grown in.
3420	n/a	n/a	0.5 km Br 17000 Clore	Copper	568521	6020214	1x3m wood box culvert in good condition.
3425	n/a	n/a	0.5 km Br. 17000 Clore.	Copper	568414	6019971	1x5m wood box culvert in good condition.
3426	25	600 mm	0.3 km Br. 17000 Clore	Copper	568371	6020023	Fish survey required. If positive replace pipe with 1x3 open bottom structure.
3570	n/a	n/a	5.5 km Clore	Copper	563440	6029333	24m concrete decked bridge.
3580	n/a	n/a	5.45 km Clore	Copper	563126	6029621	12m bridge.
3603,3604 3620,3713	n/a	n/a	1-5 km Clore	Copper	n/a	n/a	No streams/crossing at these sites.
3626	n/a	n/a	3.2 km Clore	Copper	562269	6031414	20m concrete deck bridge.

3646	33	2x1000 & 1 800 mm	2.7 km Clore	Copper	562427	6031902	Fish survey required. If positive install 1x3 open bottom structure.
3699,3711 3724,3725	n/a	n/a	Br.3000 at Copper 31 km	Copper	n/a	n/a	No streams/crossings at these sites.
3919,3921 3922,3917	n/a	n/a	Nselh Crk road off 3 km Kitnyakwa	Copper	n/a	n/a	No streams/crossings at these sites. Road permanently deactivated.
3579	n/a	n/a	7 km Br.500	Copper	576210	6030049	18m bridge (very poor condition).
3588	9	2x600 mm	6.8 km Br. 500	Copper	576087	6030410	No actions required.
4081	21	600 mm	12.7 km Copper	Copper	543349	6038847	Fish survey required. Only 50 m of habitat above crossing. No work recommended.
4084	n/a	n/a	12. km 5 Copper	Copper	543387	6038810	No stream or crossing at this site.
4065	n/a	n/a	10.3 km Copper	Copper	541383	6038263	No access. Very old deactivated spur road.
4053	n/a	n/a	Spur at 10.8 km Copper	Copper	541224	6038021	No access. Very old deactivated spur road.
4026	n/a	n/a	8 Mile spur at 10.8 km Copper	Copper	540873	6037399	No access. Very old deactivated spur road.
4022,3982 3958,3953 3886	n/a	n/a	0 8 Mile spur jct and Copper M/L	Copper	540839	6037309	No access. Very old deactivated spur road.

4115	n/a	n/a	10.7 km Copper	Copper	541818	6039355	18.5m concrete deck bridge.
4148	n/a	n/a	9.3 km Copper	Copper	540825	6039956	20m concrete deck bridge.
4154	n/a	n/a	9. km 1 Copper	Copper	n/a	n/a	Site on old eroded dirt road. Road is in very poor condition and over grown with no structures.
4163	n/a	n/a	8.8 km Copper	Copper	540224	6040284	Concrete deck bridge.
4176	n/a	n/a	8.4 km Copper	Copper	539990	6040357	No stream/crossing found.
4222	n/a	n/a	6.4 km Copper	Copper	538404	6041282	24.3m concrete decked bridge.
4294	n/a	n/a	3.3 km Copper	Copper	536300	6042622	3m wood box culvert in good condition.
4296	15	2x1600 mm	2.9 km Copper	Copper	535582	6042837	Potential barrier. Little habitat upstream. New structures. No work recommended.
4296A	20	2x1400 mm	2.8 km Copper	Copper	535624	6042832	Natural barrier directly above inlet. No work.
3596,3590	n/a	n/a	2.2 km Copper	Copper	55919	6029814	No structure at site. Pulled out and re-contoured.
3576	34	1200 mm	30.6 km Williams	Copper	558316	6029364	Numerous waterfall drops with 8m fall 20m upstream from inlet. No fish habitat.
3563	n/a	n/a	29.3 km Williams	Copper	557227	6028804	Pipe pulled. Crossing re-contoured.
3561	n/a	n/a	29 km Williams	Copper	556990	6028796	Pipe pulled. No structure.
3558	22	2x800mm	22 km Williams	Copper	555961	6028591	Road washed out. Pipes not working. Remove and replace with 1x4 box culvert.

4055	n/a	n/a	North Copper Hydro road 1.3 km	Copper	545150	6038279	Wood box culvert. Old road surface and culvert showing signs of failure.
4013	26	800 mm	North Copper Hydro road 5.7 km	Copper	547901	6037468	Low probability of fish due to grade. Either leave culvert or remove and cross ditch road.
4020	n/a	n/a	North Copper Hydro road 6.3 km	Copper	548338	6037607	Temporary wooden bridge built for mine exploration. 14.5 m span
4010	n/a	n/a	North Copper Hydro road 7.3 km	Copper	549196	6037471	Wood box culvert in poor condition. Some tension failures on road surface. Should be replaced or removed so it doesn't block stream.
4004	n/a	n/a	North Copper Hydro road 7.4 km	Copper	549342	6037418	Wood box culvert in good condition. No action.
3992	n/a	n/a	North Copper Hydro Road 0.4 km	Copper	546932	6037101	No structure. Water running across road through rock. Needs cross ditch to protect road surface.
4034	n/a	n/a	North Copper Hydro road spur 4.9 km	Copper	544909	6037768	No access. Road completely brushed in and overgrown.
4044	n/a	n/a	North Copper Hydro road spur 4.9 km	Copper	544765	6037960	No access. Road completely brushed in and overgrown.
4069	n/a	n/a	North Copper Hydro road spur 4.9 km jct.	Copper	544495	6038441	No access. Road completely brushed in and overgrown.
4083	n/a	n/a	North Copper Hydro road spur off 4.9 km	Copper	544178	6038702	No access. Road completely brushed in and overgrown.

4091	n/a	n/a	North Copper Hydro road spur off 4.9 km	Copper	543667	6038967	No access. Road completely brushed in and overgrown.
3954	n/a	n/a	Copper 22 km on gas pipeline road	Copper	550904	6036537	No structure on access road.
4831	28	800 mm	Spur at McDonnell 66 km	Copper	567754	6078712	27% slope u/s. Low habitat values. No action required.
4835	n/a	n/a	Spur at McDonnell 66 km	Copper	567604	6078779	No crossing/structure on site. (Mapping shows two roads laid on each other (error?)).
4836	23	1200	Spur at McDonnell 66 km	Copper	567604	6078779	No action required. 30% u/s slopes and no habitat values to enhance downstream.
4813	n/a	n/a	McDonnell 65.2 km	Copper	566332	6077629	Spur road off this marker is not built at this time.
4800	n/a	n/a	McDonnell 56.2 km	Copper	567262	6076815	Spur road off this marker is not built at this time.
4795	n/a	n/a	McDonnell 56.2 km	Copper	567534	6076602	Spur road off this marker is not built at this time.
4840	21	1200 mm	McDonnell 66.6 km	Copper	567167	6079003	Low habitat value u/s with 27% slopes. No action recommended.
4802	29	600 mm	McDonnell 58.8 km	Copper	571137	6076967	Culvert too small for creek flow (should upgrade to 1000 mm. No habitat above or below with 35%+ slopes.
4730	n/a	n/a	McDonnell 42 km	Copper	575740	6074498	No crossing or streams exist.
4791	n/a	n/a	McDonnell 59.2 km	Copper	571048	6076657	No crossing or streams exist. Avalanche track on site.

4856	n/a	n/a	McDonnell 71 km	Copper	564258	6081423	18 m bridge.
4855	25	800 mm	McDonnell 70.5 km	Copper	564005	6081216	No habitat values on site. 3 m drop off cut-slope into inlet.
4854	20	1800 mm	McDonnell 69.5 km	Copper	565107	6000193	Good habitat. Embed pipe gravel 30-40 cm gravel and place larger diameter stones to mimic creek bed. Good upstream habitat.
4846	39	1000 mm	McDonnell 68 km	Copper	566158	6079112	Replace pipe with larger diameter (1800mm) and embed. Fish survey required.
4843	n/a	n/a	McDonnell 66.6 km	Copper	567165	6079015	15 m bridge in good condition.
4804	n/a	n/a	McDonnell 64 km	Copper	567720	6077104	24 m bridge with gate locked.
4798	39	600 mm	McDonnell 49.6 km	Copper	571115	6076980	Low upstream values (>50% slopes). No work required.
4801	n/a	n/a	McDonnell 49.6 km	Copper	571125	6076987	25 m bridge in good condition.
4719,4720 4705,4709 4688,4700 4758	n/a	n/a	Mulwain FSR	Copper	n/a	n/a	Sites on in block road. Road very brushed in and permanently deactivated.
4706,4721 4694,4682	n/a	n/a	Mulwain FSR	Copper	n/a	n/a	Streams do not exist.
4694	10	1200 mm	Mulwain FSR	Copper	n/a	n/a	No work required.
4684	31	900	Mulwain FSR	Copper	572858	6073393	No work required. U/s slopes >40%.

4707	33	900 mm	Mulwain FSR	Copper	573239	6073921	No work required. No fish habitat or defined stream channel.
4737,4725	n/a	n/a	Burn 0.5-0.8 km	Copper	579466	6074907	Structures have been pulled and cross drains built.
4795	13	900 mm	Jackable Spur 1 2 km.	Copper	580804	6077210	No work required. Good pipe crossing.
4770	n/a	n/a	Jackable Spur 1 0.2 km	Copper	n/a	n/a	Stream or crossing does not exist.
4773,4779 4778	n/a	n/a	Jackable 4.8,3.5,3.5 Spur	Copper	576276	6676324	All with wood box culverts in good condition
4777	n/a	n/a	Jackable 2.5 km	Copper	578460	6076529	Low fish values. Creek dry with numerous waterfalls and steep down slopes below.
4781	15	800 mm	Jackable 2.4 km	Copper	578459	6076532	Low fish habitat values. Crossing in good condition.
4759	n/a	n/a	Jackable 1.0 km	Copper	579671	6075715	New 8 m bridge.
4756	28	600 mm	Jackable 0.7 km	Copper	579659	6075567	Needs fish survey. If positive replace pipe with 1200mm and embed. Good habitat.
4787	18	600 mm	Louise Spur 2.2 km	Copper	583108	6077065	No stream channel present. No work required.
4799	25	900 mm	Louise Spur 3.0 km	Copper	582555	6077452	Needs fish survey. If positive, replace pipe with 1400 mm and embed.
4822,4821 4827,4828 4829,4825 4826	n/a	n/a	Bud Lake/Christina	Copper	n/a	n/a	No access. Road has been permanently deactivated with no structures in place.

4820	36	900 mm	Louise FSR	Copper	n/a	n/a	Fish survey required. If positive culvert should be replaced with a bottomless structure.
4815,4817 4819,4823 4824	n/a	n/a	Louise FSR	Copper	n/a	n/a	No stream channel present. No work required.
4811	36	1200 mm	Louise FSR	Copper	583392	6078286	Fish survey required. If positive, recommend installing an open bottom structure.
4731	n/a	n/a	McDonnell 42 km	Copper	575740	6074498	16 m concrete deck bridge.
4728	36	1000 mm	McDonnell 41.3 km	Copper	576304	6074487	Remove culvert and replace with open bottom structure. Work would enhance 4 km of habitat.
4716	n/a	n/a	McDonnell Spur off 41.3 at 0.4 km	Copper	576191	6074238	No creek or crossing at this site.
4714	15	600 mm	McDonnell Spur off 41.3 at 0.5 km	Copper	576134	6074175	Small creek on side road. Foot access due to major road failure. Should remove culvert and cross ditch.
4713	n/a	n/a	McDonnell Spur off 41.3 at 0.6 km	Copper	576120	6074158	No creek or crossing on site.
4715	n/a	n/a	McDonnell Spur off 41.3 at 0.6 km.	Copper	576188	6074154	No creek or crossing on site.
4722	n/a	n/a	McDonnell Spur off 41.3 at 0.2 km.	Copper	576338	6074358	No creek or crossing on site.
4724	31	1000 mm	McDonnell FSR 41.2	Copper	576389	6074467	Remove culvert and replace with open bottom

			km.				structure. Work will enhance approx 1 km of habitat.
4733	18	450 mm	McDonnell FSR 40.5 km.	Copper	576949	6074646	No work required. No defined channel or habitat above road.
4743	24	800 mm	McDonnell FSR 40 km.	Copper	577201	6074946	Remove culvert and replace with open bottom structure. Will enhance approx 500 m of habitat.
4740	13	450 mm	McDonnell FSR 39.6 km.	Copper	577515	6074965	No action recommended. No defined channel.
4742	13	800 mm	McDonnell FSR 39.1 km.	Copper	578029	6074878	Passable. No action recommended.
4744	16	600 mm	McDonnell FSR 38.9 km.	Copper	578328	6074986	No action recommended. No defined channel above or below culvert.
4745	n/a	n/a	McDonnell FSR	Copper	579821	6075098	No stream or crossing at this site.
4752	n/a	n/a	McDonnell FSR 33.6 km.	Copper	580255	6075419	26 m concrete decked bridge.
4750	31	600 mm	McDonnell FSR 36.4 km.	Copper	580383	6075396	Remove culvert and replace with open bottom structure. Will enhance approx 2 km of upstream habitat.
4755	16	600 mm	Louise FSR 0.3 km.	Copper	580706	6075544	Potential barrier. Culvert backwatered enough to easily pass fish at high water. No action required.
4763	26	900 mm	Louise FSR spur at 01.7 km.	Copper	580818	6076132	Barrier. Remove culvert and replace with open bottom structure.

4765	n/a	n/a	Louise FSR	Copper	581158	6076248	No stream or crossing at this site.
4772	39	600 mm	Louise FSR 1.6 km.	Copper	581624	6076547	Barrier. Remove culvert and replace with an open bottom structure.
4784	20	600 mm	Louise FSR 2.0 km.	Copper	581957	6076785	No action required. Stream is slope seepage above inlet.
4785	n/a	n/a	Louise FSR	Copper	582042	6076862	No stream or crossing at this site.
4807	20	800 mm	Boundary FSR 0.2 km.	Copper	582888	6078093	Fish survey required. If positive then remove culvert and replace with open bottom structure.
4808	n/a	n/a	Boundary FSR 0.2 km.	Copper	582834	6078101	Map error. No stream or crossing at this site.
4810	n/a	n/a	Boundary FSR 0.4 km.	Copper	582881	6078267	8 m bridge.
4809	n/a	n/a	Boundary FSR	Copper	582836	6078205	Map error. No road spur.
4812	n/a	n/a	Boundary FSR	Copper	582813	6078275	Map error. No road spur.
4816	25	800 mm	Boundary FSR 0.6 km.	Copper	582819	6078454	Culvert is barrier. Remove culvert and replace with open bottom structure. Will enhance approx 1200 m of upstream habitat.
4834	13	450 mm	Boundary FSR 0.8 km	Copper	582489	6079499	No defined channel through moss layer. No action.
4837	16	450 mm	Boundary FSR 0.8 km.	Copper	582636	6079425	Inlet and outlet plugged with moss. No defined channel due to moss. No action due to low habitat values.
4553,4558	n/a	n/a	McDonnell FSR	Copper	n/a	n/a	No stream or crossing at these sites.

4566	n/a	n/a	McDonnell FSR	Copper	602591	6078736	10 m bridge in good condition.
4574	n/a	n/a	McDonnell FSR	Copper	603508	6071155	2x5 m wood bridges in good condition.
4552,4554 4557,4562 4544,4538 4566,4569 4580,4632 4595,4593 4594,4597 4604,4592 4577,4573 4571,4561 4549,4550 4551,4546 4547,4541 4533,4535	n/a	n/a	Dennis West	Copper	n/a	n/a	No streams or crossings exist at these sites. Some mapping errors as double sets of numbers have been assigned to some sites.
4556	23	1200 mm	Dennis West 14.3 km	Copper	587870	6070030	Fish survey required. Embed pipe 30 cm to mimic stream bed.
4568	n/a	n/a	Dennis West 13.5 km	Copper	587741	6070333	Structure has been removed and crossing contoured to road surface.
4576	20	1200 mm	Dennis West 13.5 km	Copper	587890	6070523	Fish survey required. Embed pipe with 30 cm gravel to mimic stream bed.
4548	36	500 mm	Dennis West 12.1 km.	Copper	589715	6069979	No work required. Large waterfalls up and downstream of structure.

4539	21	1800 mm	Dennis West 11.9 km.	Copper	590073	6069860	Fish survey required. If positive embed pipe with 30 cm gravel and boulders to mimic stream bed.
4563	18	1600 mm	Dennis West 10.1 km.	Copper	591558	6070347	Fish survey required. If positive, embed pipe with 30 cm gravel and cobble to mimic stream bed.
4575	n/a	n/a	Dennis West 9.3 km.	Copper	592192	6070721	8 m bridge.
4579	n/a	n/a	Dennis West 8.5 km.	Copper	592063	6070870	1x3 m wood box culvert in good condition.
4610	23	800 mm	Dennis West spur at 8.1 km.	Copper	593928	6071692	No work required. Very low upstream habitat values (slopes >50%).
4506	18	800 mm	Dennis West spur at 8.1 km.	Copper	593451	6071589	No work required. >30% slopes upstream with waterfalls.
4598	25	600 mm	Dennis West spur at 8.1 km.	Copper	593358	6077168	No work required. No habitat value. Stream is grassy and dry above and below pipe.
4591	n/a	n/a	Dennis West 7.2 km.	Copper	593879	6071209	No work required. Mainly ditchwater. Does not resemble a stream above pipe.
4603	28	1000 mm	Dennis West 4.7 km.	Copper	596053	6071584	Fish survey required. If positive replace structure with open bottom structure.
4615	n/a	n/a	Dennis West 3.7 km spur	Copper	596836	6071866	Structure pulled. Stream bed re-contoured.
4536	n/a	n/a	Dennis West 1.7 km.	Copper	597954	6069917	New open bottom pipe arch.
4531	n/a	n/a	Dennis West 0.4 km	Copper	598667	6069565	New 14 m open bottom arch.

4512,4509 4504,5402 4510,4500	n/a	n/a	South McDonnell 0 to 4.6 km.	Copper	n/a	n/a	No access. Road completely grown in under heavy brush.
4505	n/a	n/a	South McDonnell 4.7 km in block spur	Copper	601892	6067937	Bridge pulled out. Road re-contoured.
4519,4527	n/a	n/a	South McDonnell 2 km.	Copper	n/a	n/a	No stream or crossing at this site.
4522	20	500 mm	South McDonnell 2 km.	Copper	600470	6069213	Fish survey required. If positive, replace culvert with 1000 mm pipe, embed with 30 cm of gravel and cobble to mimic stream bed.
4612	n/a	n/a	South Copper 12.4 km.	Copper	574680	6070931	No stream or crossing at this site.
4619	n/a	n/a	South Copper Spur Right 11.3 km.	Copper	575203	6071669	No stream or crossing at this site.
4613	n/a	n/a	South Copper 11.3 km Spur	Copper	575594	6071679	No stream or crossing at this site.
4609	n/a	n/a	South Copper 11.3 km Spur	Copper	575588	6071658	No stream or crossing at this site.
4590	26	600 mm	South Copper 9.4 km.	Copper	577657	6070464	Fish survey required. If positive, remove pipe and replace with open bottom structure. Will enhance approx 1500 m of upstream habitat.
4587	n/a	n/a	South Copper 9 km.	Copper	578159	6070359	7 m wood decked bridge.

4584	n/a	n/a	South Copper 8.6 km..	Copper	578550	6070634	7 m wood decked bridge.
4614	n/a	n/a	Below crossing 4584.	Copper	578411	6071119	No stream or crossing at this site.
4599	n/a	n/a	South Copper 7.6 km.	Copper	579444	6070766	Open bottom culvert arch on site.
4607	5	1600 mm	South Copper Spur right 7.1 km.	Copper	579442	6071067	Passable. No remediation necessary.
4625	n/a	n/a	South Copper 6..3 km.	Copper	580775	6071331	28 m concrete decked bridge.
4624	n/a	n/a	South Copper 6.3 km.	Copper	580775	6071331	Map error. Dual site with Site 4625.
4608	n/a	n/a	South Copper Spur at 6.3 km.	Copper	580833	6071194	No road located. No stream or crossing.
4618	n/a	n/a	South Copper	Copper	581345	6071277	No road. No stream or crossing.
4605	31	1500 mm	South Copper 1.4 km.	Copper	582319	6071085	Recommend embedding material into pipe as pipe is large enough or remove and install open bottom structure.
4611	n/a	n/a	South Copper 3.4 km.	Copper	583723	6069943	No road. No stream or crossing.
4559	n/a	n/a	South Copper 3.4 km.	Copper	583723	6069943	No road. No stream or crossing.
4534	n/a	n/a	South Copper 4.1 km.	Copper	583572	6069172	Structure is half a 1600 mm pipe (open bottom). No work needed.

4626	n/a	n/a	South Copper 4 km.	Copper	582606	6071426	Structure is half a 2000 mm pipe (open bottom). No work needed.
4627	n/a	n/a	South Copper below 4626	Copper	582590	6071474	50 m below crossing 4626. No road or crossing at this site.
4644,4651 4652,4654 4663	n/a	n/a	Right spur from South Copper 4.1 km.	Copper	581758	6072252	These crossing are located on a seasonal (winter) road which has no culverts/structures.
4630	n/a	n/a	South Copper 3.6.	Copper	582989	6071544	No stream or crossing at this site.
4529	13	800 mm	South Copper 3 km.	Copper	583544	6071553	Passable. No action required.
4617	n/a	n/a	South Copper	Copper	583440	6071382	No stream or crossing at this site.
4616	n/a	n/a	South Copper 2.6 km.	Copper	583870	60713	30 m concrete decked bridge.
4620,4621 4622,4623	n/a	n/a	South Copper 2.0 km.	Copper	584187	6071470	No streams or crossing at these sites. One culvert located at 4621 but it is only a cross drain for roadside ditch.
4525	13	900 mm	Caribou 3.5 km.	Copper	584530	6068638	Crossing passable. No work required.
4537	n/a	n/a	Caribou 2.6 km unbuilt spur road	Copper	584067	6069350	Road is not yet built.
4583	18	450 mm	Caribou 1.2 km.	Copper	584577	6070657	Culvert is not drawing standing water on inlet side. Recommend fish survey. If positive, replace pipe with open bottom structure.
4601	21	800 mm	Left spur off Caribou	Copper	584425	6071212	Barrier. Remove culvert and replace with open

			0.7 km.				bottom structure.
4585	n/a	n/a	0.3 km down left spur off Caribou 0.7 km.	Copper	n/a	n/a	Road permanently deactivated. No structure.
4646	13	450 mm	Copper South 0.3 km	Copper	585228	6072412	Passable but recommend cleaning outlet as it is buried. NCD draws standing water from either side of road.
4642	42	800 mm	South Copper 0.7 km.	Copper	584856	6072286	Barrier. Remove pipe and replace with open bottom structure. Will enhance more area than shown on map.
4638	n/a	n/a	South Copper spur right.	Copper	584594	6072159	No stream or crossing at this site.
4634	13	450 mm	South Copper 1.2 km.	Copper	584360	6072016	Passable. NCD standing water either side of road (dry at survey time). No action recommended.
4655	16	600 mm	McDonnell 30.9 km.	Copper	584772	6072669	Potential barrier. Recommend removing culvert and installing open bottom structure.
4622	n/a	n/a	McDonnell 31.3 km.	Copper	584301	6072728	No stream or crossing at this site.
4673	n/a	n/a	McDonnell 30.9 km.	Copper	584500	6073248	Downstream from 4655. Map error. No stream or crossing at this site.
4517	24	800 mm	McDonnell 5.7 km.	Copper	606113	6068663	Fish survey required. If positive replace with larger diameter pipe (1000 mm) and embed with 30% gravel to mimic streambed.

4839,4842 4847	n/a	n/a	Mankin 10.4 km.	Copper	590370	6079921	Road permanently deactivated. No structures and road re-contoured.
4844	36	600 mm	Mankin 10 km.	Copper	590633	6080083	Fish survey required. If positive, replace with open bottom structure.
4832	36	600 mm	Mankin 9.6 km.	Copper	590343	6079678	Fish survey required. If positive, replace with open bottom structure.
4790,4788 4672,4769 4764A	n/a	n/a	Mankin	Copper	n/a	n/a	No streams or crossings at these sites.
4725	n/a	n/a	Mankin 6 km.	Copper	591370	6076977	New open bottom culvert
4766	20	500 mm	Mankin 5.7 km.	Copper	591391	6076785	Fish survey required. If positive replace with longer and larger diameter pipe (14mx1000 mm) and embed with 30% gravel to mimic stream bed.
4764	n/a	n/a	Mankin 5.4 km.	Copper	591582	6076628	Fish survey required. Beaver dam 15m below pipe. Embed culvert with 30% gravel.
4760	28	1000 mm	Mankin branch 2.5 km.	Copper	590683	6076307	Fish survey required. If positive, replace pipe with open bottom structure.
4762A	n/a	n/a	Mankin 4.1 km.	Copper	593479	6075981	New 15 m bridge.
4806,4805 4797	n/a	n/a	Mankin Branch at 3.5 km.	Copper	n/a	n/a	Branch road is permanently deactivated. All structures pulled out. No access. Very low risk crossings are high up mountain side on old access roads.

4818	36	1000 mm	Mankin 6 km.	Copper	593289	6078842	Fish survey required. If positive replace pipe with open bottom structure.
4786	15	1000 mm	Mankin 5.5 km.	Copper	593831	6077432	Passable. No work required.
4796	36	900 mm	Mankin Willow Lake 2.7 km.	Copper	593113	6077844	Remove pipe and re-contour stream bed. Access road ends 150 m past pipe.
4783	21	800 mm	Hadrian Willow Lake 2.0 km.	Copper	594940	6077341	Fish survey required. If positive install larger diameter pipe (10x1200mm) and embed with gravel.
4761	n/a	n/a	Mankin Willow Lake 1.1 km.	Copper	n/a	n/a	No stream or crossing at this site.
4521,4532	n/a	n/a	McDonnell 6 km spur road.	Copper	605714	6069248	Spur road permanently deactivated. All structures pulled out and re-contoured.
4518	n/a	n/a	McDonnell 6.2 km.	Copper	605594	6069073	New 5 m permanent bridge.
4528	16	800 mm	McDonnell 6.9 km.	Copper	605023	6069676	Fish survey required. If positive replace pipe with larger diameter and embed with 30% gravel to mimic stream bed.
4602	n/a	n/a	McDonnell (Silvren 0.8 km).	Copper	n/a	n/a	No stream or crossing at this site.
4586	n/a	n/a	Silvren Lk 0.8 km.	Copper	602161	6071363	Spur road just off Silvren. Permanently deactivated. Structures removed stream bed re-contoured.
4633,4637	n/a	n/a	Silvren Lk 1.0 km.	Copper	n/a	n/a	No access. Spur road very brushed in. Crossings up on very steep slopes.

4578	n/a	n/a	Silvren 0.6 km.	Copper	n/a	n/a	No stream or crossings at this site.
4803,4794 4774	n/a	n/a	Mankin/Hadrian	Copper	n/a	n/a	No streams or crossing. Sites on top of mountain.
4757	21	900 mm	Mankin Willow Lake.	Copper	595266	6076365	No work required. Passable; no work required.
4732	21	800 mm	Mankin 2.6 km.	Copper	594910	6075414	Embed pipe with gravel to mimic stream bed. Passable.
4741	n/a	n/a	Mankin Spur 1.8 km.	Copper	n/a	n/a	No road access.
4668,4723 4718,4680	n/a	n/a	Willow 0-6 km.	Copper	n/a	n/a	Road permanently deactivated. All structures have been pulled out. No access and stream 4668 does not exist.
4669,4650 4656,4658 4667,4666	n/a	n/a	McDonnell 21 km King Richard to 20 km in block spur.	Copper	n/a	n/a	No access. Road has been rehabbed and planted. All structure pulled out.
4853	n/a	n/a	Boundary 2.6 km Spur left.	Copper	583476	6080970	Road permanently deactivated. All structures pulled.
4851	n/a	n/a	Boundary 2.6 km Spur left.	Copper	582480	6080687	No structure. Should have one, standing water on either side of the road.
4845	n/a	n/a	Boundary 2.1 km. Short spur on left. Not built.	Copper	582532	6079801	Road not built. No structures.

4850	10	800 mm	Boundary FSR Jct with left spur at 2.6 km. 0.3 km on spur.	Copper	582965	6080233	Passable. No action required.
4851	n/a	n/a	Boundary 3.7 km.	Copper	584105	6079704	Wood box culvert.
4830,4833 4838	n/a	n/a	Boundary 3.7 km. Spur left.	Copper	583800	6079297	Projected spur at 3.7 km not located.
4848	n/a	n/a	Boundary 2.4 km	Copper	582856	6079943	Wood box culvert.
4849	n/a	n/a	Boundary 2.5 km	Copper	582901	6079979	No structures. Should have one. Standing water from wetlands on either side of the road.
4736	23	500 mm	McDonnell 35.9 km.	Copper	580632	6074948	Fish survey required. If positive remove culvert and replace with open bottom structure. Would enhance ~1km of habitat.
4727	32	900 mm	McDonnell 35.3 km.	Copper	580998	6074677	Barrier. Remove culvert and replace with open bottom structure. Would enhance 500 m of upstream habitat.
4729	n/a	n/a	McDonnell 35.3 km.	Copper	580998	6074677	Map error. Overlap with 4727
4710	18	600 mm	0.3 km off on right spur off 34 km McDonnell .	Copper	581187	6074253	Old spur with 200 m of potential habitat above road. Recommend remove culvert and cross ditch.
4698,4696	n/a	n/a	0.7 km off right spur of 34.5 McDonnell.	Copper	581222	6073988	Two crossings at one spot. No stream or crossing at this site.

4701	28	600 mm	Mc Donnell 34.1 km.	Copper	582183	6074192	Fish survey required. If positive remove culvert and replace with open bottom structure.
4708	n/a	n/a	McDonnell 34.2 km	Copper	582072	6074269	Not a definable stream. NCD flows into the same culvert as 4701.
4703	n/a	n/a	0.2 km on spur right at McDonnell 33.8 km.	Copper	582534	6074292	Standing water on either side of road. No culvert or structure on site.
4734	n/a	n/a	1.1 km on spur right off McDonnell 33.8 km.	Copper	582817	6074934	Standing water on either side of road. No culvert or structures on site.
4735	n/a	n/a	1.2 km on spur right off McDonnell 33.8 km.	Copper	582843	6075024	Standing water on either side of road. No culvert or structures on site.
4738	10	450	1.2 km on spur right off McDonnell 33.8 km.	Copper	582838	6075036	Passable. No action recommended.
4749	n/a	n/a	1.9 km on spur right off McDonnell 33.8 km.	Copper	582397	6075445	1x3 m wood box culvert in good condition.
4686	n/a	n/a	McDonnell 33.6 km.	Copper	582733	6073872	Map error. Duplicate sample site with 4687.
4687	42	2200 mm	McDonnell 33.6 km.	Copper	582733	6073872	Barrier to fish. Recommend embedding material in pipe due to its size to reduce water velocity.

4690	21	450 mm	0.4 km on spur right off McDonnell 32.8 km.	Copper	583235	6073946	Barrier. Old spur. Remove and cross ditch road surface. Will enhance 1 km of upstream habitat.
4692	n/a	n/a	0.4 km on spur right off McDonnell 32.8 km.	Copper	583235	6073946	Map error. Same crossing as 4690.
4717	23	900 mm	1.2 km on spur right off McDonnell 32.8 km.	Copper	583500	6074628	Barrier. Remove culvert and replace with open bottom structure or cross ditch. Will enhance approx 1 km of upstream habitat.
4704	20	800 mm	0.6 km on spur right off McDonnell 32.8 km.	Copper	583798	6074259	Barrier. Highly likely there is no fish. Recommend fish survey. If positive then remove culvert and install open bottom structure or cross ditch.
4693	n/a	n/a	0.2 km on spur right 0.5 km up spur right from McDonnell 32.8 km.	Copper	583637	6074023	Road deactivated. Culvert has been removed.
4697	10	n/a	2.2 km Ripper.	Copper	584988	6074202	Passable. No action required.
4685	n/a	n/a	1.3 km Ripper.	Copper	584499	6073901	No culvert. Road has been deactivated.
4677	33	600 mm	1.1 km Ripper.	Copper	584617	6073693	Barrier. Fish survey required. If positive remove culvert and replace with open bottom structure. Will enhance 1-2 km of habitat.
4699	10	800 mm	2.5 km Sandstone.	Copper	586018	6074316	Passable. No action required. No defined channel.

4645	13	600 mm	29.9 McDonnell.	Copper	585690	6072462	Passable. Map rates stream as S6. Pipe crushed slightly. No action. Water is flowing.
4657	n/a	n/a	28.5 McDonnell.	Copper	587738	6072819	No stream or crossing at this site.
4676	n/a	n/a	Spur right at McDonnell 28.5 km.	Copper	587346	6073542	No stream or crossing at this site.
4678	n/a	n/a	On right spur at McDonnell 28.5 km.	Copper	587065	6073826	No stream or crossing at this site.
4691	n/a	n/a	On right spur at McDonnell 28.5 km.	Copper	587010	6074112	No stream or crossing at this site.
4695	n/a	n/a	On right spur at McDonnell 28.5 km.	Copper	587014	6074204	No stream or crossing at this site.
4691	13	600 mm	On right spur at McDonnell 28.5 km.	Copper	586721	6073930	Passable. No action required.
4545	n/a	n/a	0.5 km S. McDonnell.	Copper	599372	6070387	16 m bridge.
4530	n/a	n/a	1.1 km S. McDonnell.	Copper	599299	6069505	9 m bridge.
4526	23	800 mm	1.2 km S. McDonnell.	Copper	599520	6069389	Fish survey required. If positive, install large pipe (1000 mm) and embed with 30% gravels to mimic stream.
4524	n/a	n/a	1.5 km S. McDonnell.	Copper	599866	6069285	9 m bridge. Decking in poor condition.
4523	33	800 mm	1.7 km S. McDonnell.	Copper	600149	6069251	Fish survey required. If positive, replace culvert with open bottom structure.

4567	26	600 mm	8.8 km McDonnell.	Copper	604331	6071020	Fish survey required. If positive, replace with bottomless structure.
4555	26	600 mm	11.5 km McDonnell.	Copper	601594	6070596	Fish survey required. If positive, install larger diameter pipe (1200 mm). Embed with gravel (30%) to mimic stream bed.
4661	n/a	n/a	McDonnell	Copper	596204	6073268	Both are 15m bridges.
4664,4659 4635B	n/a	n/a	McDonnell	Copper	n/a	n/a	No creeks found.
4635	24	1200 mm	McDonnell	Copper	592138	6072339	Fish survey required. Embed pipe with 30% gravels to mimic stream channel.
4641	26	800 mm	McDonnell	Copper	591418	6072533	Fish survey required. Recommend open bottom structure such as 1x3 wood box culvert or arch pipe.
4631	n/a	n/a	Br .spur at 23.8 McDonnell.	Copper	n/a	n/a	Located in old block logged in 1982. Road is completely grown in.
4647,4640	n/a	n/a	n/a	Copper	n/a	n/a	No creeks found.
4639	32	900 mm	38.2 McDonnell	Copper	587117	6072283	Fish stream. Remove structure and replace with open bottom structure.
4640	13	600 mm	25.4 McDonnell	Copper	589038	6072301	Passable structure. No action. Stream status marginal with poorly defined channel.
4659	n/a	n/a	400 m upstream of 4640.	Copper	n/a	n/a	Planned road. Not built therefore no structure.

4648	28	900 mm	23.3 McDonnell	Copper	589986	6072665	Recommend fish survey. If positive then remove culvert and replace with open bottom structure.
4665	n/a	n/a	0.7 km Ranch	Copper	589484	6073071	No road exists where shown on map.
4674,4675	n/a	n/a	1.2 km Ranch	Copper	589295	6073488	No creeks or crossings at sites. Sample sites show crossings at junction therefore overlap with two sites.
4672	n/a	n/a	1km Ranch	Copper	589305	6073368	Map projection error. No crossing on site.
4671	n/a	n/a	0.9 km Ranch	Copper	589307	6073281	Crossing on deactivated spur off M/L. No structure.
4653	10	600 mm	Spur at 0.2 km Ranch	Copper	590206	6072864	Crossing is seepage. Passable. No action needed.