MINING IN MOROBE, PAPUA NEW GUINEA

Impacts from mining along the Watut River

mineral policy institute

A Mineral Policy Institute Report

Charles Roche and Dr Gavin Mudd

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A set of supplementary online materials, including this report, full length documentary, photographs, maps and tables are available at www.watutriver.com

MINERAL POLICY INSTITUTE

The Mineral Policy Institute [MPI] is a specialist mining focused international civil society organisation with a volunteer board representing members from across the world. Operating from Australia, we assist communities affected by specific mining projects and work on achieving industry reform through improvements to policy, law and practice.

Please direct all enquiries to the Executive Director. Further information and contact details can be found at www.mpi.org.au/

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This report builds on the work of the Mineral Policy Institute (MPI) which has been active in Papua New Guinea since 1995, thanks go to all those who have helped MPI and our work in the past.

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The authors wish to thank Mia Pepper, Richard Maguire and Adam Blakester for their commitment to a shared vision of a just and sustainable mineral cycle where human rights are protected, impacts dramatically reduced and mineral/fuel efficiency and reuse is paramount.

On behalf of MPI and the affected communities we wish to recognise and thank project sponsors the Evangelical Lutheran Church of Papua New Guinea and Mission EineWelt.

Thank-you to those who assisted in the documentary ‘Hidden Valley’ especially the Watut River communities, cinematographer and director Jessie Boylan, editor Anthony Kelly and producer Charles Roche.

EXECUTIVE SUMMARY - TOK PISIN

AS BILONG RIPOT

Dispela em i ripot blong we maining bin bagarapim sindaun bilong ol lain blong Wara Watut long Morobe Provins, Papua Niugini. Olsem i gat wankian ripot i stap long planti ol arapela main displa bai stap olosem ripot tu blong maining industri blong Papua Niugini. Ol efeks blong main blong Watut i no bikpla wankaim olsem Porgera, Ok Tedi o Panguna main, tasol em i bikpela asua tu.. Em i asua bikos long ol bagarap em mekim ol ples lain, na tu mekim wankain asua olsem bipo em i soim klia piksa olsem senis i kamap isi isi tru long maining indastri.

As blong displa ripot i kam olsem wok Mineral Policy Institute, long 1995 i kamap long nau, long kainkain mein blong Papua Niuguinea. Ol lain blong Wara Watut i bin gat wari long asua i kamap long wara long taim displa main i stat, na askim helpim blong MPI klostu long pinis blong yia 2010. Behain long dispel, long stat blong yia 2012, Lutheran Sious blong Papua Niugini, wantaim Mission EineWelt blong Germany, bin givim tok orait long MPI long wokim displa painimaut.

WE BILONG WOKIM PAINIMAUT

We bilong wokim dispela wokpainimaut i bin isi. Oli bin sapos long kisim olgeta ripot i bin kamap pinis long Hidden Valley, na bungim wantain sampla toktok na komplein i kam long ol ples lain long wara. Tasol wankain olsem ol narapela hap long wol long maining indastri we ok kain infomesen i save stap hait, kamapani i bin haitim planti ripot long kominitis na stekholdas. Planti taim ol i rekwes long ol infomesen blong asua blong Hidden Valley mine na hau long manesim ol dispel asua i no go aut long pablik yet.

Tasol sampla 'data'stap long 'Environmental Impact Statement' blong Morobe Mining Joint Venture, na oli wanwan ripot bilong environmen i kamap pinis olgeta yia long wanpela komiti. Na ol environmen ripot blong Depatmen long Environmen na Consevasen blong 2010 [ol SMEC Ripot] i bin helivim mipla kisim save long we bilong waitsan i kamp bikpla long Wara Watut. I no olgeta toksave stap op, tasol ol DEC ripot makim trabel i stap long konstrasen blong mine, operasen blong mine, na ripot blong environmin blong mine.

Olsem, dispela ripot kamap long glasim saiens long ol toksave i stap pablik, wantaim sampla intavu blong ol mamapapagraun, na sampela tingting blong MPI blong ol kastom blong industri. Dispela samtin ol i kolim 'Standards and Practices'---mining olsem ol lo blong wokim wok---mas i kamap gutpela nau na larim olgeta ripot stap long han blong pablik olsem kirapim 'transparency' blong indastri.

OL PAINIMAUT NA EFEKS

Plenti efek istap yet long mining blong Morobe Provins blong bipo, wantaim ol efeks i wok long kamap yet long Hidden Valley mine nau. Tu bai gat bikpla efeks moa yet kamap sapos ol i opim Wafi-Golpu long mining. Papa bilong tupla wantaim em Morobe Mining Joint Venture, tasol MMJV gat tupla papa, em Harmony Gold blong South Africa na Newcrest Mining blong Australia. Na i gat sanis long efeks i bung go na kamap bikpla moa sapos ol i painim na divelopim sampla moa gol insait long dispela hap.

Tupla Newcrest Mining na Harmony Gold i bin kisim sampla asua pinis long ol waitsan i kamap long sait sait long Wara Watut, na ol efeks i bin kamap long peles kain olsem gaden na kastam hap; ol man i lusim peles sindaun long niupela hap ; na bagarap blong wara na ol samting stap long . Tasol ol i no putim displa infomesen i go aut long pablik peles, na tu dispela ripot i hat long lukluk long ol kain infomesen olsem stap pinis wantaim kampani .
Tasol evidens i stap long we kampani abrusim ol kastom blong lukautim environment taim oli workim mine---na hau ol i lukautim 'waste rock' (rabis ston), i bin kamapim bagarap long long Wara Watut, na kain dabolim waitsan long Wara i go-kam long sip long Wara Watut.

Long 2006 i go long 2009 waitsan blong main sait i kamap olsem 20 igo long 30 milion ton long Wara Watut. Bipo kampani bin tok olsem Upper Wara Watut na Wara Bululo bai skelim gut displa waitsan i kam, tasol taim i kamap samting olsem 90 persen i bin go daun long Wara Watut.

Planti deti long Wara Watut i kamap pinis long displa waitsan, tasol tui igat sampla kemikol i stap insait long wara nau ol save kolim 'sulfate,' 'aluminum' na 'arsenic'. Tasol bikos kampani ino luksave long ol gut, yumi nogat save long hamaspela long displa kain kemikol nogut i stap nau. Ol ripot bilong environment blong 2011 na 2012, na ripot bilong sait bilong 2012, soim hau ol i bin wok long kamapim wara klin moa yet, tasol dispel saiens ino gutpela tumas.

Sampela wara stop long tripla kain stekholda yet: (1) Ol Komuniti wait yet long kampani long klinim wara na garun gut, na ol i gat wari yet long bagarap moa yet bai kamap; (2) Ol MMJV, Harmony Gold na Newcrest Mining kampani wari long nem bilong ol i bagarap pinis; (3) Lokal, Provinsol na Nesinol Gavamen bai gat nid nau long glasim na lukautim bagaparap blo mine; na (4) ol bikpla manmeri blong mining indastri gat wari nau long stretim lo bilong wokim mine, na stretim nem bilong indastri tu, nogut ol i lusim moni na nem bilong displa.

Ol ripot bilong SMEC tokautim long Hidden Valley abrusim majoriti (43 bilong 73 total) kastom bilong wokim dispela mai. Na tu ol i abrusim pinis sampla bikpla lo bilong indastri, olsem oli (1) abrusim kampani polisi bilong Newcrest Mining na Harmonry Gold, (2) ol i no komplitim olgeta ripot blong ICMM na GRI, (3) ol i no sindaun na toktok gut wantaim ol manmeri peles, (4) abrusim plenti inap lo blong OECD blong multi-nesinol kampanis i luk olsem wanpela komplein bai kamap long Australia, (5) abrusim 'Equator Principles,' na wanpela promis blong bung wanbel wantaim ol memba bliong 'Equator Princples' - ANZ, HSBC, Credit Suisee, Barclays, JP Morgan Chase, Westpac na National Australia Bank.

Tokaut stronpela moa yet i kam long ol komuniti bilong Wara Watut, husat i les pinis long pasin blong kampani, na singautim nid long senis. Ol i nidim senses we ol lain bilong peles bai gat pawa bilong wokim disisin blong laif na divelopmin blong ol yet. Oli les long kampani na manmeri bilong narapela kantri stap longwe bai mekim disison tasol. Nek na tinging bilong ol istap long piksa (video) stap wantaim displa riport. Em bai givim gutpla stori long ples lain.

PINIS

Displa ripot i gat stori blong ol pasin nogut na bagarap i bin kamap long Hidden Valley kampani. Ol ino go pas long stori nogut long mining long PNG. Tasol ol i kamap long taim bilong ol pablik, NGO, lotu na gavamen blong PNG tu wok long wari na komplein long mining indastri bilong ol I no lukautim gut ol graun o pipol bilong peles. Olsem, ol tingting long displa ripot ol i stap piksa long olgeta industri bilong mining blong PNG.

Hidden Valley Mining no ken wokim hait pasin long efeks ol i bin wokim or senis ol i save bai kamap long graun na environmen. Displa kain pasin we ol manmeri bilong ples ol in o kisim save o pawa, emi pasin nogut na emi abrusim ol rait bilong manmeri long peles. Sapos yumi no stretim dispel problem na pasin bai stap, planti ol birua bai kamap yet namel long ol ples manmeri na Hidden Valley, Wafi-Golpu na ol arapea mine long Morobe na PNG. Sapos PNG laik kisim benefit long dispel kain mining, ol boslain blong kampani na govamen tu mas sinduan gut na harim wari bilong ol Komuniti.

EXECUTIVE SUMMARY – ENGLISH

REPORT FOCUS AND ORIGIN

This report is about the impact of mining on communities living along the Watut River and in the Morobe Province of Papua New Guinea. Given that similar reports could also be written about other mines it is also a report that applies more widely to the PNG mining industry. While the impacts from mining on the Watut River are minor in comparison to those at Porgera, Ok Tedi and Panguna, they are nonetheless serious. Serious because of the impacts on local people, the repetition of past mistakes and as an example of the slow progress of reform in the mining industry.

The impetus for this report comes from many sources. For the Mineral Policy Institute it is a continuation of our work on a range of mine-sites and mining related impacts in Papua New Guinea since 1995. Watut River Communities became increasingly concerned about riverine impacts from the Hidden Valley mine since construction commenced and asked MPI to assist in late 2010. Subsequently, in early 2012 MPI was commissioned by the Lutheran Evangelical Church of Papua New Guinea, with support from Mission EineWelt in Germany to assess impacts from mining in the Watut River region.

METHODOLOGY AND DATA

Originally the methodology for this report was straightforward: access the reports and plans relating to the Hidden Valley and its impacts, interpret and summarise these for river communities and listen to their concerns and the impacts the mine had on them to date. Unfortunately, like elsewhere in the international mining industry, the information was protected, difficult to obtain or deliberately withheld from communities and other stakeholders. Despite repeated and strident requests a considerable amount of information relevant to the management and impacts of the Hidden Valley mine has yet to be released to the public.

Despite this restriction, some data has been made available by the Morobe Mining Joint Venture through the Environmental Impact Statement, annual environment reporting and from a company appointed reference committee. The environmental management project audit and assessment commissioned by the Department of Environment and Conservation in 2010 [SMEC Reports] have contributed significantly to the understanding of failures at the mine that led to the sedimentation of the Watut River and other impacts. Whilst similarly hampered by restricted data, the DEC Reports identify problems with environmental impact assessment, construction, and mine-site operations. Just as important was its demonstration of the importance of external oversight rather than relying on self-monitoring in Papua New Guinea's mining industry.

Consequently, this report is based on a scientific assessment of publicly available data and qualitative assessments against industry norms and standards. Standards and practices which if applied, would result not only in the release of data and plans but a more transparent and equitable process.

FINDINGS AND IMPACTS

There are many historical impacts from mining in Morobe Province as well as ongoing impacts from current operations at Hidden Valley. There will also be much larger impacts if the Wafi-Golpu deposit is developed; both sites are owned and operated by Morobe Mining Joint Venture (MMJV) on behalf of equal owners, Harmony Gold from South Africa and Newcrest Mining from Australia. The potential for further mineral discoveries and exploitation at other sites could further multiply current, future and cumulative impacts in the region.

Both Newcrest Mining and Harmony Gold have publicly reported on and accepted some responsibility for the sedimentation of the Watut River and subsequent effects on communities including damage to gardens and cultural sites; village relocation; covering of river sands required for artisanal mining; and impacts of water quality and aquatic life. Unfortunately, an accurate assessment of the extent of this impact and liability has not been released to the public, nor could this report make such an assessment on the available data.

There is reasonable evidence to show that the lack of environmental management during construction, especially concerning waste rock, led to severe erosion rates into the Watut River and an approximate doubling (or more) of the sediment loads being transported down the Watut River. It is believed that some 20 to 30 million tonnes of mine-derived sediment entered the Watut River during the period of construction from 2006 to 2009. Furthermore, despite the Environmental Impact Statement predicting minor sedimentation problems to be shared equally by the Upper Watut and Bulolo Rivers, more than 90% of the sediment entered the Watut River. Whilst the impact on the water quality of the Watut River is mostly due to the higher sediment, there does appear to be slightly higher levels of some solutes such as sulfate, aluminium, and arsenic - although the typically generous compliance limits mean this is not recognised as an issue. The 2012 site inspection and 2011 and 2012 environmental monitoring reports show that efforts are proving successful in reducing sediment loads to the Watut River and improving overall water quality, although the very poor standard of the baseline studies hampers a more comprehensive analysis.

The lack of progress and closure relating to the impacts remains an ongoing issue for (1) communities, who remain concerned about existing and further impacts (2) damage to the reputation of MMJV, Harmony Gold and Newcrest Mining, (3) Local, Provincial and National Governments who have to respond to, monitor and regulate the mine and its impacts and (4) financiers and investors with relevant ethical/ industry standards and the increased risk profile of the companies and mine-sites.

In addition to the systematic non-or partial compliance on more than half (43 of 73) of the Hidden Valley mine's conditions found by the SMEC Reports, there are a number of breaches of policy or industry standards. These include (1) Breaching of both Newcrest Mining and Harmony Gold's company policies, (2) Inadequacy of company reporting to ICMM, (3) Inadequacy of community engagement, consent and representation, (4) Multiple breaches of the OCED Guidelines for Multinational Enterprises that could form the basis for a complaint in Australia, (5) Non-compliance with Equator Principles, despite Harmony Gold and Newcrest Mining making commitments to the principles and the involvement of Equator signatories such as ANZ, HSBC, Credit Suisse, Barclays, JP Morgan Chase, Westpac and the National Australia Bank.

The strongest statements of all, however, come from the communities themselves, who are tired of existing development paradigms and make a strong call for change. Change that sees communities involved in decision-making about development that is relevant to their needs instead of dominated by the interests of the companies, shareholders and financiers from far away. Rather than trying to translate their concerns into text, they are, at least in part, captured by the documentary accompanying this report, which also provides valuable context for those not familiar with the region (MPI, 2013).

CONCLUSIONS

This report outlines various mining impacts, irregularities and non-compliances at Hidden Valley - although these are far from being the worst examples in PNG. They have occurred, however, in a period where the mining industry in PNG is increasingly being challenged by community, churches, civil society and even members of Parliament for both its excessive negative impacts and failure to deliver a significant benefit to the people of PNG. Indeed, the issues discussed in this paper should be seen as symptomatic of the industry as a whole, rather than being an irregular occurrence.

Critical problems are a demonstrated lack of transparency, environmental damage and a process that fails to adequately involve, consider and respect the rights of impacted communities. Unless these are addressed in a meaningful way and supported by Government, Industry and community then we can expect further instances of impact and community opposition to mining at Hidden Valley, Wafi-Golpu and other mine-sites in Morobe and PNG. If PNG is to capture the benefits from industrialised mining, while minimising the negative impacts, then significant change is required from mining operators and regulators as well as how they interact with communities.

ACRONYMS

ANZ	Australia and New Zealand Banking Group Limited
ANZECC	Australian and New Zealand Environment Conservation Council
AusNCP	Australian National Contact Point
CAC	Citizens Advisory Council
CRA	(formerly Conzinc Riotinto of Australia Limited)
DEC	Department of Environment and Conservation
EIS	Environmental Impact Statement
ELCPNG	Evangelical Lutheran Church of Papua New Guinea
EMP	Environmental Management Plan
EP	Equator Principles
ESAP	External Stakeholder Advisory Panel
FPIC	Free Prior and Informed Consent
GRI	Global Reporting Initiative
HSBC	(formerly Hongkong and Shanghai Banking Corporation)
HVJV	Hidden Valley Joint Venture
ICMM	International Council on Mining and Metals
ISO14001	International Organization for Standardization (environmental management)
MMJV	Morobe Mining Joint Venture
MPI	Mineral Policy Institute
NTU	(measurement of turbidity)
OCED	OECD Guidelines for Multinational Enterprises
PNG	Papua New Guinea
SLO	Social License to Operate
SMEC	SMEC Holdings Limited (formerly Snowy Mountains Engineering Corporation)
TDS	Total Dissolved Solids
TSF	Tailings Storage Facility
TSS	Total suspended sediment
UoWRC	Union of Watut River Communities

METALS

Al	Aluminium
As	Arsenic
Ag	Silver
Au	Gold
Cd	Cadmium
Cu	Copper
Mn	Manganese
Mo	Molybdenum
Pb	Lead
Zn	Zinc

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INTRODUCTION

Despite often being labelled as a “mountain of gold floating in a sea of oil” Papua New Guinea, or rather, many Papua New Guineans, have yet to experience the benefits promised by mining and other extractive industries. With poor education standards, increasing infant mortality and declining services all contributing to a static Human Development Indicator, Papua New Guineans have a right to question the assumption that ‘mining brings development’.

The background to this report lies not just in the recent impacts from mining along the Watut River, but in the history of mining in PNG that spans the Bulolo Gold Fields, the crisis that started at Panguna leaving 16-20,000 dead, the destruction of the Ok Tedi River and the disposal of mine waste into the ocean at Lihir, Misima and Ramu. It is a history marked by conflict between economic systems, beliefs and customs where mining profits are expatriated or leave little lasting community benefit to compensate for significant environmental impacts and ongoing social and cultural dislocation.

All too often - mineral exploitation is pushed and promoted by those with the most to gain; multinational companies, Government and corporate elites and, sometimes, local leaders. For these select few, the benefits from mining outweigh the impacts. For others, their experience is a loss of self determination and transitory benefits complicated by external processes and scales of operation that overwhelm their culturally specific, often localised, knowledge and experience.

Increasing community awareness and expectations means that the tri-fecta of proponents can no longer ignore or overrule communities with impunity. While there has been some slow and incremental reform in PNG’s mining industry in recent decades, it is now time to change the mining development paradigm to ensure that ‘mining really does bring development’ for all Papua New Guineans.

While industry, government and investors could once have hidden behind their own ignorance of the impact of mining; this is no longer possible. While the concepts of free, prior and informed consent [FPIC] and social license to operate [SLO] do not hold all the answers, they have and are changing the paradigm where the evaluation of the risks and benefits of mining occurs with the full and active participation of affected communities.

The question that remains is whether mining along the Watut River will follow the historical and destructive pattern of large-scale industrial mining development in PNG or whether it can set a new standard.

This report takes neither a pro nor anti-mining perspective: instead it supports the decision-making authority of the Morobe Province, Local and National Government, affected communities and the people of PNG. Rather, our contribution is to assist those concerned about mining to understand the impacts and make informed decisions about whether, where, how and when mining should occur.

BACKGROUND TO THIS REPORT

Mining in Morobe, Papua New Guinea is part of a larger project, which itself builds upon ongoing engagement and over 15 years work on mining in Papua New Guinea by the Mineral Policy Institute [MPI]. During that time MPI has witnessed and assisted many communities negatively affected by large-scale industrial mining in PNG and around the world.

This project responds to concerns of local communities and organisations over the impact of mining at Hidden Valley and its effect on the Watut River and the communities who live along it. In late 2010 MPI responded to a call for help from the Union of Watut River Communities. Research and a visit to communities in February 2011 confirmed there was evidence to support significant concerns about past and potential impacts on the Watut River from the Hidden Valley mine and planned exploration and mining projects.

With the endorsement of the UoWRC, MPI engaged in dialogue with Newcrest with the aim to ***"resolve the issues once and for all if the opportunity was given"*** (UoWRC, 2011). Meetings in June and September 2011, while cordial, did not result in any progress. This lack of progress was frustrating for MPI and the community, which continue to be affected, and who lacked information about the impacts on the river.

The lack of information also concerned the Evangelical Lutheran Church of PNG who were concerned about environmental and human impacts in the Watut area. MPI was commissioned by the Church to assess past and possible future impacts along the Watut, produce a documentary and engage with the community.

During the fieldwork associated with the project it became clear that affected communities were concerned about future impacts as well as the more immediate effects of sedimentation on water quality, transport, villages and fishing. Part of this report is a documentary which captures the concerns of impacted communities better than any written report ever could. The documentary is linked in the digital version of the report and along with associated information and images can be found at the dedicated website www.watutriver.com

Key to developing a better understanding of past, present and future impacts was access to documents that established baselines and assessed impacts and operation/management plans. Unfortunately most of these documents are not in the public domain. Nor have they been provided despite repeated requests to Newcrest, the Australian half on the Morobe Mining Joint Venture [MMJV]. It is hoped that Newcrest Mining, Harmony Gold and MMJV will soon make all the relevant documents public.

Until then, the lack of openness continues to be a significant obstacle to effective engagement with affected communities and other stakeholders. Furthermore this lack of transparency conflicts with the mining companies own stated values, international best practice and increase the risk of adverse outcomes from current and future operations in PNG.

However, despite the lack of transparency regarding scientific and management reports documenting impacts, it is acknowledged and appreciated that a site visit to Hidden Valley in April 2012 was facilitated by Newcrest and hosted by MMJV.

On behalf of MPI and the affected communities we gratefully acknowledge the funding provided by the German Lutheran Church through the "Mission One World" program. Thanks also to the team, the Union of Watut River Communities and the communities who welcomed, assisted and hosted us in their homes and villages.

MINING IN PAPUA NEW GUINEA

PNG MINING HISTORY

Mining has been occurring in Papua New Guinea for about a century, mainly in specific gold fields such as Misima Island, Wau-Bulolo, Woodlark Island and Mt Kare (amongst others), but also as large scale modern mines since the 1972 development of the Panguna copper-gold-silver mine on Bougainville Island, the mid-1980s development of the Ok Tedi copper-gold-silver mine in Western Province, the Porgera gold mine in the Central Highlands in the mid-1990s, the Lihir gold mine in New Ireland in the late 1990s and more recently the Hidden Valley gold-silver mine in the late 2000s. Smaller gold mines include Tolukuma, Kainantu, Simberi and Sinivit, as well as major deposits being explored and considered for development at Frieda River, Wafi-Golpu and Yandera. The Ramu nickel-cobalt project (near Madang) was built in the late 2000s, and, after an unsuccessful legal case attempting to block the use of marine tailings disposal, began production in late 2012. A basic mining map of Papua New Guinea is shown in Figure 1.

At the Panguna and Ok Tedi copper-gold-silver mines, mine tailings were directly discharged into an adjacent river system, while waste rock was either directly dumped to the river or placed on easily erodible dumps. The substantive scale of social and environmental impacts from the Panguna mine led to a civil war breaking out in May 1989 which lasted more than a decade (Havini & John, 2001), before peace was finally negotiated in 2002. Riverine mine waste disposal is still being used at Ok Tedi, Porgera and Tolukuma, which are all associated with severe environmental and social impacts along their respective river systems (especially the Fly River downstream from Ok Tedi; see Bolton, 2008 and papers therein; Tingay, 2007).

Alternatively, at the former Misima gold-silver mine on Misima Island east of Port Moresby, as well as at the operating gold mines of Simberi and Lihir, tailings are discharged to the sea at depths of ~100 metres or more. The Ramu nickel-cobalt project, near Madang, also now uses marine disposal of tailings and began production in late 2012 after the failure of a lengthy court case where the community sought to stop the use of marine tailings disposal. Ongoing concerns about impacts from marine tailings disposal at Basamuk Bay are regularly reported in PNG's formal and social media (see PNG Mine Watch, 2014).

By the start of the new millennium, there was yet to be a major mine in Papua New Guinea which used conventional engineered mine waste management techniques, such as a tailings storage facility (or tailings dam) and careful waste rock dump designs to minimise erosion and environmental impacts. These approaches are required by law in countries such as Australia or Canada and are considered standard mining practice. Although the mid-2000s Kainantu gold mine built a tailings dam, though the dam was very modest in scale and not comparable in scale to Ok Tedi or other major mines.

The 2013 and cumulative production from major mines across PNG are shown in Tables 1 and 2, along with reported mineral resources in Table 3. As can be observed, some projects such as Lihir and Ok Tedi remain large producers, while deposits such as Wafi-Golpu and Frieda River could be substantial new mines if they are successful in the assessment and approvals process and proceed to commercial production.

Table 1: 2013 Production Statistics for PNG Mines

Mine	Ore Milled (tonnes)	Gold (g/t)	Silver (g/t)	Copper (%Cu)	Gold (kg)	Silver (kg)	Copper (t)	Total Prod. Cost	Waste Rock (t)	Companies
Hidden Valley	3,812,000	1.73	24.4	-	5,718	73,134	-	2,244 A$/oz	15,766,000	Harmony Gold[50%], Newcrest Mining[50%]
Simberi	1,780,723	0.98	-	-	1,515	-	-	2,200 A$/oz	~2,000,000	St Barbara Mines[100%]
Porgera	5,636,099	3.22	-	-	15,779	-	-	1,294 A$/oz	13,972,790	Barrick Gold[95%], PNG Government[5%]
Lihir	9,380,000	2.99	-	-	23,487	907	-	932 A$/oz	17,588,000	Newcrest Mining[100%]
Sinivit[a]	~30,000[a]	~2.5[a]	-	-	73a	60a	-	no data	no data	New Guinea Gold Corp.[100%]
Ok Tedi[2012 data]	22,602,000	0.77	~2.1	0.66	12,618	27,875	125,325	***no data***	~22,000,000	Ok Ted Mining Joint Venture[#]
Tolukuma[a,b]	~116,000[a,b]	~9[a,b]	-	-	1,030 [a,b]	1,692[a,b]	-	***no data***	***no data***	Petromin PNG[100%]

[#]Ok Ted Mining is 63.6% owned by the PNG Sustainable Development Program Limited (PNGSDP), which is a trust on behalf of the Western province, and 36.4% directly owned by the PNG Government, with the PNGSDP interest taken over by the PNG Government in early 2014, effectively now making Ok Tedi a 100% PNG Government operation (although court cases continue in relation to Ok Tedi regarding ownership). [a]New Guinea Gold and Petromin PNG do not publish detailed annual production statistics for Sinivit and Tolukuma, respectively, data approximate only (based on available data); [b]2011 production only.

Table 2: Cumulative Production Statistics for Major PNG Mines

Mine	Period	Ore (Mt)	Gold (g/t)	Silver (g/t)	Copper (%Cu)	Gold (kilograms)	Silver (kilograms)	Copper (tonnes)	Waste Rock (Mt)	Companies
Ok Tedi	1984-2012[#]	~668	~0.9	-	~0.8	~416,514	~836,000	~4,343,500	~998	Ok Ted Mining Joint Venture
Panguna	1972-1989	675.37	0.63	-	0.52	305,604	784,041	2,988,058	570	Rio Tinto[53.83%], PNG Government[19.06%], Public[27.11%]
Porgera	1990-2013[#]	107.67	6.17	-	-	572,668	-	-	~879	Barrick Gold[95%], PNG Government[5%]
Lihir	1997-2013[#]	75.044	5.07	-	-	334,139	1,567	-	525.0	Newcrest Mining[100%]
Misima	1989-2004	87.471	1.45	~13	-	115,896	~570,000	-	347.8	Placer Dome[100%,a]
Tolukuma[b]	1996-2012[#,b]	~2.5	~12.4	~30	-	~28,750	>38,700	-	>2.79	PNG Government[100%,b]
Hidden Valley	2009-2013[#]	15.310	1.91	~24	-	23,955	>196,900	-	~127.6	Harmony Gold[50%], Newcrest Mining[50%]
Simberi	2008-2013[#]	10.732	1.24	-	-	11,507	-	-	>5.5	St Barbara Mines[100%]
Kainantu[c]	2006-2008	~0.35[c]	~7.3[c]	-	-	~2,200[c]	-	-	*no data*	PNG Government[100%,c]
Sinivit[c]	2008-2012[#,c]	~0.52[c]	~3.9[c]	-	-	~1,130[c]	>129[c]	-	>0.2	New Guinea Gold Corp.[100%,c]
Mt Victor	1987-1990	0.199	~3.2	~1.8	-	636	360	-	0.19	Niugini Mining[100%,c]

Note: Mt - million tonnes; g/t - grams per tonne. [#]Still operating in 2012. [a]Placer Dome was taken over by Barrick Gold in early 2006. [b]Tolukuma was bought by the PNG Government in February 2008 (through state company Petromin PNG) but does not report production statistics; data shown is approximate only. [c]Some production statistics not reported, approximate values assumed.

Table 3: Reported Mineral Resources for PNG Mines and Projects (2012 or most recent data)

Copper-Gold / Gold	Mt Ore	g/t Au	g/t Ag	%Cu	Other	Gold (kg)	Copper (t)	$million[@]	Companies (%shareholding)
Frieda River Group[a]	2,585	0.23	0.59	0.47	-	589,900	12,192,000	125,568	Xstrata[81.82%], Highlands Pacific[18.18%]
Golpu	1,000	0.63	1.08	0.90	0.0095% Mo	634,300	8,972,000	104,461	Harmony Gold[50%], Newcrest Mining[50%]
Lihir[(mine)]	1,020	1.95	-	-	-	1,993,000	-	103,207	Newcrest Mining[100%]
Panguna	1,838	0.34	-	0.30	-	627,500	5,514,000	74,800	Rio Tinto[53.83%], PNG Government[19.06%], Public[27.11%]
Ok Tedi[(mine)]	755.2	0.70	-	0.59	-	526,200	4,420,000	61,154	Ok Ted Mining Joint Venture[#]
Yandera	833	0.05	~1.5	0.34	0.0076% Mo	34,300	2,871,000	26,872	Marengo Mining
Porgera[(mine)]	120.4	3.37	-	-	-	406,200	-	21,035	Barrick Gold[95%], PNG Government[5%]
Hidden Valley[(mine)]	117.9	1.48	26.9	-	-	174,400	-	12,123	Harmony Gold[50%], Newcrest Mining[50%]
Wafi	133	1.63	-	-	-	216,900	-	11,232	Harmony Gold[50%], Newcrest Mining[50%]
Kodu[e]	276[e]	0.30[e]	1.7[e]	0.27[e]	0.0077% Mo[e]	82,800[e]	745,000[e]	11,083	Frontier Resources[100%,e]
Simberi[(mine)]	183.9	1.10	-	-	-	202,300	-	10,474	Allied Gold[100%]
Simiku	200	0.06	2	0.36	0.0061% Mo	12,000	720,000	6,891	Coppermoly[100%]
Arie[f]	164[f]	0.1[f]	1.7[f]	0.32[f]	-	16,400[f]	525,000[f]	5,147	Triple Plate Junction[75.98%], Pacrim Energy[13.43%], Golden Success[10.59%]
Woodlark Island	42.4	1.5	-	-	-	63,600	-	3,296	Kula Gold[100%]
Mt Kare	24.6	2.13	15.49	-	-	52,400	-	3,083	Indochine Mining[100%]
Nakru	38.4	0.28	1.80	0.61	0.0013% Mo	10,800	234,000	2,487	Coppermoly[100%]
Solwara 1	2.57	5.84	30	7.74	0.70% Zn	15,000	199,000	2,413	Nautilus Minerals[70%], PNG Government[5%]
Nambonga[d]	40	0.79	-	0.22	-	31,600	88,000	2,312	Harmony Gold[50%], Newcrest Mining[50%]
Crater Mountain	24	1	-	-	-	24,000	-	1,243	Gold Anomaly[90%]
Imwauna-Normanby	1.8	12.2	20	-	-	22,000	-	1,172	New Guinea Gold Corp.[50%], NMC Mining Corp.[50%]
Laloki[f]	0.9[f]	21.9[f]		-	-	19,700[f]	-	1,021	*unknown*
Tolukuma[g.(mine)]	0.58[g]	30.6[g]	-	-	-	17,700[g]	-	919	PNG Government[100%]
Gameta	5.1	1.8	-	-	-	9,200	-	475	Gold Anomaly[100%]
Mt Kren-Puan[f]	20	-	-	0.3[f]	-	-	60,000[f]	460	Triple Plate Junction[75.98%], Pacrim Energy[13.43%], Golden Success[10.59%]
Sinivit[(mine)]	2.05	3.5	-	0.26	-	7,100	5,000	369	New Guinea Gold Corp.[100%]
Solwara 12	0.23	3.6	56	7.3	3.6% Zn	800	17,000	201	Nautilus Minerals[70%], PNG Government[5%]
Sehulea-Weioko[f,h]	1.71[f,h]	1.36[f,h]	12.3[f,h]	-	-	2,300[f,h]	-	141	New Guinea Gold Corp.[100%]
Nickel-Cobalt	**Mt Ore**	**%Ni**	**%Co**			**Nickel (t)**	**Cobalt (t)**	**$billion[@]**	**Companies (%shareholding)**
Mambare	162.5	0.94	0.09			1,528,000	146,000	30,006	Direct Nickel[50%], Regency Mines[50%]
Ramu	143	1.01	0.1			1,444,000	143,000	28,843	MCC[85%], Highlands Pacific[8.56%], PNG Government[3.94%], Landowners[2.5%]
Wowo Gap	125	1.06	0.07			1,325,000	88,000	24,899	Resource Mining Corp.[100%]

Note: Mt - million tonnes; Mo - molybdenum; Zn - zinc. [#]Still operating in 2012. [@]Australian dollar values estimated based on 2012 prices from BREE (2013). [a]Frieda River consists of several deposits - the dominant H-I-T (or Horse/Ivaal/Trukai), Nena, Koki and Ekwai deposits. [d]Nambonga is part of the Wafi-Golpu project. [e]Kodu is extremely close to the Kokoda Track and has been halted from development. [f]Resource estimate not JORC Code compliant. [g]Tolukuma resource is from 2006, since more recent data not available. [h]Resource estimate historical and not JORC-code compliant.

MINING IN THE MOROBE PROVINCE

This section is summarised from Lowenstein (1982) and Enesar (2004), unless otherwise noted.

Gold was discovered in the Morobe Province in 1910 by Arthur Darling in the Bulolo River near Koranga Creek, although significant activity did not start until the site was re-located in 1922 by William Park and Jack Nettleton. The region was proclaimed a gold field in February 1923, with work focussed on alluvial gold in Koranga Creek and the Bulolo River. Interest continued to grow as rich deposits of alluvial gravels were discovered throughout the 1920s, and in 1927 the first hard rock or lode gold deposit was discovered at Edie Creek. By 1930, both alluvial dredging and hard rock mining was progressing to modest scale projects based on rich gold grades and easily mineable ore at or near the surface.

The Day Dawn hard rock mine at Edie Creek began production in May 1931, while the large scale Bulolo dredge began operations in March 1932. The major operations in the region concentrated on dredging in the Bulolo area and hard rock mining around the Edie Creek area throughout the 1930's, with record field production in 1940 of 8,477 kilograms of gold and 6,025 kilograms of silver (about 272,500 ounces of gold and 193,700 ounces of silver).

At its peak in 1941, the Bulolo dredge processed about 3 million tonnes of gravels per year and recovered some 5,200 kilograms of gold and 2,250 kilograms of silver - a yield of 0.22 grams of gold per tonne of gravel processed (silver yield was 0.098 g/t). The Koranga sluicing operation processed up to some 1 million tonnes per year of gravels at an approximate yield of about 0.09 g/t gold (silver yield was about 0.05 g/t).

The outbreak of World War 2 and the advance of the Japanese military in the area closed the entire field in January 1942. The Bulldog track from Upper Edie Creek to the Lakekamu gold field to the south was built by the army from 1942 to 1944 to help supply the war effort in the region.

After a period of damage assessment and re-establishment of infrastructure, especially power supplies, dredging recommenced at Bulolo in February 1947 with hard rock mining re-starting at the Upper Ridges site in 1948. While dredging and hard rock mining returned to their previous production levels for the 1950's, the field had begun to decline by 1960. The Bulolo dredge closed in 1967, and the Golden Peaks mine near Wau closed in 1977. Reported production over time is shown in Figure 2. The alluvial gold resources were considered to be depleted by the mid-1980's, with attention turned to trying to revive the Edie Creek area (Neale, 1994) as well as develop the Hidden Valley/Kaveroi and Hamata deposits discovered in the mid-1980's (see Pascoe, 1991; Denwer and Mowat, 1997).

After resuming production in 1947, the Bulolo dredge only processed about 1 to 2 million tonnes of gravels per year and recovered between 1,000 to 2,500 kilograms of gold per year and between 300 to 1,000 kilograms of silver per year – an average yield of 0.11 grams of gold per tonne of gravel processed (silver yield was 0.051 g/t). The Koranga sluicing operation continued processing at between 0.5 to 1 million tonnes per year of gravels at an approximate yield of about 0.09 g/t gold (silver yield was about 0.05 g/t), though post-war operations only lasted from 1952 to 1961.

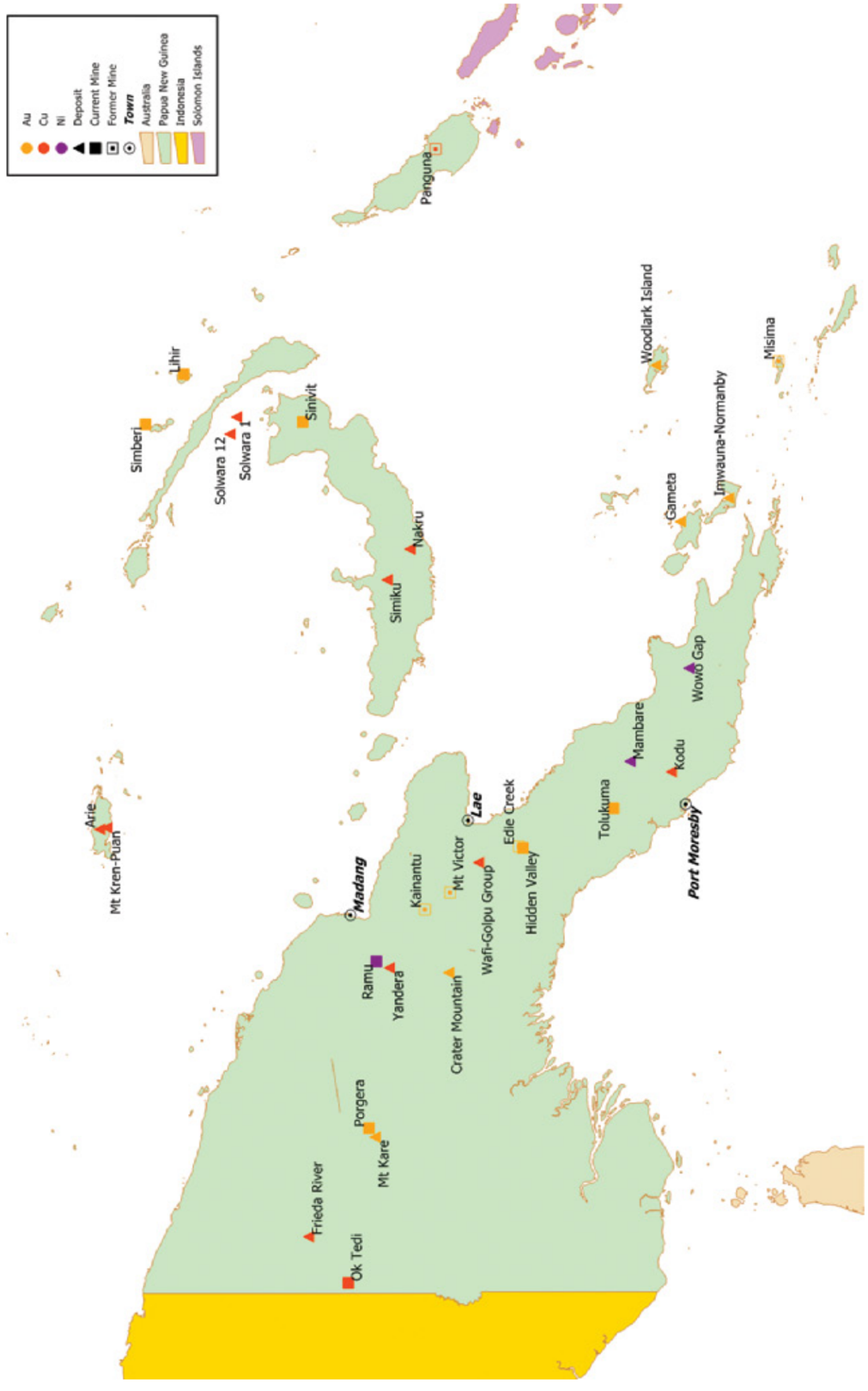

Figure 1: Location of major gold and copper-gold mining projects in Papua New Guinea.

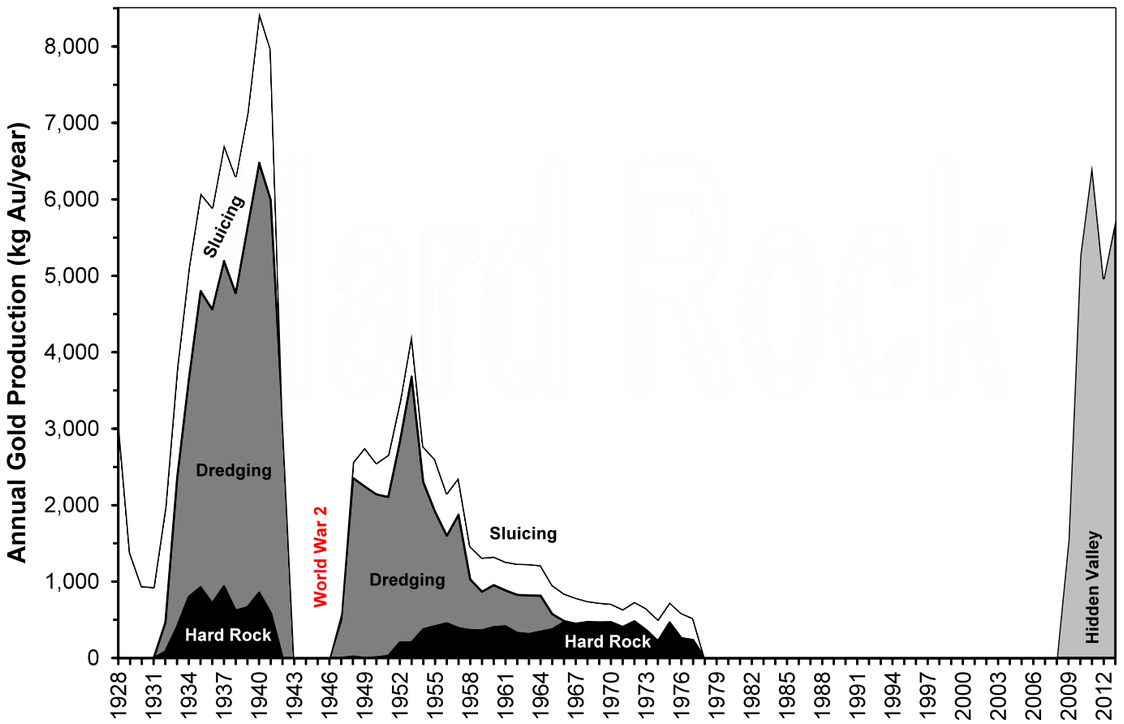

Figure 2: Reported gold production over time (1928-1977) by mining method in the Morobe Province, including inset by mining method (adapted from data in Lowenstein, 1982) plus Hidden Valley (2009-2012; from data in this report) (no data is known between 1978-2008).

Figure 3: Artisanal gold mining, Wau-Bulolo region.

Although data is not available, artisanal and small scale alluvial mining has continued to the present day, as shown in Figure 3.

HIDDEN VALLEY

HIDDEN VALLEY OVERVIEW

The Hidden Valley gold-silver (Au-Ag) mine is located in the Wau-Bulolo gold field of Papua New Guinea (PNG), about 90 km south-southwest of Lae and some 300 km north-northwest of the capital Port Moresby, as shown previously in Figure 1 and more locally in Figure 4. The region forms a major part of the Morobe Province. The Hidden Valley project is located in the headwaters of the Bulolo and Watut Rivers, with the Watut River being a major tributary of the Markham River which reaches the ocean near Lae.

The Hidden Valley Au-Ag deposit, including the adjacent Kaveroi zone, was discovered by CRA Exploration Limited in July 1985 (Nelson et al., 1990; Pascoe, 1991), while the Hamata deposit was discovered in July 1987 (Denwer and Mowat, 1997, 1998) (CRA were the majority owners of and operated the Panguna copper-gold-silver mine on Bougainville Island). Although CRA lodged a development application for Hidden Valley in 1988, they later withdrew it (Burton, 2001).

Curiously, some the of early CRA environmental studies led to the following prediction by Pascoe (1991): ***"Sediments derived during construction, prestripping and waste rock dumping would enter the Bulolo and Upper Watut Rivers. While no cultivated river-side areas would be affected, there will be a depressed fish population which would affect subsistence fishing during, and for a short time after, the construction period. Water-borne waste during operations would be confined to the rivers affected by the Upper Watut River catchment area and would have some minor impact. No gardening or riparian land use would be threatened. The main potential for impact comes from the tailings dam decant water so control methods would be incorporated in the plant facilities to ensure compliance"*** (pp 75).

The Hidden Valley project was sold by CRA to Australian Gold Fields NL in 1997, who completed an 'Environmental Plan Inception Report' and began other technical studies in 1997, however this work was shelved in March 1998 when AGF were forced into bankruptcy. The project was bought by Aurora Gold Limited and CDC Financial Services (Mauritius) Limited in September 1998, with Abelle Limited merging with Aurora in January 2003. Abelle, in turn, was 75% owned by Harmony Gold Limited from South Africa, but became a fully owned subsidiary of Harmony by mid-2004.

An Environmental Impact Statement (EIS) for the project was publicly released in February 2004 (Enesar, 2004), proposing three open cut mines (Hidden Valley, Kaveroi and Hamata), a carbon-in-pulp (CIP) process plant and an engineered tailings storage facility. Approval of the EIS was given by the PNG Government in March 2005. The original mineral resource in the EIS was 36.173 Mt of ore grading 3.2 g/t gold and containing about 115,750 kg of gold (about 3.6 million ounces) (this compares to the current reported resource of 117.9 Mt at 1.48 g/t; see Table 3).

Harmony Gold began development of the Hidden Valley project in September 2006, with Newcrest Mining becoming a joint venture partner in August 2008, initially at 30% but rising to a 50:50 joint venture at the commencement of production in July 2009. The partnership is known as the Morobe Mining Joint Venture (or 'MMJV') and includes three main projects - the Hidden Valley, Wafi-Golpu and the Morobe Exploration Joint Ventures.

During construction of the project between September 2006 to June 2009, major problems arose with respect to managing waste rock and erosion. Although it is claimed by the MMJV that these issues are now effectively resolved and current operations minimise all erosion offsite, the downstream communities in the Watut River have been publicly complaining about the ongoing extent of impacts, especially sedimentation and poorer water quality and perceived health issues.

During 2010, the PNG Government's Department of Environment and Conservation ('DEC') engaged Australian engineering consultants SMEC International to review and formally audit the status of environmental management at Hidden Valley (SMEC, 2010a), as well as a major study of the erosion and additional sedimentation to the Bulolo and Watut Rivers caused by the Hidden Valley project (SMEC, 2010b).

Although the MMJV has numerous internal studies and reports, these are not publicly available - nor were many of them available for the SMEC reports. The only reports released publicly to

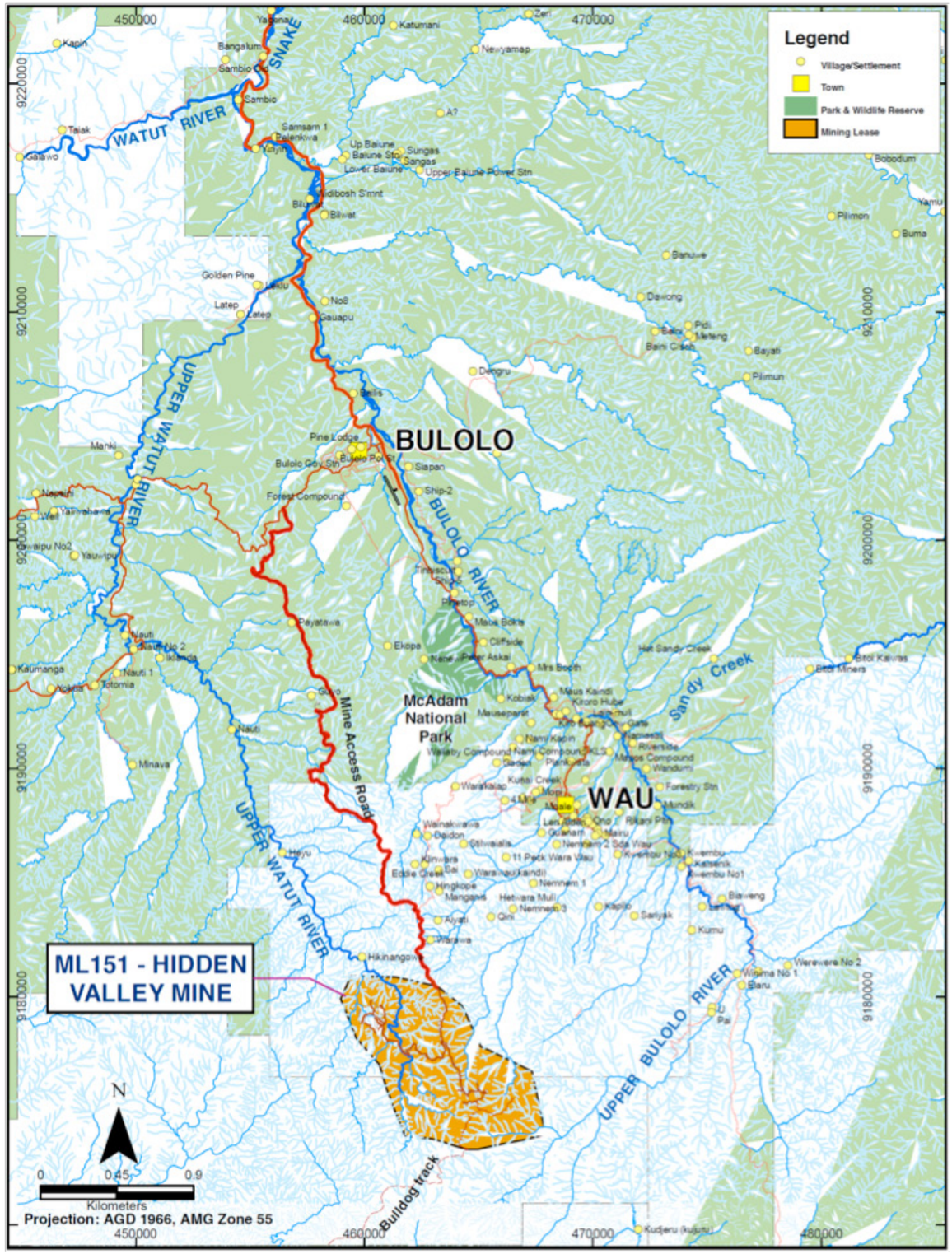

Figure 4: Regional location map of the Hidden Valley Au-Ag mine, Papua New Guinea (SMEC, 2010a) (note: it appears the scale is incorrect).

date by the MMJV are the 2011 and 2012 Annual Environment Reports (HVJV, 2012, 2013) - which contain the results of environmental monitoring and assessment work for 2011 and 2012, respectively (these reports are reviewed in detail later).

As such, this review focusses on the original Environmental Impact Statement (EIS) and relevant conditions of approval, the principal findings of the two SMEC reports, including some of the data presented in the SMEC reports concerning sedimentation impacts on the Watut River, the 2011 and 2012 Annual Environment Reports, as well as other technical reports and studies available for the Morobe region.

Table 4: Hidden Valley Production Statistics

Year	Ore milled Mt	g/t Au	g/t Ag	kg Au	kg Ag	Waste Rock Mt	Total Cost ($/oz)	Gold Price ($/oz)[@]
2006-09	*construction*					»30		
2009	0.990	2.16	26	1,549		12.252	-	1,235.25
2010	3.428	2.05	26.3[#]	5,263	20,148[#]	14.990	1,490[§]	1,333.14
2011	3.432	2.16	26.5	6,454	52,515	23.388	1,349	1,524.53
2012	3.648	1.64	26.0	4,969	51,103	16.180	2,027	1,610.50
2013	2.800	1.71	24.56	2,626	24,698	15.766	1,762[a]	~1,458
Total	**14.298**	**1.92**	**~24.1**	**22,413**	**164,201**	**»127.5**		

Notes: [@]Gold prices from BREE (2012, 2013); [#]silver grades and production not reported until the September 2010 quarter, hence 2010 silver data represents only July to December 2010. [§]Costs exclude the March 2010 quarter and month of April 2010 (considered part of project commissioning and ramp-up). All data derived from Harmony Gold and Newcrest Mining quarterly and annual reporting. [a]In September 2013 cost reporting was changed to "All-In Sustaining Costs", with Hidden Valley recording $1,889/oz for the quarter compared to $2,422/oz for the financial year to date.

HIDDEN VALLEY - PRODUCTION & RESOURCES

The total production statistics for the Hidden Valley project, from commissioning in July 2009 and commercial production from October 2010 to September 2013, is shown in Table 4. Unfortunately, no data has been published concerning waste rock produced during the construction phase, although it is expected to be more than 30 million tonnes[1] (see SMEC, 2010a,b).

Annual processing capacity is presently about 3.5 Mt of ore, grading ~2.1 g/t Au and ~25 g/t Ag, to produce about 5,500 kg Au and 50,000 kg Ag per year. The MMJV is currently working towards optimising the existing mining infrastructure and mill and increasing the processing rate to about 4.7 Mt of ore per year. As of December 2012, reported total mineral resources remaining are 117.9 Mt grading ~1.5 g/t Au and ~27 g/t Ag – (~5.61 million ounces Au, 102 million ounces Ag) (Newcrest, 2013). At present processing rates, this gives a mine life of some 45 years.

A detailed site map is shown in Figure 5, outlining all major site features (open cuts, power station, processing plant, tailings storage facility, waste rock dumps and rivers and streams). Recent aerial views of the main part of the project site are shown in Figure 6 (the Hamata open cut mine, processing plant and tailings storage facility) and Figure 7 (looking from the Hidden Valley open cut to Hamata).

[1]Based on 20-30 Mt eroding to the Watut River (SMEC, 2010a,b).

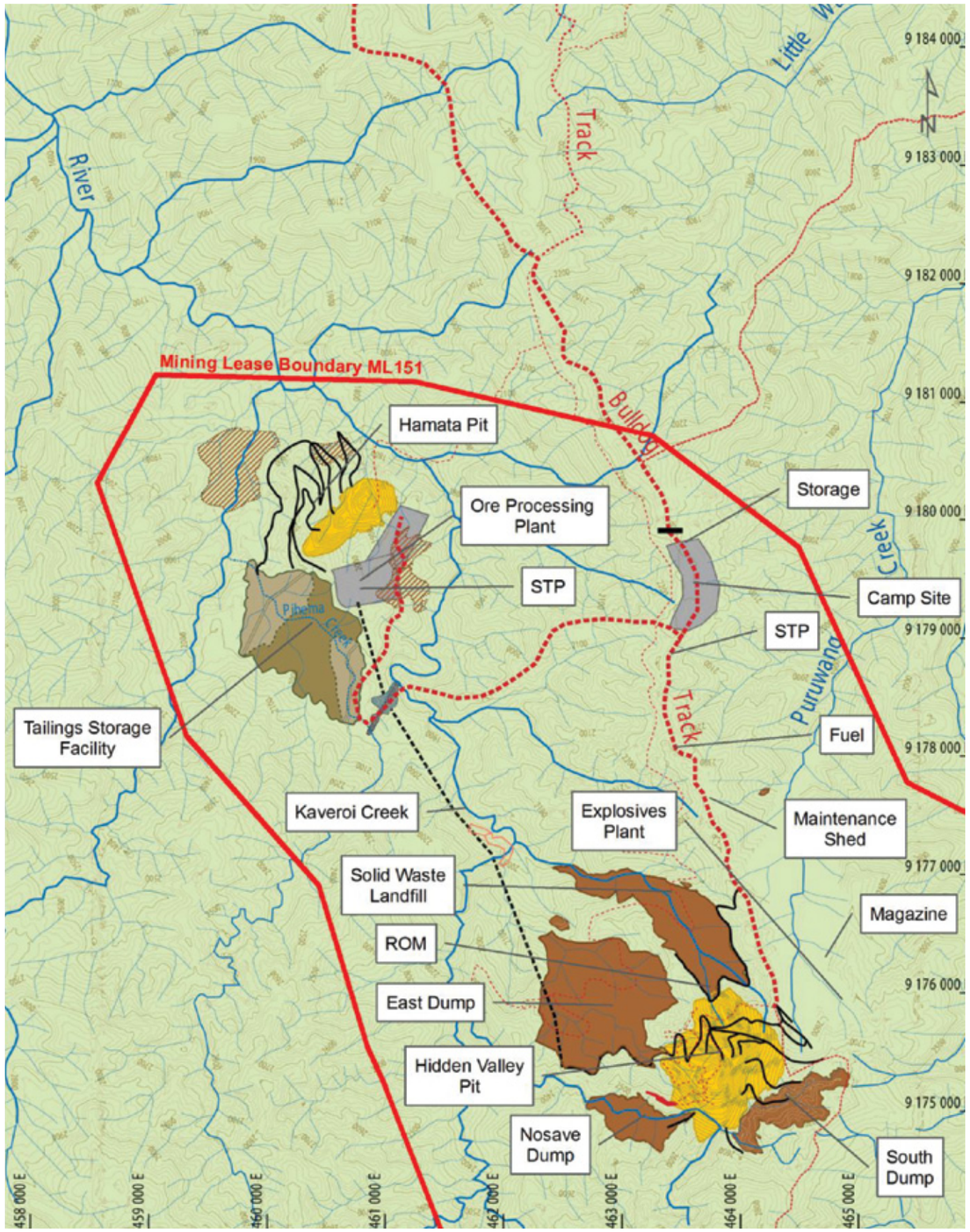

Figure 5: Detailed site plan of the Hidden Valley Au-Ag mine (SMEC, 2010a).

Figure 6: Hidden Valley Au-Ag mine, Papua New Guinea, showing the Hamata pit (centre), tailings storage facility (centre left) and processing mill in between (photo: Gavin Mudd, Mineral Policy Institute, February 2011).

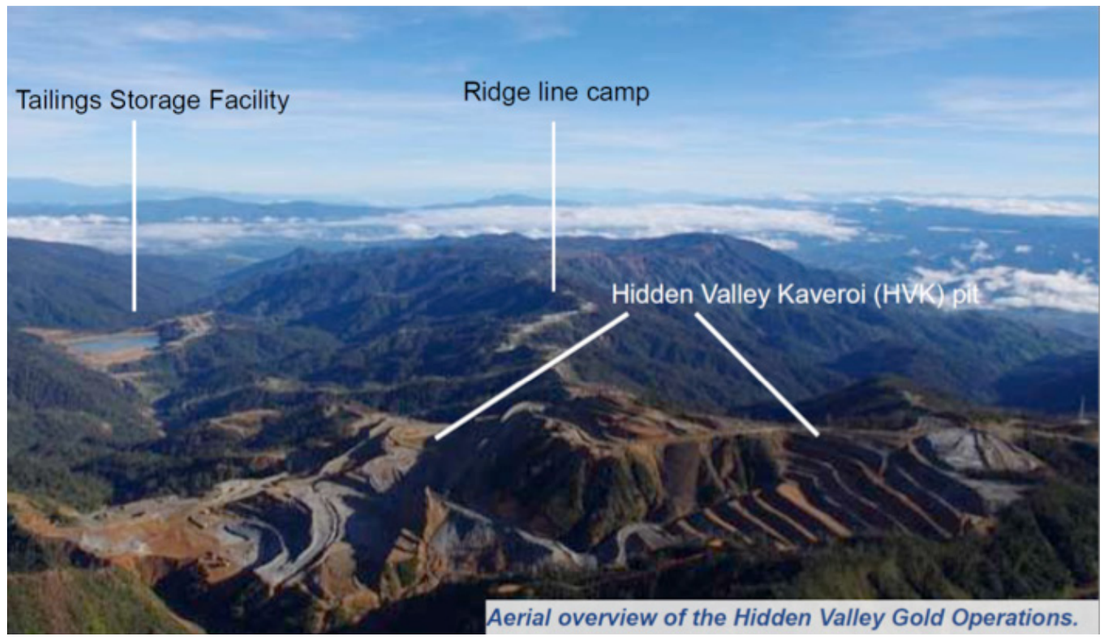

Figure 7: Hidden Valley Au-Ag mine, Papua New Guinea, showing the Hidden Valley pit (front) looking towards the tailings storage facility (centre left) (MMJV, 2011).

HIDDEN VALLEY GROUP GOLD DEPOSITS AND MINERAL RESOURCES

The Hidden Valley project comprises three main deposits being mined concurrently - the Hamata, Hidden Valley and Kaveroi deposits. As shown in Table 3, in 2013 these deposits still contained 117.9 Mt of ore grading ~1.5 g/t gold and ~27 g/t silver, and containing 174,400 and 3,169,000 kilograms of gold and silver, respectively (or about 5.61 and 102 million ounces of gold and silver, respectively).

There are also a variety of other prospects and gold deposits in the Morobe region. The Kerimenge-Lemenge deposit, discovered in 1983, was reported to contain 55 Mt at 1.0 g/t gold for 55,000 kilograms of gold (1.78 million ounces), but the ore is refractory leading to low gold recoveries and therefore remains uneconomic (Hutton et al., 1990; Denwer 1997). The Kerimenge-Lemenge deposit is presently part of the Morobe Exploration Joint Venture, with all exploration leases owned by the MMJV. In addition to the activities of the MMJV, there are additional companies conducting mineral exploration in the Morobe Province.

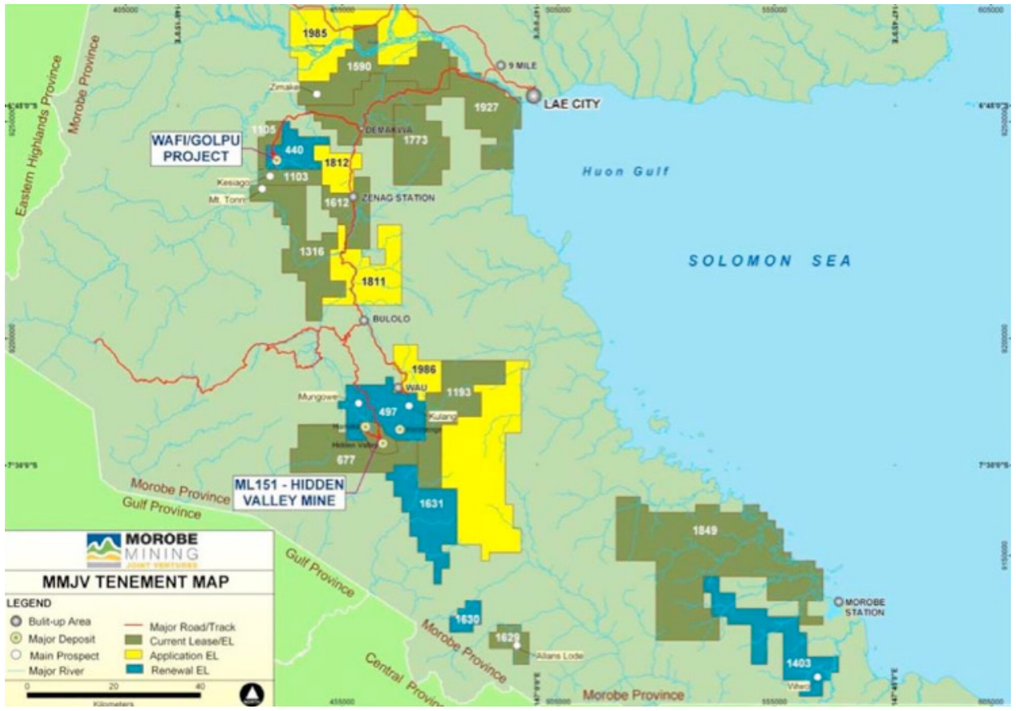

Figure 8: Morobe Mining Joint Venture exploration and mining licences (Palaulo, 2012).

THE HIDDEN VALLEY ENVIRONMENTAL IMPACT STATEMENT

An Environmental Impact Statement (EIS) was released for public comment in February 2004 (Enesar, 2004), and formed the basis upon which Abelle/Harmony sought approval to develop the Hidden Valley project. This section only briefly touches upon the issues and commitments around the project proposal, tailings, waste rock, water, acid mine drainage, baseline studies, environmental monitoring and management generally.

- **Project Proposal:** Stage 1 was to last 6.5 years and process 3.5 Mt of ore per year and produce about 8,900 kg of gold and 124,000 kg of silver per year (or ~275,000 ounces gold, ~4,000,000 ounces silver). All three deposits would be mined, including the Hidden Valley, Kaveroi and Hamata deposits. The mill would be built adjacent to the Hamata pit. In total, 21.5 Mt of ore would be processed and about 107 million cubic metres (Mm^3) of waste rock would also be mined, or some 300 Mt. The identified mineral resource reported was, in contrast, 36.2 Mt ore at 3.2 g/t gold (containing ~113,500 kg or 3.65 million ounces of gold). Stage 2 development, which would mine and process ore beyond 6.5 years, would require further assessment via a new EIS.

- **Tailings Management:** a tailings storage facility (TSF) would be constructed adjacent to the Hamata pit, taking advantage of a relatively flat area in a small valley. The tailings would be deposited using sub-aerial methods, where the slurry from the processing plant would be discharged via beaches, allowing the tailings to settle and consolidate into a solid mass. Given the high rainfall of about 2.6 to 2.8 metres per year and pan evaporation rates of between 1 to 1.2 metres per year, the site has a strongly positive water balance and therefore accumulates water in dams such as the TSF. Tailings water will be treated to reduce cyanide and heavy metal concentrations and excess water from the TSF is to be discharged via Pihema Creek to the Upper Watut River.

- **Waste Rock:** all Hidden Valley/Kaveroi waste rock to be placed in dumps as close as practicable to the pits, generally aiming to fill valleys after accounting for potential acid formation risks (ie. acid mine drainage), dump stability and drainage of water from the dump. Hamata waste rock is to be used in the tailings dam walls.

- **Acid Mine Drainage:** waste rock will be assessed for its potential to form acidic drainage, and managed accordingly. Any formation of acidic waters in the pit will be monitored and addressed either through water treatment (eg. neutralisation) and discharge to adjacent streams or through sending this water to the process plant.

- **Water:** due to the strongly positive water balance (ie. higher rainfall than evaporation rates), the vast majority of water required will be captured on site and managed according to quality and needs. Fresh water for potable (drinking) purposes will be extracted from the Upper Watut River at a long-term average rate of 110 cubic metres per hour (m3/hour).

- **Baseline Studies:** in general, no new baseline studies were conducted, with the previous CRA studies and some additional studies by Abelle/Harmony used to characterise the existing environment, such as flora, fauna, climate, land and resource use, and water quality, amongst other aspects. Air quality and noise were not assessed. Water quality was generally good, though some heavy metals in some samples exceeded PNG guidelines for either environmental or drinking water purposes. Sediment loads in the Bulolo River due to small scale mining were about 0.15 million tonnes per year (Mt/yr), while the Wau gold mine discharged about 0.7 Mt/yr from 1984 to 1990. The Middle Watut River, downstream of the Upper Watut and Bulolo confluence, was estimated to carry sediment loads of 4.7 Mt/yr.

- **Environmental Monitoring and Management:** a detailed environmental management plan (or EMP) was developed, which included further baseline studies and validation monitoring as well as plans for operational and post-closure monitoring. In general, monitoring was to include water quality, climate, sewage treatment performance, biodiversity and other aspects. An environmental management plan (EMP) was prepared and released in November 2005 (see Enesar, 2005).

TAILINGS DAM DESIGN

The construction and use of a conventional tailings dam to store tailings from large mining projects has been avoided in Papua New Guinea until Hidden Valley[2]. At Bougainville, Porgera, Ok Tedi and Tolukuma, all mine tailings after ore processing are discharged to adjacent rivers, causing severe environmental and social impacts matching the scale of each project. The typical case made to justify riverine tailings disposal was the high cost of engineering tailings dams to address risks such as earthquakes and high rainfall rates causing dam failures, as well as sometimes difficult geological conditions and/or rugged topography making suitable sites problematic to find (see Murray et al., 2003, for an honest and critical review).

In the late 1980s, when CRA were actively assessing the potential development of Hidden Valley, riverine tailings disposal or a conventional tailings dam were both considered, while the ***"… latter was chosen for financial and environmental reasons"*** (pp 73, Pascoe, 1991). Given that CRA operated Panguna

[2]The very small Mt Victor gold mine, near Kainantu, built a conventional tailings dam to store about 0.2 Mt of tailings during mining from November 1987 to January 1990 (see Samuel and Sie, 1991). The Kainantu gold mine also built a tailings dam, but this was very modest in scale (about 1.2 Mt in scale; Mudd, 2004).

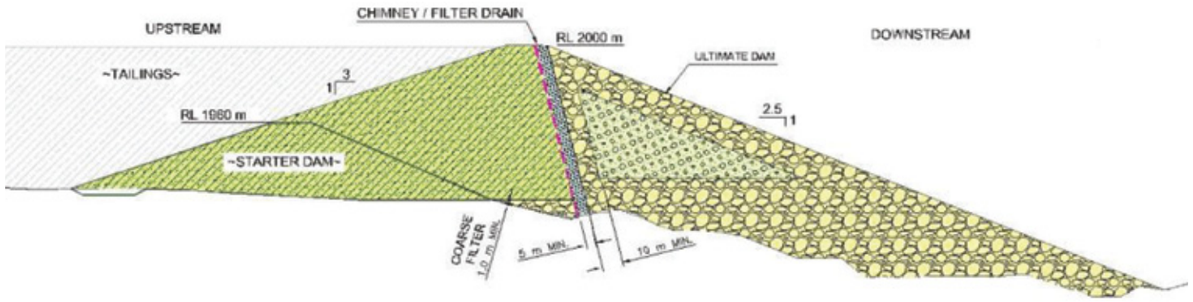

Figure 9: Engineering design of the main tailings dam wall at Hidden Valley (Murray et al., 2010).

using riverine tailings disposal, largely to avoid the high costs of building and maintaining a conventional tailings dam, this is very curious - and perhaps a subtle recognition by the late 1980's of the severe impacts from the Panguna mine on Bougainville.

The CRA plan for a tailings dam at Hidden Valley consisted of using a small topographically flat area about 5 kilometres from the deposit (ie. next to the Hamata deposit), using a downstream construction design for the dam wall and discharge of excess waters to the Upper Watut River (Pascoe, 1991). It was expected that this water discharge ***"…would comply with international standards well before any foreseeable requirements of the closest village"*** (pp 75, Pascoe, 1991).

CRA failed to proceed with the project, arguing it was uneconomic at the time, and it was not until the mid-2000s that, after a number of different companies, new owner Abelle Limited, which was 75% owned by Harmony Gold, began steps towards development. Abelle effectively continued the approach by CRA and incorporated a tailings dam in the 2004 Environmental Impact Statement (EIS) (Enesar, 2004; the EIS). The design of the main dam wall is shown in Figure 9. Murray et al. (2010) make the following commentary on the Hidden Valley tailings storage facility: ***"Building the first on-land tailings containment area sets a precedent for the mining industry in PNG and helps secure a future for the industry by demonstrating the ability to meet modern standards and thereby attract the international investment needed to finance such large ventures"*** (page 15, Murray et al., 2010).

Thus the Hidden Valley project has proven that it is possible to engineer a modern, acceptable tailings dam in the mountains of Papua New Guinea.

A note of caution, however, is that the existing tailings dam only has a limited capacity for expansion, and it is likely that a second dam will be required in the future if Hidden Valley continues to operate. That is, the original approvals were for a 6.5 year project and 21.5 Mt of tailings compared to the 2013 mineral resources of 117.9 Mt of ore and production by December 2013 of 15.3 Mt of tailings. Presumably a second tailings dam would be part of approvals to operate Hidden Valley beyond the current 6.5 years of mining. The 2004 EIS noted that the Hamata pit could potentially be converted to a second tailings dam after completion of open cut mining (pp 10-8).

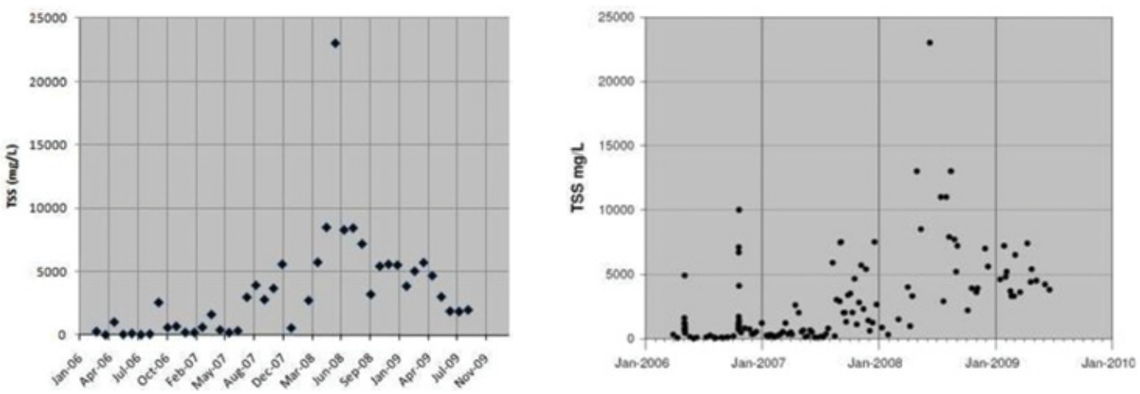

Figure 10: Total suspended sediment (TSS) at the Nauti compliance point in the Watut River, downstream from Hidden Valley (left - monthly mean values; right - individual data points) (SMEC, 2010a).

THE SMEC REPORTS: PRINCIPAL FINDINGS

The two SMEC reports (SMEC, 2010a,b) systematically examined the environmental management systems that were in place during the construction phase of the Hidden Valley project, as well as those in early 2010 after commissioning had started just before commercial production was declared from October 2010. In concise terms, the SMEC reports found:

- systematic non-compliance with permit and approval conditions, with 10 potential non-compliances and only partial compliance with 30 conditions from a total of 73 conditions, including failure to achieve certification of the environmental management system (based on ISO14001, the relevant international standard);
- a lack of waste rock and erosion controls during construction, including a weakness in the permit conditions which set no limit for suspended sediment in waters draining the site during the construction phase;
    - an internal study for the MMJV suggested that some 20 to 30 Mt of waste rock and mine-related sediment had entered the Watut River - or some 5-10 Mt/tear and much higher than the EIS value of 4.7 Mt/year of natural sediment at the Watut-Bulolo confluence;
    - of the eroded waste rock, approximately 30% was potentially acid-forming – that is, it contained sulfide minerals which when exposed to the surface environment would chemically react to form sulfuric acid and leach heavy metals and salts from the waste - providing a major environmental hazard to aquatic ecosystems and users of the Upper Watut River;
    - the EIS predictions of equal but minor impacts on the Bulolo and Watut Rivers was severely deficient, since the impacts have been about 90% to the Watut River instead and quite significant (especially with respect to erosion of waste rock);
- a failure to operate waste management and landfill practices in accordance with the approved plan;
- the sewage treatment system was overloaded and causing a major risk of pathogen and nutrient contamination to downstream users of the Watut River;
- systematic failure to maintain a thorough environmental monitoring regime for aspects such as ecological, air quality, noise, vibration, hydrometeorology, and water and sediment quality monitoring, including rigorous data management and permit review procedures;
- a single grab sample of water from the Watut River showed slightly elevated concentrations of some heavy metals and cyanide compared to environmental baseline studies, which suggested the need for a more thorough study of possible pollutant sources and pathways.

As part of the permit and approval conditions for the Hidden Valley mine, a compliance point is located at Nauti downstream in the Upper Watut River - although there is no clear map showing this location in the SMEC reports (it is shown, however, in the two recent Annual Environment Reports). The total suspended sediment ('TSS') in water of the Watut River at the Nauti compliance point is shown in Figure 10. The commencement of road construction in mid-2006 is clearly visible as a major though short-lived spike in TSS levels to ~5,000 mg/L, including another short spike in late 2006 to ~10,000 mg/L. As full-scale mine construction began in June 2007, TSS levels gradually rose to a new peak of about 23,000 mg/L in mid-2007, but were declining to around 5,000 mg/L by mid-2009. This period is closely correlated with poor waste rock management practices at the project, which led to excessive erosion into the Watut River. The MMJV did not provide SMEC with any 2010 data to verify if the TSS trend continued to decline.

FIELD AND SITE INVESTIGATION APRIL 2012

As part of the larger MPI project, the authors travelled with a multi-disciplinary team to the Morobe Province in April 2012. This in turn built on earlier visits in 2011 and ongoing engagement with community representatives. The field component focused on the areas outside of the mine-site MOA, seeking information and views about impacts relating to riverine sedimentation and pollution.Access to the lower Watut River was obtained using a local powered canoe that enabled the team to travel from the junction with the Markham River to Pekumbe, visiting at Chiatz, Uruf and Manaring along the way.

The middle Watut was accessed from Sambio where the team visited communities at Upper and lower Sambio and Kapin as well as the Hidden Valley mine-site.

While it was difficult to isolate mining related sedimentation from naturally occurring sources, it was clear that communities had suffered and remained concerned about ongoing and future impacts. For example the Village of Chiatz had to be relocated back from the river due to flooding associated with riverbed and channel changes from sedimentation. Other villages had lost food gardens and were concerned about the impact on fish and aquatic life relied upon for food (supported in Mete, 2012).

During discussions and village meetings it quickly became apparent that the communities wanted more information about the impacts of and response to sedimentation. Of concern to the authors was the lack of awareness communities had about ongoing exploration and the potential for additional, larger scale mining along or in the Watut River region. Nowhere was this more apparent than at Pekumbe, which is situated near the Wafi-Golpu deposit. Despite the noise of helicopters and the nearby drill crews, the community was unaware that decisions were being made about the future of their land and surroundings without their involvement or consent. Given the massive local impacts (sedimentation, turbidity, noise, outsiders) expected with the development of the Wafi-Golpu deposit and the long-term impact it would have on the viability of the Pekumbe community, this represented a gross breach of trust and inadequate consultation.

Rather than trying to translate community concerns into text for this report, the documentary was expanded to capture, at least in part, the views, dreams and concerns of community members. The documentary should be read as part of this report as well as providing valuable context for those not familiar with the region. Affected communities in the documentary make a compelling case for change in the way that mining and other development is undertaken in PNG. Change that sees communities involved in decision making about development that is relevant to their needs instead of dominated by the interests of the companies, shareholders and financiers from far away.

EXTERNAL STAKEHOLDER ADVISORY PANEL (EASP)

The MMJV, through the Hidden Valley Joint Venture [HVJV] established the External Stakeholder Advisory Panel [ESAP] in June 2011 to address the environmental and related social impacts of mining activities on the community. The committee has six members and an MMJV secretary appointed by the HVJV and its key objectives include ***"… assisting the HVJV to formulate and implement appropriate environmental and social policies and strategies and recommend and review the results of relevant technical studies and investigations"*** (ESAP, 2013).

By August 2014 ESAP has publicly released one report, entitled the ESAP Annual Report on the Hidden Valley Joint Venture, July 2011-June 2012. Within the report the Committee identify the mine as a significant source for sediment as a "result of poorly constructed waste rocks dumps" with some of the sediment still in the upper and lower Watut River (2012, p.5). Furthermore, sediment loads are identified as contributing to changes in the lower Watut including: river straightening; increased bank erosion and landslips; overbank flooding and deposition; ecosystem loss; dieback; a major decline in fish populations; and adverse impacts on vegetable gardens.

ESAP state that the sediment comes from three main sources which have contributed approximately the same amount over different time frames: the mine over five years; historic and alluvial mining in the Bulolo over fifty years and; the Kamalu landslide over twelve years. ESAP believes that communities have a lack of appreciation for other sediment sources and tend to blame all the impacts on the mine. Unfortunately, although it is acknowledged there are multiple sources, natural and human induced, for sediment in the Watut River, ESAP offers no data or sources to support their attribution of sediment load so this statement cannot be verified.

Figure 11: The Hidden Valley complex, April 2012 - view from the mine camp showing the process plant in the centre, Hamata open cut on the right and mountains in the background (top); Hidden Valley mine showing acid mine drainage on mine wall (centre top); waste rock dump encapsulating sulfidic material to reduce acid mine drainage risks (centre bottom); tailings dam panorama (bottom) (photo's: Gavin Mudd, Mineral Policy Institute April 2012).

Despite claiming to be an 'independent watchdog' the ESAP Committee was unable to ascertain the causes of significant fish, prawn and eel kills at Chiatz and the Markham River bridge on the 15th and 16th February 2012. Again, without providing data or sources the Committee find that the mine was not responsible for either event. While this conclusion may be correct, the finding cannot be verified with the data available to public, undermining the independent watchdog role of the Committee.

The 2012 ESAP report makes a number of positive observations about the conduct and benefits of the mine and the establishment of the ESAP Committee. Without discussing all the matters they identify requiring attention, there are some significant observations the Committee make that are worth noting;

1. That key reports and documents should be in the public domain/on the internet - while this is best practice HVJV has yet to do so.
2. That ESAP's assessment has to be qualitative rather than quantitative given the lack of baseline environmental data.
3. A lack of socio-economic baseline data.
4. Women and youth are concerned about current decision making and lack of transparent process to freely select their own representatives without fear or intimidation.
5. Communities lack the capacity to make informed decisions on how to use revenue inflows.
6. Lack of knowledge about changes in river geomorphology and the fate of the heavy metals in mine derived sediment.

ESAP also refer to a number of reports and initiatives, the details of which are not in the public domain including: the Environmental Improvement Plan; details of the Watut River Impact Management Program, summary environmental baseline - including an assessment of historic, current and future impacts on the Watut River system; Acid Rock Drainage Plan; Aquatic Impact Studies; Sediment and Erosion Control Management Plan; Mine Closure Plan; Environmental Management Plan; and the ESAP Fish Kill Assessment. The absence of these reports severely undermines the ability for stakeholders or researchers to validate the findings in ESAP's Report, or in other environment and social publications/announcements by ESAP, MMJV, Newcrest or Harmony Gold.

The ESAP Committee makes some strong observations relating to ineffective mine monitoring by the Government, despite the presence of what they regard as an adequate regulatory framework. They identify a clear lack of capacity and resources within Government to monitor and regulate against compliance standards, with a reliance on the mines own data rather than the Government undertaking its own visits and data collection.

Notwithstanding the comments above, ESAP has made a good contribution to understanding and documenting the impacts from Hidden Valley. The establishment of the group and their ongoing role is a step forward for MMJV which has and continues to suffer from a lack of community confidence. If the MMJV/HVJV and the Government were to adopt the recommendations, actions and practices identified by ESAP, then the operations, transparency and thereby community relations and reputation would be significantly improved.

Unfortunately, the establishment of ESAP is not world's best practice as claimed by ESAP, MMJV, and Newcrest. The lack of transparency about community and environmental impacts, mostly outside of ESAP's control and the lack of community representation on ESAP, severely undermine its credibility and ability to perform a valuable role in monitoring and reporting on the mines impacts and activities. See section four for further discussion of community engagement, consent and representation.

ANNUAL ENVIRONMENT REPORTS 2011 AND 2012: A CRITICAL REVIEW

This section will focus on the main environmental aspects of the two published Annual Environment Reports for 2011 and 2012 (HVJV, 2012, 2013) which relate to surface water management and monitoring, mine waste management and acid mine drainage.

However, as noted previously, the MMJV have conducted a variety of studies along the Watut River to assess the extent of impacts from operations to date - but the vast majority of these studies remain confidential and are not publicly available. This significantly hampers public transparency as well as the ability to analyse the relevant scientific information and allow a more realistic assessment of the impacts of the Hidden Valley Silver-Gold project to date.

Surface Water Management and Monitoring:
When the Hidden Valley project was approved by the PNG Government, the village of Nauti on the Watut River was designated as the primary downstream compliance point for potential surface water impacts. This point is shown in Figure 4, previously, as the village of Nauti (the first village downstream from Hidden Valley on the Watut River) and is about 15 km downstream from the Hidden Valley project.

A compilation of annual average water chemistry data from the EIS and recent annual environment reports (2011 and 2012) is given in Tables 5 and 6, using the villages of Hikinangowe, Heyu and Nauti. Hikinangowe is ~4 km downstream of Hidden Valley while Heyu is ~9 km downstream. These tables show that there are discernible changes in water quality at the Nauti compliance point due to Hidden Valley, primarily in suspended sediment (as Total Suspended Sediment or TSS), sulfate (SO^4) and metals such as aluminium (Al), arsenic (As), cadmium (Cd), copper (Cu), lead (Pb) and manganese (Mn). The intensity of suspended sediment with respect to rainfall is shown in Figure 12, with detailed As, Cu and zinc (Zn)concentrations during 2012 shown in Figure 13.

The Nauti permit criteria for suspended sediment in water is stated as no less than a change in 25 turbidity units (or NTU), although the TSS (total suspended sediment) is presented differently in mg/L. In general, a correlation needs to be developed between TSS (in mg/L) and turbidity (in NTU) to demonstrate that the simple measurement of NTU is sufficient to monitor TSS - but the 2011 and 2012 reports fail to present this correlation, limiting the scientific confidence in the presented TSS information in the 2011 and 2012 reports. In addition, although the Hidden Valley permit states <25 NTU change in water quality, this is not referenced to any upstream site or baseline / pre-mining values, making it very difficult to assess compliance. Based on the data in Table 5, suspended sediment appears to have increased about 100-fold in the Watut River at the Nauti compliance point but is decreasing over time while sulfate concentrations have increased 3-4 times and are still increasing.

Finally, in view of the landslides in the broader region and the substantial sediment loads these can deliver to rivers, there is a clear need to distinguish riverine sediment derived from landslides versus those coming from the Hidden Valley project - meaning the correlation between NTU and TSS is crucial to inform ongoing monitoring and assessment.

Although all metals are below the Nauti permit criteria, all except for iron (Fe) show an increase since the late 1990s studies in the 2010 data but generally declining in 2011 and 2012 data. In terms of metals of concern, the most critical are Al, Cu and Zn (and to a lesser extent Mn), based on the magnitudes of the concentrations and relative to ANZECC levels. The higher levels in 2010 are presumably related to discharges of some waters from the mine, such as acidic drainage from some of the waste rock dumps (see later section), since significant discharge volumes of treated tailings water did not occur until early 2012 (see pages 47-48, MMJV, 2013).

The Cu and Zn concentrations over time during 2012 show a highly variable behaviour (ranging from ~1 to 220 μg/L), while As is relatively stable at around 4 μg/L. Based on the 2012 Annual Environment Report it is unclear if the large spikes and variability are due to mine releases or not, but the early 2012 spikes could be related to discharges of treated waters from the tailings dam. Without more detailed site operational information, it is not possible to speculate further, but the magnitudes of the Cu and Zn spikes

- reaching some 100 times ANZECC trigger levels to protect 99% of aquatic species - should be of significant concern despite strictly being below the Nauti permit levels.

Importantly, if one compares the Nauti compliance criteria to the relevant Australian standards for freshwater ecosystems (ie. ANZECC & ARMCANZ, 2000) using the high conservation value trigger levels (ie. 99% protection values), all metals are substantially in excess of these values except for Mn. Although it is unclear to what extent that the Australian ANZECC guidelines may be applicable in PNG, there is no clear scientific basis for the criteria presented by the HVJV or PNG Government. It seems reasonable to speculate that the compliance criteria are merely derived from those used for Ok Tedi - especially in the case of Cu and Zn, where the compliance levels are 1,000 and 5,000 μg/L compared to the ANZECC 99% protection values of 1.0 and 2.4 μg/L, respectively (or even the ANZECC 80% protection values of 2.5 and 31 μg/L, respectively). Close to the Hidden Valley mine at Hikinangowe, the average heavy metal levels were clearly capable of causing significant biodiversity impacts, such as Zn at 127 μg/L in 2010, with the levels generally reducing by 2012. The average levels at the Nauti compliance point still remain capable of causing biodiversity impacts in the Upper Watut River if the ANZECC values are instead used for assessment. It must also be remembered that there were substantial peaks in heavy metal concentrations which are much higher than the yearly averages - increasing risks of biodiversity impacts along the Upper Watut River if these were to re-occur.

The 2012 Annual Environment Report, perhaps surprisingly, acknowledges that: ***"An ongoing assessment of the aquatic biology of the Watut River has indicated that populations of fish and prawns in the upper Watut collapsed during 2007 to 2009. It is likely that most of this impact was associated with physical sedimentation. To date there is little evidence populations of fish and prawns are recovering despite lower sediment levels, however, populations of diatoms, which are at the base of the food chain for fish, are recovering"*** (page 56, HVJV, 2013).

An alternative approach to water quality criteria would be to ensure the Hidden Valley project does not cause unacceptable deviations away from background or baseline water quality. This could be done either using an upstream reference site (ie. in the Upper Watut River just above the impacted project area) or at the Nauti compliance point as a baseline value plus an allowable variation. In any case, there is a clear need to improve the regulation of water quality compliance for the Hidden Valley project and its actual and potential impacts on the Watut River.

At present, there appears to be no data published by the Hidden Valley project on the metals concentrations of sediments in the Watut River, and this remains a major weakness of the environmental monitoring regime. Sediment concentrations are crucial to understand the full picture of environmental risks and impacts.

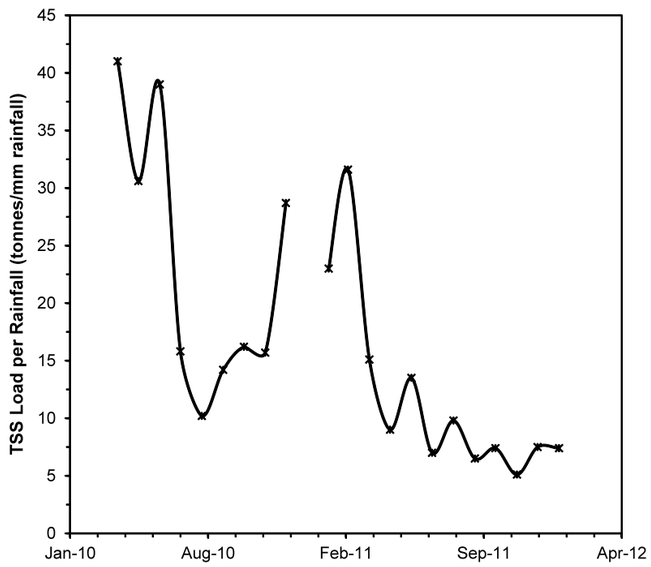

Figure 12: Suspended sediment load downstream of Hidden Valley (redrawn from Figure 17, MMJV, 2012).

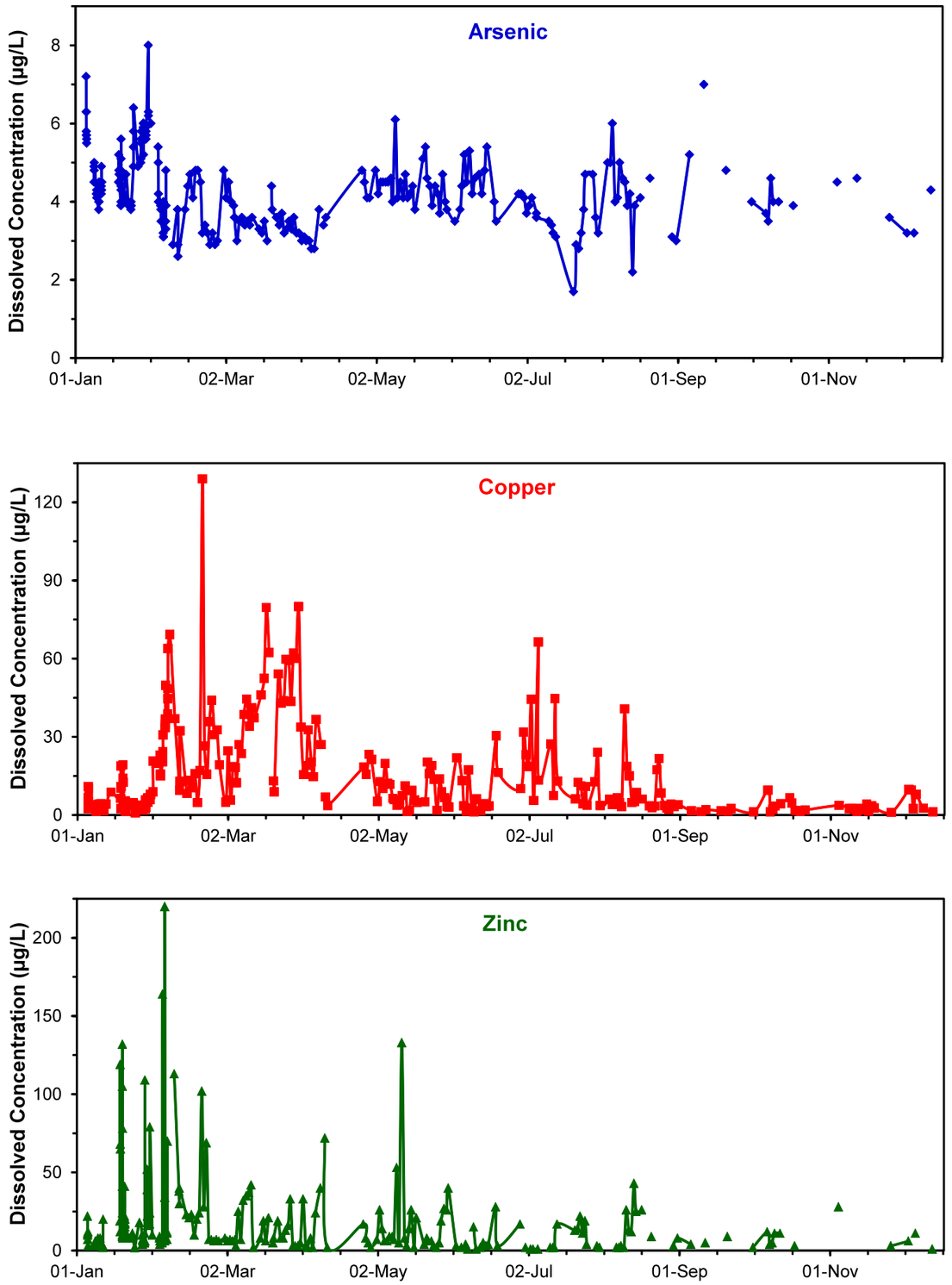

Figure 13: Concentrations of arsenic (As, top), copper (Cu, middle) and Zinc (Zn, bottom) during 2012 at Nauti (adapted from data in MMJV, 2013).

Table 5: Average water chemistry parameters at the Hikinangowe, Heyu and Nauti monitoring points in the Upper Watut River (compiled from Powell & Powell, 2000; Enesar, 2004; HVJV, 2012, 2013)

	Hikinangowe[a]				**Heyu[a]**
(mg/L)	Oct. 1996	2010	2011	2012	Oct. 1996
pH[@]	7.45	7.02	7.4	7.5	7.62
Diss. O_2	8.28	6.3	7.08	8.1	8.24
TSS	10	2,478	1,259	1,208	23.7
TDS	42.7	-	-	-	52.7
SO_4	-	54.8	72.4	84	-
NO_3	-	-	-	-	-

	Nauti Compliance Site				
(mg/L)	Oct. 1996	2010	2011	2012	*Permit*
pH[@]	7.67	7.25	7.4	7.7	no change
Diss. O_2	8.3	7.3	8.2	8.8	>6
TSS	26	2,311	1,333	1,086	<25 NTU increase[†]
TDS	49.3	-	-	-	-
SO_4	10	29.4	34.8	40.8	-
NO_3	<1	-	-	-	-

Notes: [a]The Powell & Powell (2000) study, as provided in the EIS, uses names of Ikenenuwe and Aiyu; [@]pH has no formal units; Diss. O_2 - dissolved oxygen; TSS - total suspended solids (ie. suspended sediment); TDS - total dissolved solids (ie. dissolved salts); SO_4 - sulfate; NO_3 - nitrate. [†]NTU is turbidity units, a surrogate for TSS.

Table 6: Average heavy metals in water at the Nauti compliance point and along the Watut River (compiled from Powell & Powell, 2000; Enesar, 2004; HVJV, 2012, 2013)

	Hikinangowe[a]				**Heyu[a]**	**ANZECC**	**ANZECC**
(µg/L)	Oct. 1996	2010	2011	2012	Oct. 1996	***99% prot.***	***80% prot.***
Al[#]	44	2,740	160	49.9	51	27	150
As[†]	1.1	15	5	3.1	2.1	0.8	140
Cd	<0.1	1	3	0.9	<0.1	0.06	0.8
Cr[‡]	-	<1	<1	0.2	-	-	-
Co	-	16	5	2.7	-	-	-
Cu	0.9	31	24	12.7	0.8	1.0	2.5
Fe	130	4,860	190	35.1	110	-	-
Pb	<0.2	28	6	0.3	0.3	1.0	9.4
Mn	14	1,970	1,380	869.9	10	1,200	3,600
Hg[§]	<0.2	<0.1	<0.1	<0.1	<0.2	0.06	5.4
Ni	-	7	3	1	1,000	8	17
Se[$]	-	<10	<10	<0.2	10	5[$]	34[$]
Ag	-	5	1	0.6	50	0.02	0.2
Zn	-	127	74.5	10.4	5,000	2.4	31

	Nauti Compliance Site					**ANZECC**	**ANZECC**
(µg/L)	Oct. 1996	2010	2011	2012	***Permit***	***99% prot.***	***80% prot.***
Al[#]	51	200	110	61.9	-	27[#]	150[#]
As[†]	1.4	6	6	4.3	50	0.8[†]	140[†]
Cd	<0.1	0.8	0.7	0.4	10	0.06	0.8
Cr[‡]	-	<1	-	0.6	50	-[‡]	-[‡]
Co	-	2	1	1.8	1	-	-
Cu	0.2	9	6	14.2	1,000	1.0	2.5
Fe	170	121	93	53.1	1,000	-	-
Pb	<0.2	1	1	1.1	5	1.0	9.4
Mn	12	540	440	337.8	500	1,200	3,600
Hg[§]	<0.2	<0.1	<0.1	0.5	2	0.06[§]	5.4[§]
Ni	-	1	0.8	1.2	1,000	8	17
Se[$]	2.8	<10	<10	0.2	10	5[$]	34[$]
Ag	-	1	0.5	0.2	50	0.02	0.2
Zn	-	16.4	9.6	18.1	5,000	2.4	31

Notes: [a]The Powell & Powell (2000) study, as provided in the EIS, uses names of Ikenenuwe and Aiyu; ANZECC values are for 99% protection of biodiversity (ANZECC & ARMCANZ, 2000); [#]Al for pH>6.5; [†]As is for As (V) species; [‡]Cr is for Cr (III) species; [§]Hg is for inorganic species; [$]Se is total Se.

MANAGING IMPACTS AND ACHIEVING TRANSPARENCY

The previous sections have described and demonstrated the history, potential, scale and impact of the mining industry in PNG, the Morobe Province and along the Watut River Valley. Documenting real impacts on people and place as a direct result of mining. The question then, is how to respond to these past and potential impacts and more specifically, what guides the companies involved and how did they respond? What mechanisms are in place to both guide companies and provide a point against which to assess their response?

This can be a difficult process, especially for impacted communities trying to understand and assess predicted or actual impacts on their communities. This is complicated by a range of responses from extractive companies making it difficult to distinguish between genuine efforts and greenwash. Indeed there is now a whole body of Corporate Social Responsibility literature and a host of accountability mechanisms of which to adhere to or report against. A choice that does guarantee a better result.

This section of the report presents an analysis of company actions and policies and an evaluation against industry standards including International Council on Mining and Metals (ICMM), Global Reporting Initiative (GRI), OCED Guidelines for Multinational Enterprises (OCED Guidelines) and the Equator Principles with reference to Free Prior and informed Consent (FPIC), Social License to Operate (SLO) and Citizens Advisory Councils (CAC).

COMPANY POLICIES

Assessing the policies of the MMJV operations is a difficult and complex process. As a wholly owned JV by Newcrest and Harmony Gold, there is little information available to the public. For example, while the management team is listed on the MMJV website, there is no mention of a Board. There is also a stark absence of guiding policies, forcing interested parties to turn to the joint venture owners for policy guidance.

Newcrest has a suite of policies (2013) that deal with a range of internal and external issues including governance, safety, environment and community, and a code of conduct. In general, the policies are high level and hard to assess against performance, as is the norm for much of the globalised mining industry. The following principles taken from their Communities, Environmental and Operations Policies have clearly not been consistently delivered when examined against the evidence in this report. Together they illustrate how well meaning policies can be ineffectual at best, and at worst, provide a ready company defense while obscuring the real impact on the ground.

Community: Be open and transparent in all dealings with communities and in describing and explaining potential social and environmental impacts that might occur.

Environmental: Manage the environmental risks on a site-specific basis to achieve planned environmental outcomes.

Operations: Exhibit industry leadership in the mitigation of risk and the management of both temporary and permanent change.

Perhaps this is, in part, explained by the absence of specialised skills in community and environmental impact on the Newcrest Board. Or at least a failure to monitor the implementation of organizational policies as is required by the Board Charter. Interestingly, when challenged about the Board's ability to assess and monitor such impacts at the 2013 AGM, the Chair and CEO were quite dismissive of the need for specialized community and environment skills at Board level insert (MPI, 2014).

Harmony Gold does not have a set of similar policies to Newcrest, making policy comparisons difficult and time consuming. For example, rather than having a communities policy, Harmony Gold has a terms of reference for their Social and Ethics Committee. Within that document the Committee is charged with monitoring company activities in relation to: the UN Global Compact; labour; and environment and public safety. What the document does not provide is a statement of principles or criteria to guide and assess performance against. Similarly, within the company code of ethics, Harmony stresses the importance of maintaining a social license to operate and the creation of lasting benefits for communities but again falls short of assessable criteria (Harmony, 2013).

The recently updated environment policy does provide more targeted goals, which have not been consistently delivered since the inception of the project. These include:

Environmental: …we aim to prevent pollution or otherwise minimise, mitigate and remediate harmful effects of our operations of the environment.

Environmental: We will ensure transparent engagement on environmental issues with communities affected by our operations and consider their views and concerns in our decision-making.

The above goals and criteria failed to provide any comfort when poor mine practices caused sedimentation of the Watut River. Nor did initial response, lack of cooperation and absence of publicly available data about the sedimentation of the Watut River assist communities to understand and respond to unanticipated impacts.

The confusion arising from twin, non-compatible sets of policies, diminish their practical effect in informing communities and guiding the practice of mine operators and contractors. Lack of a clear policy structure may indeed have contributed to poor practice or impact response, it also makes it difficult for stakeholders to understand company policies, standards and commitments, thereby further reducing transparency.

SUSTAINABILITY REPORTING AND ASSURANCE

Both JV partners reference the ICMM principles in their respective 2012 Sustainability Reports, making them relevant standards to assess their activities. Newcrest makes a strong commitment to ICMM via its membership of the Australian Minerals Council, and its commitment to the Enduring Values Framework since 2005, which adopts the principles, elements and implementation guidance (Newcrest, 2012, MCA, 2005).

Commendably, Newcrest includes a mention of an outstanding lawsuit in relation to the mine-related sedimentation of the Watut River in their Sustainability Report from 2011 (p.20). But unfortunately, no mention is made in 2012 despite the proceedings remaining open. Similarly, references to the SMEC Audit, which found numerous non-compliant practices, in the 2011 Report is not mentioned in the 2012 Report despite ongoing impacts and concerns. By not reporting on either of these matters in the 2012 Report, including in the GRI, Newcrest has portrayed a much more positive situation than a site inspection, data analysis and community consultation would reveal.

These examples of a lack of reporting, combined with the lack of available scientific reports, is at odds with general principles of transparency and openness as well as specifically, in ICMM principle 10. In Table 7 Newcrest respond specifically to principle 10, managing to convey an apparent openness without referring to transparency at all. The over reliance of companies on newsletter and factsheets as effective consultation and information sharing, while simultaneously denying stakeholders access to scientific reports and management plans reflects poorly on the company and the reporting mechanisms, as well as contributing to ongoing concern and conflict with community and stakeholders.

In another example of disclosure, Harmony Gold do refer to problems with the water quality of Watut River following mine construction and sedimentation of the river in their 2012 Sustainable Development Report (2012, P.111). Harmony refers to commissioned scientific reports, remedial action and independent advisory committee. Unfortunately, the report does not refer to ongoing problems from sedimentation, the scientific assessments that have not been released to the public or the lack of community representation on the MMJV appointed advisory panel. Nor does the Stakeholder Advisory Panel [ESAP] transparently 'honour a commitment made in 2010 to continually review sediment and related issues affecting the Watut River' (p.30).

Similarly, Harmony's definition of and reporting on a significant environmental incident (p. 23,124), means that they have nothing to report, despite the ongoing physical and chemical impacts from the sedimentation and pollution of the Watut River. Again, by not recognising the ongoing nature of these impacts and effect on community, including stress, the Report seems to indicate either a lack of awareness or concern or another failure in reporting standards.

An examination of Harmony's reporting on grievance mechanisms provides another example where sustainability reporting can both fail to give an accurate description of events or result in an effective mechanism. In their GRI section of the 2012 Report Harmony state they now have grievance mechanisms in place, but 'they have not been required to date' (p.143). In another section there is reference to a grievance mechanism being trialled with primary issues of concern including 'compensation, land, environment, accidents/ damage, health, safety/security business development and community projects' (P.99). Given the acknowledged mine related problems in the area it would appear that the grievance mechanism has not been effective in identifying or hearing concerns/grievances and needs improvement before it would satisfy any reasonable standard including those in the GRI and ICMM.

To state the obvious: managing environmental impacts, implementing an effective grievance mechanism and achieving genuine, ongoing transparency, are all basic elements of a responsible mining company. There seems to be little benefit to external users of the Sustainability Reports in reporting to ICMM principles or the GRI framework if these standards are easily satisfied by generic policy or general statements.

Both Newcrest's and Harmony's Sustainability Reports have been independently assured, with the companies choosing a moderate and limited assurance respectively. In Harmony's case, it would appear that either Price Waterhouse Coopers were either satisfied with the reporting or were unable to ground-truth site reports, or detect errors and inconsistencies. It is not clear from the assurance statement which sites were inspected nor the contract details between assurer and Company Board –offering little assurance to the report reader. In Newcrest's case the 2012 report used Net

Balance, a different assurer than that used in the 2011 Report, though both reported to AA1000. Net Balance specifically state that 'nothing came to our attention' that would cause them to doubt Newcrest ICMM alignment statements. That would seem to indicate that either Net Balance approves of the level disclosure by Newcrest or was not able, or not contracted to undertake a more comprehensive assurance. There is no indication that Morobe data was reviewed under the assurance assessment. Again the assurer is responsible only to the Board and management of Newcrest and guided by confidential terms of reference - offering little assurance to the report reader.

For both companies, a higher level of assurance with effective independent community engagement is required if the sustainability reports are to be relevant to company, shareholders and stakeholders alike. Until then, the Sustainability Reports provide little in terms of real detail and thus relevance to environment and community impacts for communities, investors or regulatory authorities. Alternatively, comprehensive site reporting would provide constructive feedback to the company as well as a more useful assessment of impacts and actions for communities, Local, Provincial and National Governments and other stakeholders.

Table 7: Newcrest Alignment with ICMM principles (Newcrest Sustainability Report 2012).

ICMM Principle	Current Newcrest Alignment
10. Implement effective and transparent engagement, communication and independently verified reporting arrangements with our stakeholders	A range of formal and informal processes are employed to maintain relationships, to keep stakeholders informed of relevant business activities and to stay abreast of stakeholder issues and concerns. We undertake extensive stakeholder engagement at all our sites. We communicate and report to our stakeholders in a variety of ways, for example, 'Across the Valley' newsletter at Cadia Valley Operations, local community site-based forums and site open days. We produce an independently assured Sustainability Report annually.

OECD GUIDELINES FOR MULTINATIONAL ENTERPRISES

The OCED Guidelines for Multinational Enterprises [Guidelines] provide clear standards for the appropriate behaviour of multinationals from 34 OECD[3] and 12 non-OCED countries[4] (OCED Watch, 2014). Although Papua New Guinea is not a signatory to the Guidelines, they are applicable to the MMJV operations through Australia's binding commitment to implement them, making the Guidelines applicable to Australian companies. This commitment would apply to Newcrest and also its Australian suppliers and funders including ANZ, Westpac and the NAB (Profundo, 2012).

In recognising that the primary governmental responsibility for mining in PNG clearly lies with the National, Provincial and Local level governments, Newcrest also has an obligation to meet the standards. Furthermore, although the Guidelines are perhaps more enforcable for an Australian than a South African company, both joint venture partners are responsible for the outcomes and shortcomings of the development and operation of the Hidden Valley mine.

While Australia emphasises the voluntary nature of the principles they still maintain ***"…Australian companies operating overseas are expected to act in accordance with the principles set out in the guidelines and to perform to – at a minimum-the standards they suggest"*** (AUSNCP, 2014).

They brief assessment below examines the impacts from the Hidden Valley operations against some of the individual standards in the Guidelines (2011). While not intended to be a complete assessment, a more detailed assessment would provide valuable information to improve performance and outcomes. Nor does the assessment indicate success or failure in meeting the remaining, unassessed criteria. Common themes in the assessment table are: a lack of consultation both geographically and over time; inadequate response to impact; indirect human rights impacts; lack of transparency; not learning from in-country experience; lack of FPIC; and poor initial project assessment.

The assessment indicates that the Hidden Valley project and, by extension, any future operations in Morobe, by MMJV could be significantly improved through the adherence to and reporting against the OCED Guidelines for Multinational Enterprises. MMJV have the power to implement this immediately and should commit to and fund an independent assessment against the guidelines with the aim to inform and improve practice rather than prosecute. Such an assessment would not only assist the MMJV's efforts to improve operations, but would also inform affected Communities about international standards leading to a more fair and balanced engagement.

Alternatively, if MMJV refuses to comply with and report to the Guidelines, then the Communities could seek assistance from external bodies to undertake their own assessment with the aim to negotiate improved outcomes, or, if necessary make a complaint to the Australian Contact Point. On a Provincial or even National scale, mandatory independent reporting to the Guidelines could be implemented for all large scale mines leading to improvements in practice and process for Government, companies, communities and the environment.

On a national scale this assessment does not mean that Hidden Valley is worse than its PNG contemporaries, but rather it identifies the extent to which it and other multinational projects need to improve to adhere to the intent and the specifics of the Guidelines within PNG.

Table 8: Assessment of Hidden Valley impacts against 2011 OCED Guidelines.

Reference No.	Guideline text [abbreviated]	Description of impact/ desired outcome
General Policy 1.	Contribute to sustainable development.	Given that PNG has a poor record of transforming large scale mining into sustainable development there is a need for companies to ensure development of the non-mining related economy to ensure long-term sustainability of the region post-mining.
General Policy 7.	Develop and apply self-regulation and management to build trust with society.	Inadequate/flawed assessment of mining impact both in intensity and geographical spread. Need more effective and transparent process.
General Policy 10, 11.	Due diligence, Avoid/mitigate actual and potential adverse impacts.	Newcrest bought into existing project with inadequate/flawed implementation and assessment of negative mining impact. Effective mitigation hampered by lack of publicly available information on sources and impacts of sedimentation.
General Policy 12.	Prevent and mitigate impacts where not directly responsible.	Failed to adequately identify or respond to existing and ongoing impacts when buying into the Hidden Valley mine. This also applies to suppliers and financiers.
General Policy 14.	Engage with relevant stakeholders in order to provide meaningful opportunities to contribute to decision making.	Original consultations limited in geographic extent, despite previous in-country experience of riverine impacts on downstream communities. ESAP offers partial compliance but hampered by design and lack of representation.
Disclosure 2, 3, 4.	Disclose polices and material information, environment and social reporting and performance, relationship information.	Poor disclosure. Inadequate policies by operating entity [MMJV], failure to implement existing policies of JV partners, Newcrest and Harmony Gold. Failure to adequately assess and disclose social and environmental impact.
Human Rights 1.4.	Policy commitment and respect for Human Rights.	No MMJV Policy. Do not obtain Free Prior and Informed Consent. Inadequate consultation, lack of assistance for landowners to access independent information about potential impacts and alternatives.
Human Rights 2.	Avoid causing or contributing to human rights impacts.	Indirect human rights impacts through environmental impact and economic/cultural change.
Human Rights 5.	Carry out human rights due diligence.	Poor assessment despite operating in a country known for in/direct human rights abuses in extractive industries.
Human Rights 6.	Seek remediation of impacts.	Lack of transparency regarding recognition and response to impacts. Contentious 'compensation' payments requiring forgoing of future legal options.
Environment 1a,b,c.	Establish and maintain system of environmental management.	Lack of transparency and access to EMS. Inadequate baseline data. Poor reporting. Inappropriate standards used.
Environment 2a,b.	Provide public with timely and adequate information and adequate community consultation.	Restricted consultation, slow response to crisis. Ongoing problems with information dissemination, access to independent information and consultation.
Environment 3.	Prepare an adequate environmental impact statement [EIS]	EIS failed to anticipate impacts, no public review or updated assessment. Poor transparency and consultation about un/anticipated impacts.
Environment 5.	Timely damage minimisation, maintain contingency plans.	Slow response to impacts, including amelioration strategies. Contingency plans inadequate and/or unavialable, lack of transparency about environmental management and incident response.
Environment 8.	Contribute to awareness and improved public policy.	Withholding relevant information from the public and regulatory bodies. More positively, MMJV is a member and contributing to PNG EITI and a number of local projects.
Science 2.	Transfer and diffusion of knowledge	Withheld/ failed to make available scientific reports on environmental data and impacts.

[3]Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.
[4]Argentina, Brazil, Colombia, Costa Rica, Egypt, Jordan, Latvia, Lithuania, Morocco, Peru, Romania and Tunesia.

EQUATOR PRINCIPLES

The Equator Principles [EP] were first developed in 2003 in response to increasing concerns (Collevecchio Declaration, 2003) about the impact of industrial development activities financed by commercial banks. The EP are a risk management framework for managing environment and social risk. The eighty EP financial institutions commit to ***"…implementing the EP in their internal environmental and social policies, procedures and standards for financing projects and will not provide Project Finance or Project-Related Corporate Loans to projects where the client will not, or is unable to, comply with the EP"*** (Equator Principles, 2013).

Despite being limited in application to project related funding (including loan and advisory services) and having various flaws (Wright, 2013, BankTrack, 2013) the EP's do provide a mechanism for guiding and assessing the responsibilities of financial institutions. Although the EP's were designed for private financial institutions, due to their importance in accessing multiple- sourced finance, many developers commit to meeting the EP. In this case both Harmony Gold and Newcrest have made commitments at various times to the Equator Principles as have a number of their financiers making the principles relevant to current and future activities along the Watut River.

Harmony (2013b) make a strong commitment to the Equator Principles in their annual 2013 20-F form submitted to the United States securities and Exchange Commission. With specific reference to Hidden Valley in Papua New Guinea Harmony commit to ***"A framework for a Sustainable Business Management System is being developed which will comply with relevant Australian and international standards and principles for safety, environment, quality and sustainable development (including AS/ANZ ISO 14001 : Environmental Management Systems, Equator Principles, and the Cyanide Code)."***

Newcrest makes a similar commitment to a Sustainable Business Management System (SBMS) in its April 2013 Hidden Valley FactSheet. Unfortunately, as with other documents relating to Hidden Valley, the SBMS has not been made public so it remains unclear whether it meets the standards committed to, including the equator principles. Newcrest also made a direct reference to the Equator Principles in their 2009 and 2010 Sustainability Reports recognising that financial institutions 'seek to assess our performance of a range of environmental, social and economic impacts' (Newcrest 2009, 2010). The commitments to the EP by both MMJV partners indicate recognition of their importance, even if Newcrest seems to have moved away from their previous commitments in recent years.

While Hidden Valley was developed prior to EPIII, given that it and the Wafi-Golpu project are both owned by MMJV and will occur in the same river valley and affect many of the same communities - their impacts should be assessed concurrently and cumulatively making the new Equator Principles III the relevant standard. Detailed above and summarised in Table 9, are significant issues relating to most of the EP. These include problems with unexpected impacts, a lack of due diligence, demonstrated impacts all made worse by an ongoing lack of transparency.

Similarly to the OCED Guidelines, there are also a number of Australian and other financial institutions associated with the project. Research by Profundo (2012) identified a range of EP financial institutions (summarised in Table 10) that had links with Newcrest, including HSBC, ANZ, NAB and Westpac. Unfortunately, it is difficult to determine the exact nature of the relationship, including whether it involved project related funding for Hidden Valley, because of the complex financial arrangements and lack of publicly available data. More recently Newcrest established bilateral loan facilities of US $450 million with two new banks, though again it is unclear whether these funds relate to MMJV's projects or not.

While some financial institutions may seek to avoid responsibility for current impacts, the scale and linkages between the projects makes the application of the Equator Principles to Hidden Valley and any future projects, including Wafi and/or Golpu, a pre-requisite for any project related finance. Furthermore, unless EP Institutions take corrective action immediately including an immediate independent review and the establishment and public release of an action plan to rectify problems, then this case will remain as an example of the impotency of the principles and their failure to respect and protect the rights of affected peoples.

Table 9: Hidden Valley mine - assessment against the Equator Principles

Principles	Performance	Comments
1. Review and Categorisation		Category A (highest category).
2. Environmental and Social Assessment	Inadequate	Hidden Valley mine had unexpected environment and social impacts suggesting poor risk identification and a lack of due diligence.
3. Applicable Environmental and Social Standards	Inadequate	Demonstrated impacts on environment and community.
4. Environmental and Social Management System and Equator Principles Action Plan	Inadequate	Environment, social and action plans have not been publicly released.
5. Stakeholder Engagement	Inadequate	Basic MOA with nearby landowners, delayed re-negotiations, agreement out of date. No/limited prior engagement with riverine communities subsequently affected by mine derived sediments. Failure to secure free prior and informed consent or formalise social licence to operate.
6. Grievance Mechanism	Inadequate, with some recent progress.	Mechanism designed, yet to be fully implemented, not used. Failure to capture ongoing community concerns.
7. Independent Review		Should be applied to existing and future operations.
8. Covenants		Should be applied to existing and future operations.
9. Independent Monitoring and Reporting	Inadequate	Neither this report or the SMEC assessment was able to obtain all the relevant information to assess impacts.
10. Reporting and Transparency	Inadequate, with some recent progress.	Lack of access to data, management plans. Some reporting through ESAP and Annual Environment Reports

Table 10: Equator Principle Financial Institutions - relationship to Newcrest.

Financial Institutions	Relationship	Country
ANZ	Bank Loans (since 2010)	Australia
Bank of America	Important bondholder (at least 1.50%)	United States
Barclays	Bond underwriter	United States
Credit Suisse	Bond underwriter, Bank Loans (since 2010)	Switzerland
HSBC	Bond underwriter, Bank Loans (since 2010)	United Kingdom
JP Morgan Chase	Shareholder (at least 0.20%)	United States
National Australia Bank [NAB]	Bank Loans (since 2010)	Australia
Westpac Banking	Bank Loans (since 2010)	Australia

COMMUNITY ENGAGEMENT, CONSENT AND REPRESENTATION

Rights based reform is slowly gathering momentum in the international mining industry. Corporate Social Responsibility approaches are increasingly challenged as to their effectiveness and their very design. With inherent inequalities between community and company and the colonial approaches to community rights to self determination no longer accepted around the world. This is reflected strongly in Morobe Province when talking to communities and captured in the Watut River documentary.

Despite making some advances in approach and practice [discussed earlier], the Hidden Valley site and its operators, MMJV still reflect the mining industry of yesterday, rather than tomorrow. The task for MMJV has been made harder and more complicated by having to respond at a time of increasing national opposition to the impacts and inequalities of mining in PNG. Opposition that has developed at mine-sites far worse than Hidden Valley. Indeed, the collective reputation of PNG mining industry has been almost irreversibly damaged by: the human tragedy that arose from Panguna on Bougainville; the environmental devastation from the OK Tedi mine; the ongoing human rights violations at Porgera; the pollution from Tolukuma; and marine mine waste dumping at Mismia, Ramu, Simberi and Lihir. The impact of this collective loss of industry reputation on its social license to operate is illustrated in Figure 14.

Alongside these major environmental and human tragedies, is an increasing awareness that PNG has yet to fully capture the benefits of the mining industry. There is also a growing sense that transplanted western development is not the only option for sustainable livelihoods and economic growth in PNG. Unfortunately, the PNG mining industry, lead by the Chamber of Mines and Petroleum, seems more interested in perpetuating past and poor practices than championing mining reform. As indicated by the utility of sustainability reporting above; the industry seems willing to discuss and report to new standards as long as it does not require real change that would alter the balance of power, change practices, or result in a more equitable distribution of benefits between company, shareholders, government and communities.

In response, communities and civil society are increasingly advocating for a right to self-determination. A structured approach often uses the concepts of free prior and informed consent [FPIC], social license to operate [SLO] and effective community representation to discuss these community rights and aspirations. Those without access to these concepts express themselves differently, but the message is relatively consistent, it is about community representation, consent and appropriate development. It is no longer acceptable or financially prudent for external actors to make large-scale and long lasting development decisions without respecting or securing community involvement and consent first.

The concepts of SLO and FPIC as means of securing effective community engagement, consent and representation have received significant attention in recent years (see Roche and Bice, 2013). Despite the terms being partially captured by 'mining report speak' they remain effective concepts that can assist in the transformation of the mining industry in PNG. While it may be difficult to determine the roles of relevant stakeholders in implementing consent, this should not stop the application of the concepts as a method of significantly improving community engagement. This is very relevant to the Watut River and supported by ESAP's recognition of the need for improved transparency and involvement in decision making, especially in relation to women and youth.

Similarly, the use of Citizens Advisory Councils [CAC] is increasingly seen as a mechanism to ensure the effective representation of the community. This is particularly important in securing positive outcomes for women and family from any mining or development. According to Steiner ***"…large-scale resource development projects generally receive insufficient oversight by, and engagement with, civil society. And in the absence of effective supervision and public engagement, corporate and government vigilance can weaken, complacency increases, environmental and social standards decline, and risks increase. Such insufficient oversight, lower standards, and complacency can result in acute and catastrophic damage, such as oil spills, chemical explosions, mine disasters, overharvest and stock collapse; long-term, chronic environmental degradation; and social tension, mistrust, litigation, and even violence between local people and industry"*** (Steiner, 2013).

Given the many examples of mining impacts in this paper that illustrate Steiner's quote above, it is vital that local communities and civil society are directly involved in the oversight of extractive industries. Properly funded and structured, CAC's can become the 'eyes, ears and voice' for local communities and ensure effective community participation in decision making. It is important to note that CAC's are to complement rather than replace the vital role that Government performs in regulating the mining industry.

The difference between a CAC and an expert committee, such as the External Stakeholder Advisory Committee [ESAP] appointed by the HVJV/MMJV, is its structure and independence. It is critical for CAC's to have a high level of independence, with the necessary resources, human and financial, to perform its functions properly. While structures may vary, the Council needs to include significant representation from the community as well as the ability to appoint experts as and when required.

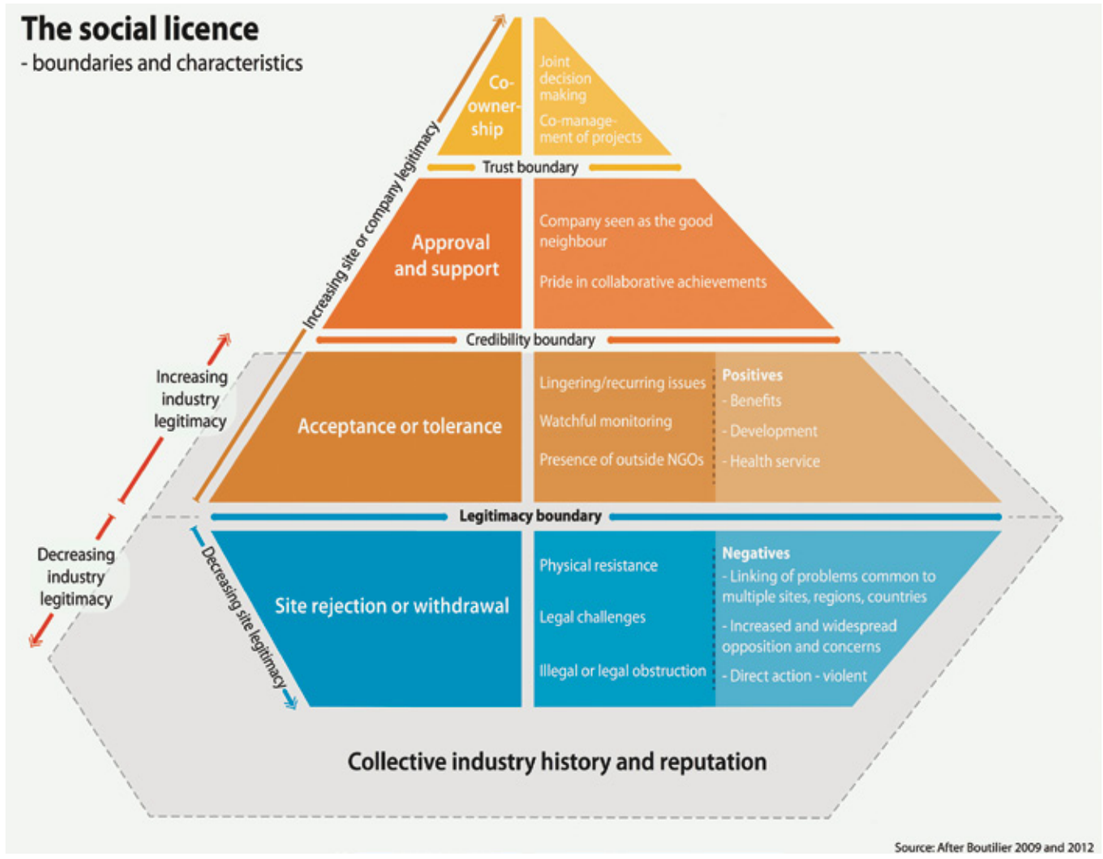

Figure 14: Social License to Operate at site and industry scales (Roche and Bice, 2013).

MINING: THE FUTURE FOR MOROBE?

EXPLORATION ACTIVITY IN MORBE - WAFI-GOLPU AND BEYOND

While the Hidden Valley mine has impacted on the environment and communities there is also a genuine concern, if not fear, about further impacts from the mining. During the field visit for this report, the authors discovered that few people along the river had heard, let alone been consulted about the potential for further mining development in the region or Province. This is despite the raw prospectivity of the Province and the potential for mining to impact not just on communities where the mining occurs but on the Province as a whole as shown in Fig 16 and Table 11.

According to MMJV's own presentation at the PNG Chamber of Mines and Petroleum Conference of 2013, the Morobe Province is highly prospective with a concentration of activity within 30km of Wafi and further exploration licenses along the Watut and Markam River regions. As well as the extent of potential mining activity there is also the issue of scale with Newcrest listing Wafi-Golpu as one of their 'big three' along with Lihir in PNG and Cadia Valley in Australia, at their AGM in September 2013.

To date, while there are extensive seabed exploration licenses in nearby West and East New Britain, New Ireland, Manus, Medang and Milne Bar Provinces, only one has been registered in the Morobe Province. There are, however, a number of predominantly terrestrial licenses that extend into the sea along the coast. While the seabed mining industry has yet to develop, an extension of exploration interest into Morobe waters could place additional development pressure on the Province.

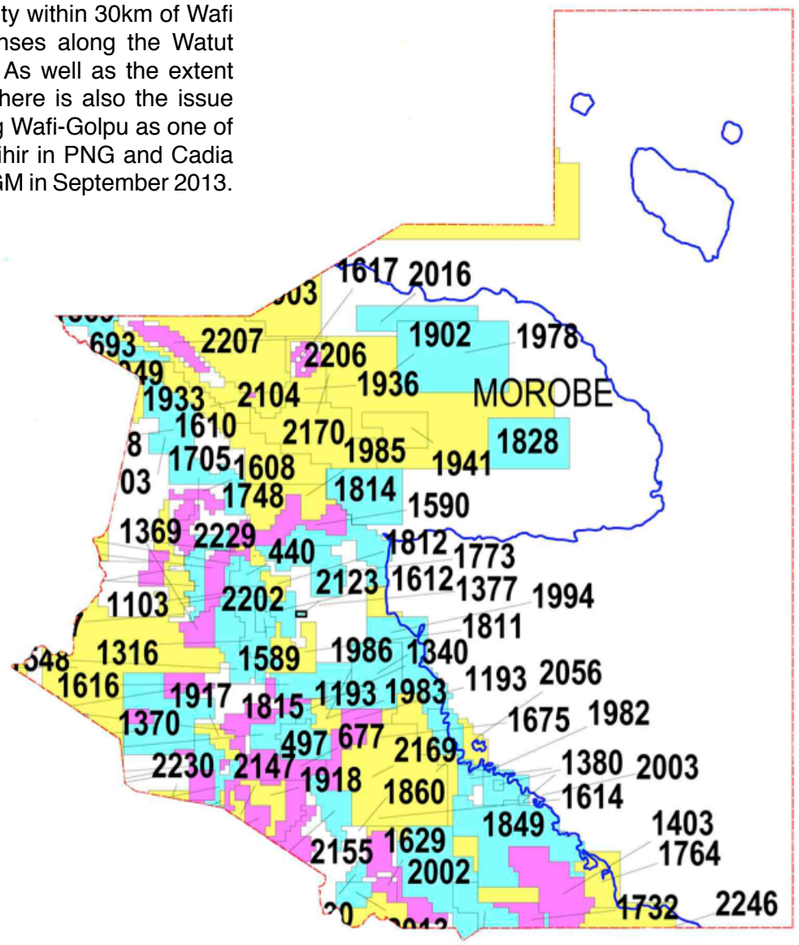

Figure 16: Morobe province Exploration License Map November 2012.

Table 11: ELA's in Morobe Province

Lease ID	LOCATION	SIZE (KM2)
EL 1193	Mt Missim	255.75
EL 1370	Heiweni	552.42
EL 1666	Hamuni Village	126.17
EL 1667	Yenawe Village	126.17
EL 1668	Indiwi River	64.79
EL 1710	Mt Walker	252.78
EL 1435	Morobe	893.20
EL 1548	Gumots. Wau,	255.75
EL 1568	Lake Trist,	917.29
EL 1585	Bapi, Bulolo,	238.70
EL 1630	Garaina,	40.92
EL 1674	Snake River,	323.95
EL 1675	Lake Trist,	317.13
EL 0497	Kaindi, Wau	228.47
EL 1103	Zilani	54.56
EL 1271	Waria	480.81
EL 1316	Mumeng	392.15
EL 1340	Wandumi	37.51
EL 1365	Wau	143.22
EL 1371	Tekadu, Wau	2472.30
EL 1377	Manga	426.25
EL 1380	Simpoma	102.30
EL 1403	Siu, Zinaba,	2039.18
EL 1409	Mt Chapman, Biaru, Garaina	337.59
EL 1589	Zilani,	64.79
EL 1590	Wampit,	569.47
EL 1608	Watut,	569.47
EL 1609	Mt Ruwain	98.89
EL 1612	Zenag,	184.14
EL 1614	Garaina,	596.75
EL 1615	Gusap,	2165.35
EL 1616	Bulolo,	272.80
EL 1617	Adzera,	852.50
EL 1629	Garaina,	57.97
EL 1631	Biaru,	283.03
EL 1379	Mt Victoria	2209.68
EL 1305	Morobe	252.34
EL 0440	Mt Wanion, Mumeng	92.07
EL 0677	Waria River	242.11
EL 1105	Wautut Mountain	34.10
ELA 1704	Tsile tsile,	146.60
ELA 1705	Tsile tsile,	30.69
ELA 1706	Tsile tsile,	10.23
ELA 1707	Tsile tsile,	23.87
ELA 1732	Tubi Village	170.80
ELA 1303	Morobe	281.00
ELA 1602	Lake Trist	917.29

IMPACTS AND ACTION

There can be no doubt that the Hidden Valley Gold-Silver mine has caused environmental impacts in excess of permit and approval conditions, mainly due to poor environmental management practices during construction that resulted in significant and ongoing sedimentation of the Watut River. These impacts from Hidden Valley have added to the historical and ongoing environmental impacts from both the Wau/Bulolo Goldfields and more recent workings in the Watut River area. While not at the same scale of impacts from mine-sites elsewhere in PNG, mining related problems in Morobe need to be examined and discussed as part of the national mining industry. An industry that has yet to effectively respond to current impacts, mining legacies and changing community expectations.

The scale of problems from the Hidden Valley mine-site have been exacerbated by the lack of transparency about the impacts and the response from operators and regulators. A lack of detail that leaves communities and stakeholders unsure of the source of and management response to sedimentation and other mining impacts. To date, although the MMJV have conducted a range of studies on the Watut River, many of their reports and plans are still not publicly available - nor were they all made available to the PNG Government for the SMEC Report. Such secrecy and lack of transparency significantly hampers accurate scientific interpretation and only worsens the community perception of the impacts from the project to date.

What is clear is that by commissioning an independent review, DEC were able to quantify the level and number of breaches at Hidden Valley, thereby increasing awareness and public scrutiny. Ongoing assessment of impacts and management response by DEC or other agencies would add significantly to our understanding of the project and increase community confidence in both the operation and regulation of the Hidden Valley mine-site and potentially, the development of Wafi-Golpu. Furthermore, future activities in the Watut River area should be guided by a commitment to maintaining a social license to operate based upon a free prior and informed consent process. The involvement of the community through community advisory councils or similar structure would capture community concerns, guide operations and inform regulatory agencies.

The future of mining in Morobe is uncertain. In some ways MMJV's operations are an improvement on existing industry practice, as evidenced by the use of a tailings dam rather than riverine disposal. On the other hand, MMJV is operating under increased scrutiny and community expectation and needs to implement substantial improvements to existing industry practices if it is to obtain a social license to operate. Regulators also have a vital role in managing the current and potential mining industry in Morobe if it is to contribute to genuine, sustainable development rather than overwhelm communities, agencies, infrastructure and the environment.

While longer-term initiatives that support consultation and consent processes are being developed and implemented, more immediate action could be taken to improve the situation on the ground. Communities should consider the findings of this report and whether a complaint should be lodged to either the PNG or Morobe Governments, or under the OCED Guidelines or made to the signatories to the Equator Principles. Local, Provincial and National Governments could heed the advice of ESAP, which identified the need for further capacity, independent monitoring and increased data collection and site visits by government bodies

MMJV and its owners, Newcrest and Harmony Gold should: immediately address the lack of transparency by releasing all relevant data; accurately report on issues relating to their mining operations; identify a board or decision makers for MMJV; adopt and adhere to suitable guiding policies; implement an effective grievance mechanism; respond to failings regarding OCED Guidelines and Equator Principles; and MMJV owners should appoint independent directors at board level with community and environmental expertise to assist in addressing current inadequacies and lead proactive reform.

Finally, it is hoped that by drawing the facts together in a paired documentary and report, that the existing and potential impacts from mining will be recognised and the communities call for a new development paradigm will be respected and supported.

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