Anvil Range Mining Complex
Aerial Photographs and Site Mapping
for Final Closure and Reclamation

Report Prepared for

Deloitte & Touche

Report Prepared by

December 2003

Draft report: Anvil Range Mining Complex Aerial Photographs and Site Mapping for Final Closure and Reclamation

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SRK Project Number 1CD003.28

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December 2003

Compiled by:

_____
Cam Scott, P.Eng.

Executive Summary

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1 Introduction

The Anvil Range Mining Complex, which comprises the Faro and Vangorda Plateau mines, is located in the central Yukon. The owner, Anvil Range Mining Corporation, is currently in receivership and Deloitte & Touche Inc. (Deloitte), in its capacity as "Interim Receiver," is overseeing the management of the site.

As part of its mandate, the Interim Receiver has initiated the process of developing a Final Closure and Reclamation Plan. This process is presently ongoing and, in 2002 and 2003, has included a series of technical studies and workshops involving Deloitte, government regulators, consultants and numerous stakeholders. During the course of this process, it has become apparent that the existing base of site maps is inadequate for the development of a Final Closure and Reclamation Plan. Therefore, Deloitte authorized SRK Consulting (SRK) to acquire new aerial photographs and site maps of the Anvil Range Mining Complex in conjunction with scoping studies that SRK and others were undertaking in 2002. However, the weather "windows" at the site in 2002 were too short to schedule the necessary flights prior to the fall deadline. As a result, the topic was revived at a technical workshop in June 2003 in Whitehorse and it was agreed that the necessary flights should be attempted again during the 2003 summer season.

The flights were successfully completed in the summer of 2003. This report provides a summary of the previous and recently acquired mapping at the site.

2 Mapping Prior to 2003

The mapping for the Faro Mine, Vangorda/Grum and Rose Creek areas was compiled for scoping studies undertaken in 2002 (SRK). Aerial photographs of all or part of the site were taken at various times between 1949 and 1993. The maps of individual areas were developed using a variety of different methods over an extended time period, i.e. since the 1960's. The map database compiled in 2002 covers discrete areas at a variety of scales, units and contour intervals. The use of digital technology has added complexity to the map database because base maps have occasionally been modified to suit project-specific objectives. The actual source of the data in some of these cases is not noted.

At the regional level, a National Topographic System (NTS) map, produced at a scale of 1:250,000, provides the project location and select features, such as the main water courses and lakes. The next level is the 1:50,000 NTS maps, of which there are four, that provide topographic information at a contour interval of 30.5 m (100 feet) over the site and the confluence of its drainages with the Pelly River. Figure 2.1 shows the location of the four NTS maps superimposed on part of the 1:250,000 map sheet. The aerial photographs on which the 1:50,000 maps were based were taken in 1967/68, which pre-dates mining at the site. These contours were converted from paper format, based on UTM NAD 27, to digital format, based on UTM NAD 83, between 1998 and 2000, inclusive.

The local mapping is summarised on Figure 2.2, which has been prepared using two 1:50,000 NTS maps (105 K/3 and 105 K/6) that, for consistency with local site mapping, have been converted to UTM NAD 27. The local map areas are summarized in Table 2.1, which includes the base scale (estimated in some cases), the contour interval, the date of the mapping and relevant comments. The latest activities at the Vangorda and Grum areas post-date the most recent mapping in this area.

Table 2.1: Local Mapping Summary Compiled in 2002

Area	Site	Scale	Contour Interval		Date	Comments
			(ft)	(m)		
A	Faro Mine	1:10,000	10	3.05	09/1990	UTM NAD27, by Orthoshop
B	Faro Mine	1:20,000	25	7.62	1967 (?)	UTM NAD27
C	Rose Creek	1:2,000	3.28	1	12/1999	Tailmast.DWG
D	Fresh Water Supply Reservoir	1:5,000	1.64	0.5	07/2001	UTM NAD83 Zone 8, by YES
E	Vangorda/Grum	1:2,000[1]	6.56	2	1988 (?)	UTM NAD27, by Orthoshop? missing portions of pits & dumps
F	Vangorda/Grum	1:5,000	16.4	5	1988 (?)	UTM NAD27, Curragh Resources
G	Little Creek Dam	1:2,000	3.28	1	1990 (?)	Mine Grid Survey, Lemerton Assoc.
H	Vangorda and Grum Pits, Grum Waste Dump	1:2,000*	3.28[2]	1[2]	03/1996	- CAD files from Robertson GeoConsultants - Edge of slopes from GPS
I	Vangorda Waste Dump	1:2,000	3.28	1	1994	UTM NAD 27, surveyed & tinned

Note 1: Assumed base scale.
Note 2: Toes and crests are surveyed; slope is assumed to be uniform between crest and toe.

Due to inconsistencies with the coordinate systems, scales and contour intervals of the existing mapping and that some changes at the site post-date the most recent mapping, Deloitte authorized SRK Consulting (SRK) to acquire new aerial photographs and site maps of the Anvil Range Mining Complex in 2002.

Three different options were considered: conventional aerial photographs, satellite imagery and LIDAR (scanning laser with digital imaging and inertial GPS). The option of obtaining ortho-rectified images of the site was explored with each option. Table 2.2 summarizes the cost of each of these options based on quotations obtained in 2002. Further details are provided below.

Table 2.2: Options Considered for the Development of Comprehensive Mapping

Option	Contour Interval	Lowest Quotation	Provider	Comments
Air photos	2 m	$25,100	Orthoshop	Includes 1m pixel orthophoto
Satellite	4 m	$39,400	IKONOS	Includes ortho-rectified imagery
Satellite	N/A[1]	$5,000	IKONOS	Cost of images only; no mapping
LIDAR[2]	1 to 2 m	$74,400	LIDAR	0.5m pixel imagery

Note 1: N/A = not applicable.
Note 2: There was a possible $2,000 reduction in cost at the 2m contour interval.

Conventional mapping using aerial photography was the least expensive option. The quotation by The Orthoshop in Calgary was significantly less than three other contractors, partly because of the existing ground control that The Orthoshop has on site.

Satellite imagery by IKONOS was about 60% more expensive than the aerial photography option. In addition, the images have lower resolution and the weather constraints are more stringent than for air photos, i.e. conditions must be absolutely clear from space at 11 am daily. The concept of using existing satellite images was explored, but IKONOS had no suitable images in their archives (despite nine attempts in the previous two years).

LIDAR was the most expensive option but has higher accuracy and image resolution than air photos and satellite imagery. This technology is understood to be less weather dependent than the other options.

The Orthoshop was authorized in August 2002 to obtain aerial photographs and develop comprehensive topographic maps of the site. However, due to unsettled weather conditions, an extended period of weather suitable for aerial photography did not occur in 2002 prior to the "logistical deadline" of September 22. Beyond this date, the angle of the sun significantly reduces the quality of the photographs and the resultant topographic mapping. The decision was made to revive the concept of obtaining new photographs and topographic maps in 2003.

3 2003 Aerial Photography and Site Mapping

3.1 General

A technical workshop involving the Deloitte, government regulators, consultants and numerous stakeholders was held in June 2003 in Whitehorse. The workshop addressed, amongst other things, the need for new aerial photographs of the site and the development of comprehensive topographic maps. Attendees agreed that the acquisition of photographs and new maps should be a high priority

in 2003. Deloitte subsequently authorized SRK to complete this task during the 2003 summer season. Contractors were again contacted and a new budget was prepared and approved.

Geographic Air Survey (GAS) in Edmonton was contracted to undertake the aerial photography. The Orthoshop was contracted to undertake the topographic mapping and produce a photo mosaic.

3.2 Flights and Photographs

The photographic flights at the Anvil Range Mining Complex were completed in two stages: the first stage was in late July and the second was in mid-August. In both cases, the photography was coupled with other GAS contract work in the Yukon. This kept the cost estimate in line with the 2002 estimate and provided significant cost savings compared to the case where the GAS plan would mobilize to Faro exclusively for this contract.

The photography on July 25th comprised black and white photographs at a scale of 1:10,000 and 1:20,000. The product of this effort was 116 contacts at 1:10,000 and 56 contacts at 1:20,000. The quality of these photos is generally quite good, although sporadic low level cloud is visible on some photos. However, there is sufficient overlap with other photos to overcome this minor problem.

On August 9th, 11 colour photographs at a scale of 1:40,000 were taken. The conditions while these photos were taken were very good.

Figure 3.1 shows the flight lines associated with the each of the three photographic levels.

3.3 Topographic Mapping

The 1:20,000 photographs were used by The Orthoshop to develop site-wide topographic maps at a contour interval of 2 m. As shown in Figure 3.2, the area covered by this mapping includes both the Faro and Vangorda Plateau mine areas, as well as the transportation corridor between the two sites.

As with all topographic mapping, the elevation data tends to be more accurate in areas where the ground surface is exposed and has no or few trees. The contour mapping on the waste dumps, tailings or other mine features are, therefore, accurate to within the accuracy of the 2 m contour interval. On areas where the ground surface is forested, the accuracy is affected by the heights of the local trees. Users of these maps should therefore be cautious about the elevations indicated in forested areas.

The 1:10,000 photos are available and can be used in future to develop more accurate contour maps. In particular, the 1:10,000 photos could be used to develop 1 m contours over all or part of the site.

3.4 Ortho-rectified Photo Mosaics

The Orthoshop has used the 2 m contour mapping and the 1:40,000 colour photographs to develop a high quality, ortho-rectified photo mosaic of the Anvil Range Mining Complex. A version of this photo mosaic is provided in Figure 3.3.

The digital version of this photo mosaic can be used to produce, for example:

- aerial views of small or large parts of the site; or
- aerial views with topographic information superimposed on the photo.

Examples of the latter option are provided in Figures 3.4 and 3.5 which show the Faro and Vangorda Plateau mine areas, respectively. The contour lines are indicated in green on each of these photos. Using computer software such as AutoCAD, the contour spacing and line colour can be changed as appropriate.

4 Photographic and Mapping Deliverables

4.1 Aerial Photographs

All negatives for the 2003 aerial photographs are being held by The Orthoshop in Calgary. One set of black and white photos currently resides with SRK. Additional copies can be purchased on the basis of the quotation provided in Appendix A. Alternatively, high copy images of the black and white photos can be saved on a series of compact disks, although the number of contact disks is significant (29 for 1:10,000 scale images and 8 for 1:20,000 scale images). A quotation for this option is also provided in Appendix A.

Table 4.1 summarizes the cost of the two alternatives listed above, assuming all the black and white photos obtained in 2003 are included. Appendix A provides the basis for determining the cost of select photos, based on their quotation #12987, dated September 2, 2003.

Table 4.1: Costs for Copies of Black and White Prints and CDs with Digital Images

Scale	No. of Images	Cost (pre-GST)	Comments
Hard Copy Prints			
1:10,000	116	$1,006.25	
1:20,000	56	$481.25	
Both	172	**$1,487.50**	**Total Cost**
Digital Images on CDs or DVDs			
1:10,000	116	$2,656.00	29 CDs (130 Mb/photo)
1:20,000	56	$1,175.00	8 CDs (84Mb/photo)
Both	172	**$3,831.00**	**Total Cost (**37 CDs)

4.2 Topographic Maps and Photo Mosaics

A CD containing the main suite of digital information provided by The Orthoshop in September 2003 is attached to the inside cover of this report. The principal contents of this CD are summarized in Table 4.2. The files on this CD are very large and may be difficult for some users to handle. We have consequently included information from The Orthoshop on free software that is capable of compressing the tif files by a factor of approximately 20 (Appendix B).

Table 4.2: Digital Data Provided by The Orthoshop

File name	File Size*	Type and Contents
8856_north.dwg	23.3 Mb	AutoCad drawing, version 15, topography for Faro mine and north (west) half of the haul road
8856_south.dwg	17.6 Mb	AutoCad drawing, version 15, topography for Vangorda Plateau mines and south (east) half of the haul road
FARO_WEST.TIF	339.6 Mb	Photomosaic image for Faro mine and north (west) half of the haul road
FARO_EAST.TIF	237.2 Mb	Photomosaic image for Vangorda Plateau mines and south (east) half of the haul road

* Mb = megabytes

In addition, jpg's of the areas shown in Figures 3.4 and 3.5 (with and without contours) have been uploaded to the Deloitte eRoom in the following location: (https://er0.deloitteonline.com/eRoom/anvilrange/EHS/0_514e).

Lastly, files containing the topographic data and various versions of the photo mosaics have been posted to the SRK ftp site (ftp://faro@ftp.srk.com/Clients/Faro/), including the six colour photos that show the mining complex (folder labelled *Aerial Photos*), select black and white photos (folder labelled *Scanned Aerial Photos*) and the complete suite of 2 m topography provided by The Orthoshop (folder labelled *Topo Maps*).

Password clearance is required to access both the Deloitte eRoom and the SRK ftp site.

4.3 Drawings and Prints

Aside from the figures provided in this report, no drawings or prints have been issued with this report. Users will undoubtedly want to customize the digital database to meet their specific needs.

5 Other Photos

In July 2003, the DIAND Type II Mines Office indicated that they have 2,884 70mm photo-positive transparencies of the Anvil Range properties and surrounding area. The photos are approximately 1:10,000 scale and were acquired from August 1 to 7, 2000 by Tutchone Air Inc. of Whitehorse using a Hasselblad camera. Each positive covers an area about 500 m square. The colour prints from these photo-positives are high quality and may be useful to some groups for select purposes. However, these images cannot be used for topographic mapping because they do not come with the necessary control information.

A plan showing some of the flight lines used to obtain these images and a sample print showing the Seepage Control Dam adjacent to the Vangorda waste dump are provided in Appendix C.

SRK obtained a preliminary estimate of the cost of obtaining digital images (1,200 dpi would be about 23 Mb per photo) of these photo-positives. The cost was very high (about $14,500 to $17,500). In addition, approximately 100 CDs would be required to store all 2,884 images. For these reasons, no further actions were taken in relation to these images.

6 Conclusions

Prior to 2003, the most recent aerial photos of the Anvil Range Mining Complex were taken in 1993. There was no large scale topographic mapping that covered all or most of the site, although area-specific ground and aerial surveys were completed at various times during the 1990's. None of the available photos or mapping included the results of mining activities at the Vangorda Plateau area in the late 1990's. This base of photos and maps is inadequate for the development of a Final Closure and Reclamation Plan.

Based on these factors, Deloitte requested that SRK acquire new aerial photographs and comprehensive maps of the Anvil Range Mining Complex. Black and white images at 1:10,000 and 1:20,000 and colour images at 1:40,000 were obtained in late July and early August 2003, respectively. Topographic maps with a 2 m contour interval and an ortho-rectified photo mosaic were completed in September 2003. Although this data has already been made available to Deloitte, government regulators and consultants, this data is provided in digital format on a CD attached to this report. In addition, the Deloitte eRoom has select aerial images and the SRK ftp site has the complete topographic data and select scanned airphotos.

Aside from the figures provided in this report, no drawings or prints have been issued. It is anticipated that users will want to customize the digital database to meet their specific needs.

7 References

SRK Consulting, 2003. Scoping Studies for the Final Closure and Reclamation Plan, Faro Mine, Yukon, prepared for Deloitte & Touche Inc., April.

SRK Report Distribution Record

Complete this form and include it as the final page for each copy of the report produced.

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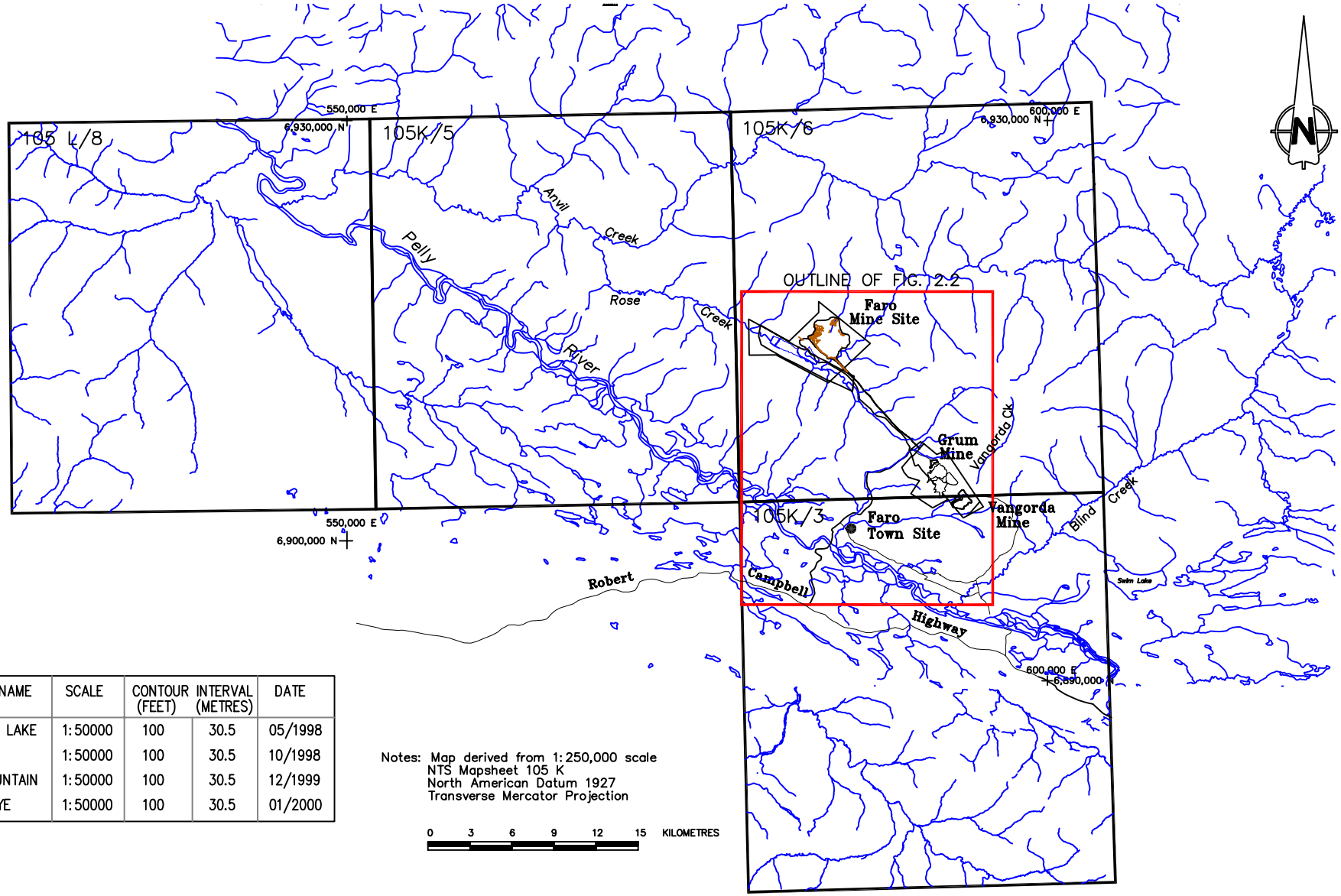
FIGURES



NTS MAP SHEET	SHEET NAME	SCALE	CONTOUR INTERVAL (FEET)	(METRES)	DATE
105 L/8	GLENLYON LAKE	1:50000	100	30.5	05/1998
105 K/3	FARO	1:50000	100	30.5	10/1998
105 K/5	ROSE MOUNTAIN	1:50000	100	30.5	12/1999
105 K/6	MOUNT MYE	1:50000	100	30.5	01/2000

Notes: Map derived from 1:250,000 scale
NTS Mapsheet 105 K
North American Datum 1927
Transverse Mercator Projection

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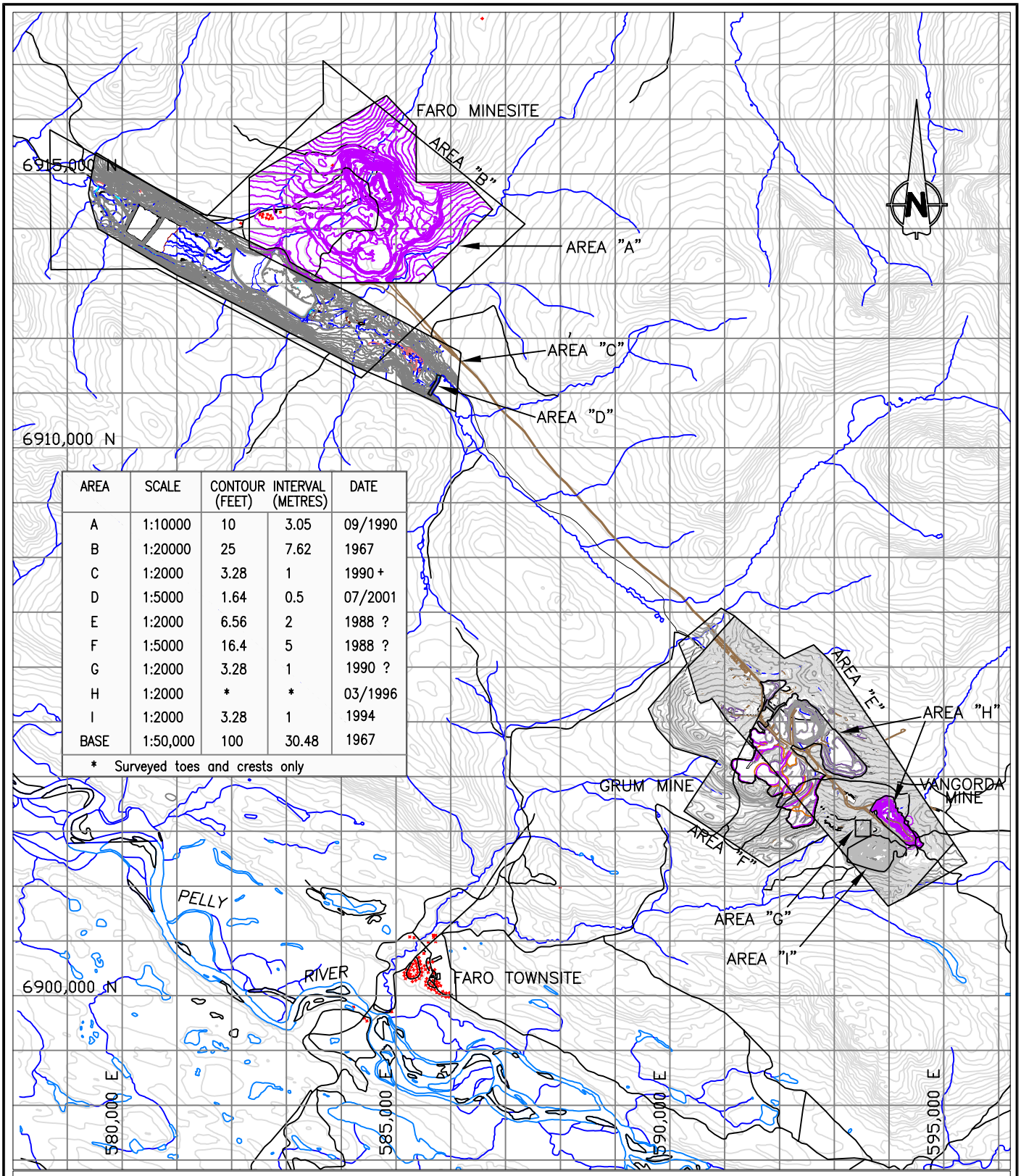
DELOITTE & TOUCHE INC.

FARO–VANGORDA PLATEAU MINE SITES

REGIONAL MAPPING

PROJECT NO.	DATE	APPROVED	FIGURE
1CD003.28	Dec. 2003		2.1

Dwg Ref: Location map.dwg



AREA	SCALE	CONTOUR INTERVAL (FEET)	(METRES)	DATE
A	1:10000	10	3.05	09/1990
B	1:20000	25	7.62	1967
C	1:2000	3.28	1	1990 +
D	1:5000	1.64	0.5	07/2001
E	1:2000	6.56	2	1988 ?
F	1:5000	16.4	5	1988 ?
G	1:2000	3.28	1	1990 ?
H	1:2000	*	*	03/1996
I	1:2000	3.28	1	1994
BASE	1:50,000	100	30.48	1967

* Surveyed toes and crests only

Notes: Map derived from 1:50,000 scale
NTS Mapsheet 105 K/3 and 105 K/6
North American Datum 1927
Transverse Mercator Projection

0 1 2 3 4 5 kilometres

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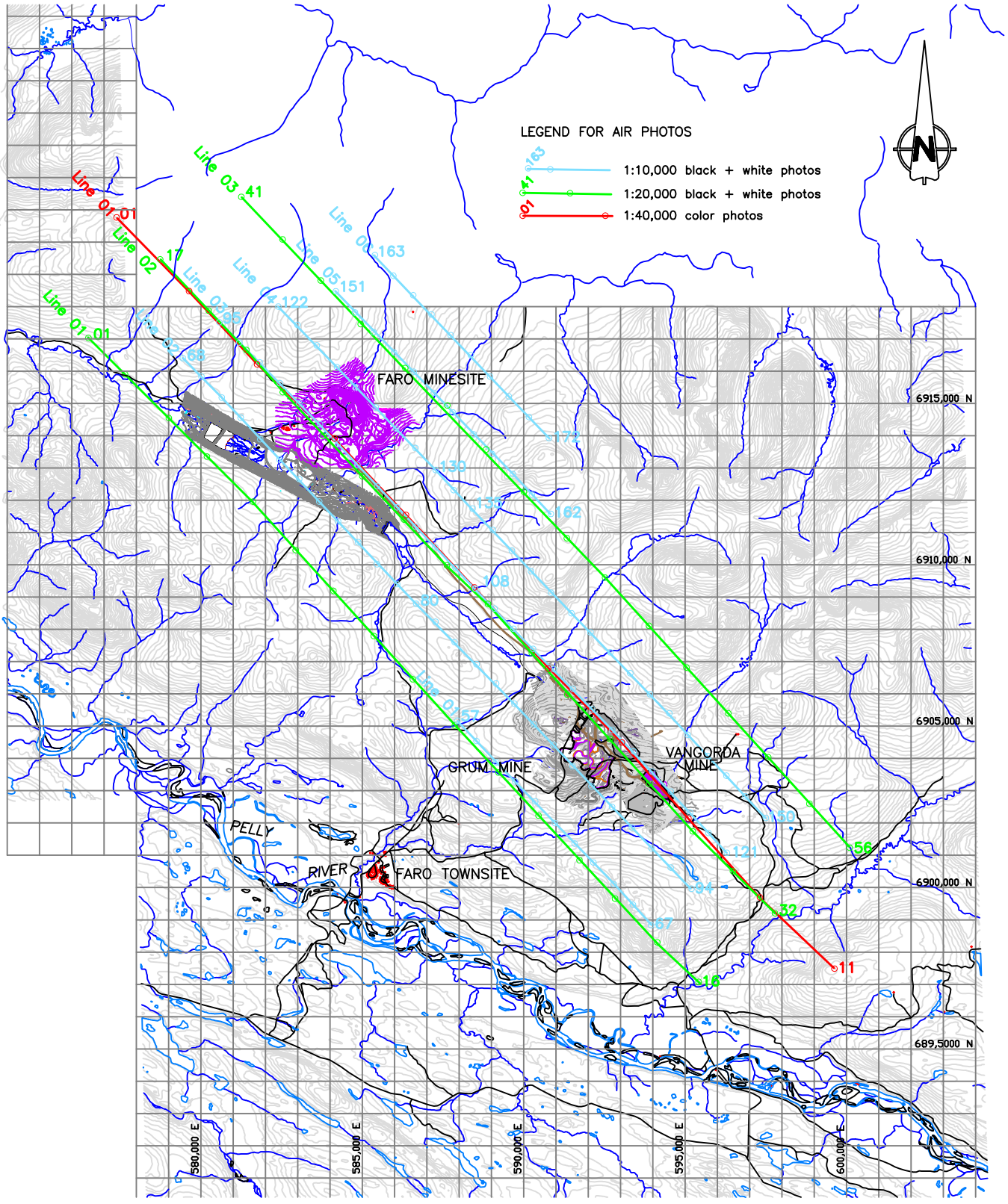
FARO–VANGORDA PLATEAU MINE SITES

LOCAL MAPPING

PROJECT NO.	DATE	APPROVED	FIGURE
1CD003.28	Dec. 2003		2.2

Dwg Ref: Siteplan03-06.dwg



Notes: Map derived from 1:50,000 scale
NTS Mapsheet 105 K/3 and 105 K/6
North American Datum 1927
Transverse Mercator Projection

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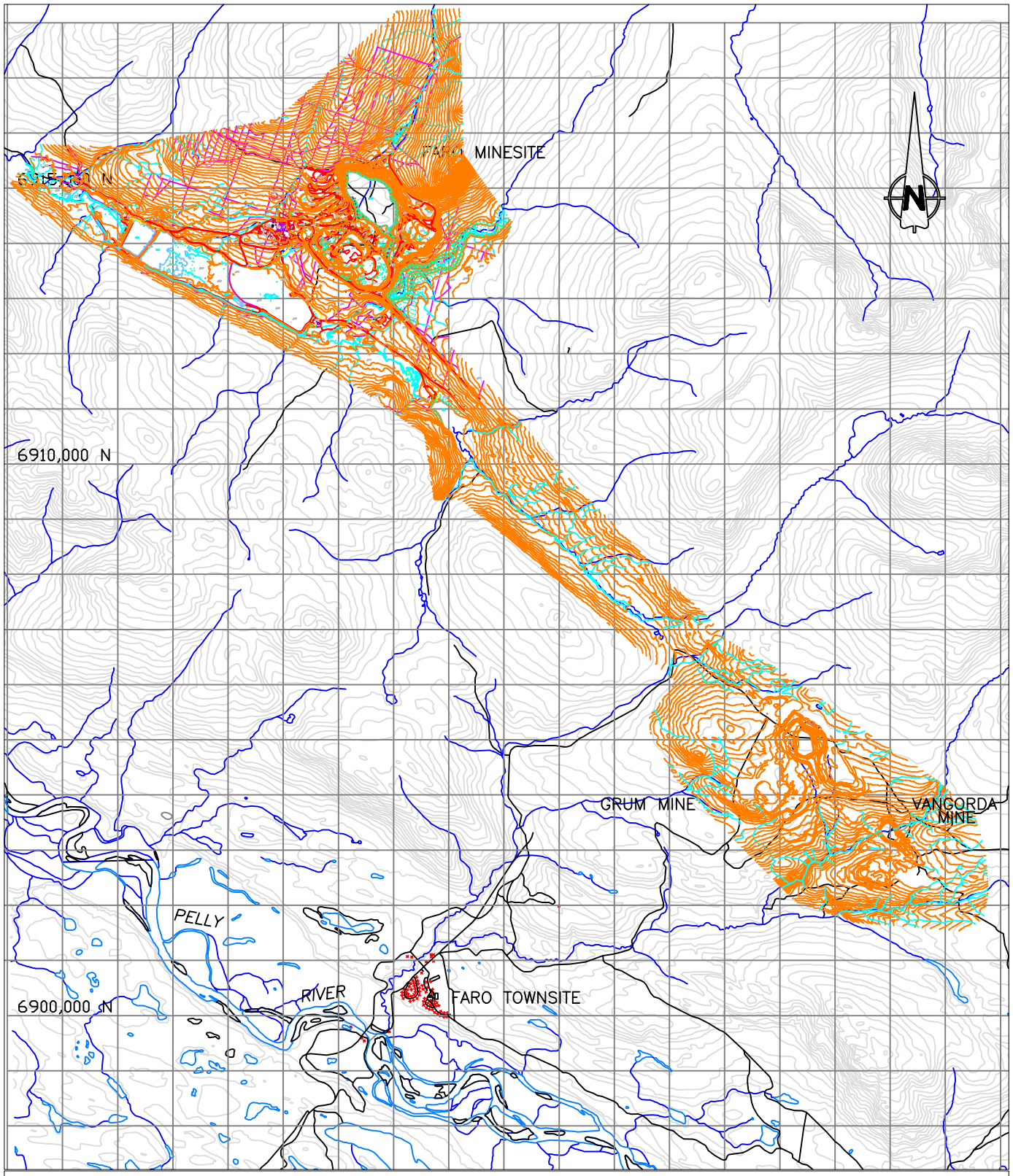
ANVIL RANGE MINING COMPLEX

Air Photo Flight Lines

PROJECT NO.	DATE	APPROVED	FIGURE
1CD003.28	Dec. 2003		3.1

Dwg Ref: Siteplan03-06.dwg



Notes: Map derived from 1:50,000 scale
NTS Mapsheet 105 K/3 and 105 K/6
North American Datum 1927
Transverse Mercator Projection

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FARO–VANGORDA PLATEAU MINE SITES

LOCAL MAPPING

PROJECT NO.	DATE	APPROVED	FIGURE
1CD003.28	Dec. 2003		3.2

Dwg Ref: Siteplan03-06.dwg

Notes: Map derived from 1:50,000 scale
NTS Mapsheet 105 K/3 and 105 K/6
North American Datum 1927
Transverse Mercator Projection

0 1 2 3 4 5 kilometres

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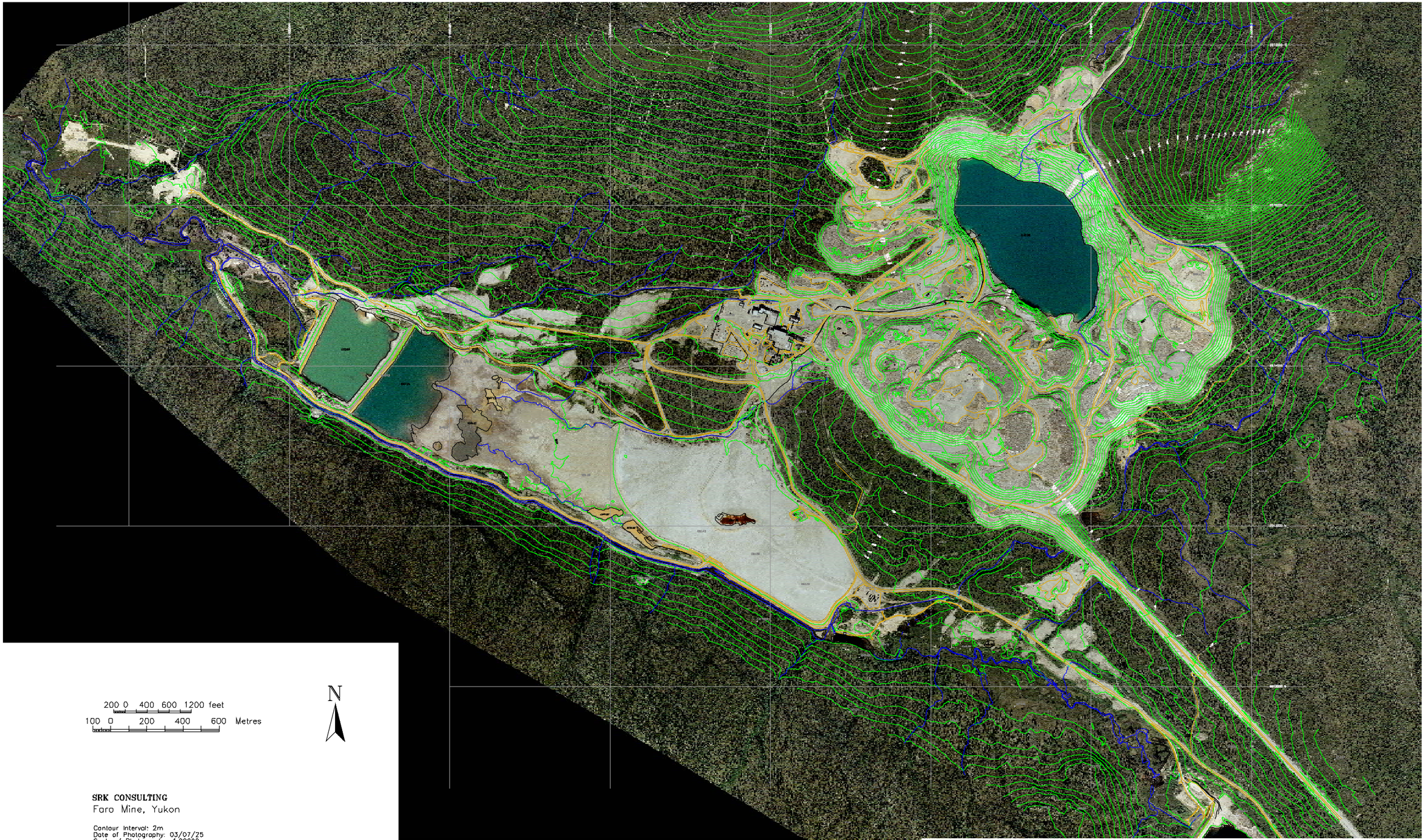
FARO–VANGORDA PLATEAU MINE SITES

ORTHO–RECTIFIED MOSAIC OF THE ANVIL RANGE MINING COMPLEX

PROJECT NO.	DATE	APPROVED	FIGURE
1CD003.28	Dec. 2003		3.3

Dwg Ref: Siteplan_2003-Photos.dwg



200 0 400 600 1200 feet
100 0 200 400 600 Metres

N

SRK CONSULTING
Faro Mine, Yukon

Contour Interval: 2m
Date of Photography: 03/07/25
Scale of Photography: 1:20000
Survey control derived from existing 1:20000 photography
Survey control based on: UTM Projection, NAD27
Compiled by The ORTHOSHOP, Calgary, September 2003
WO 8856

File Ref: 2003 SITE PLAN-photo.dwg

SRK Consulting
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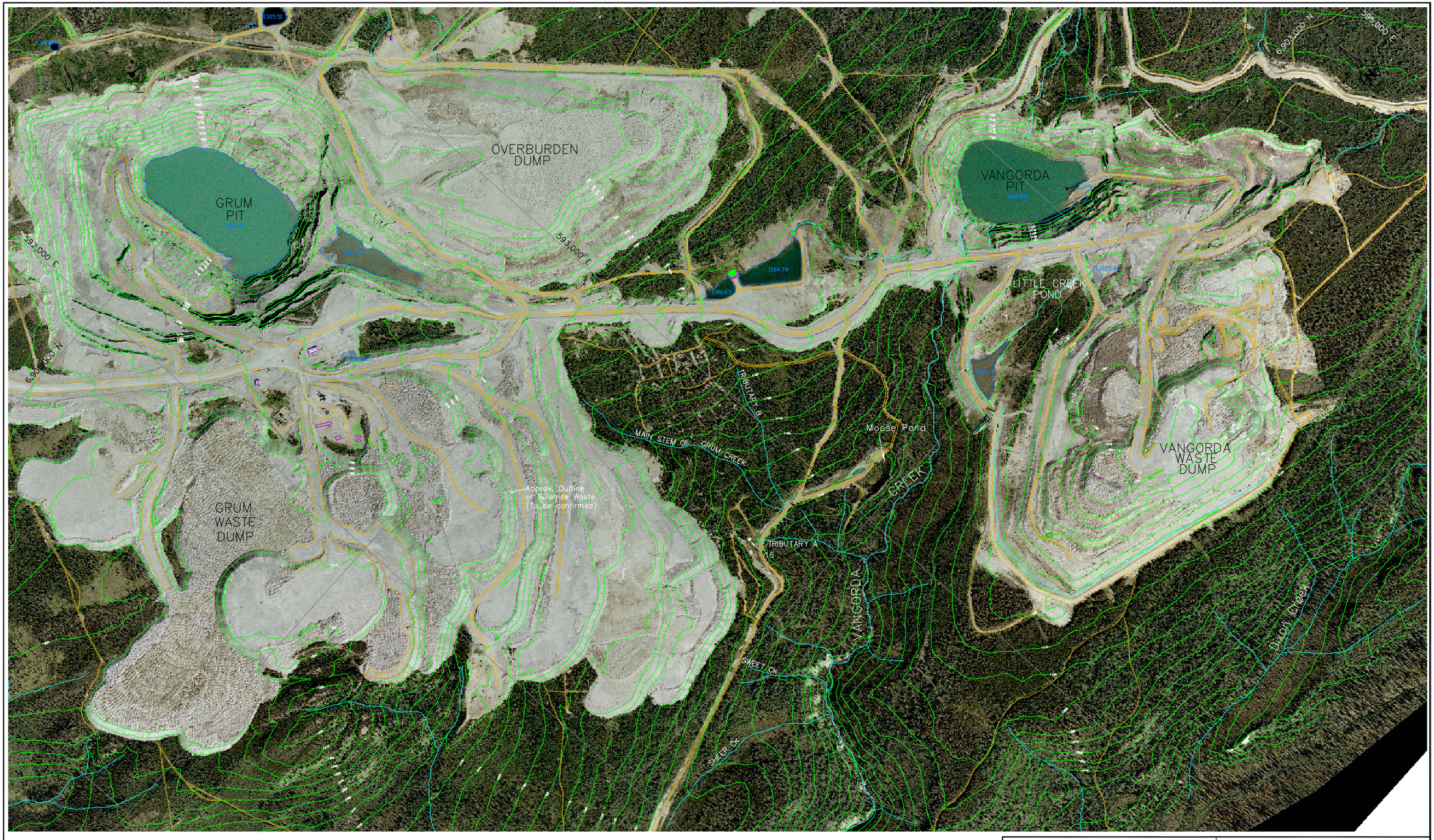
DELOITTE & TOUCHE INC.

FARO MINE SITE

ORTHO-RECTIFIED MOSAIC, WITH CONTOURS, OF FARO AREA

PROJECT NO.	DATE	APPROVED	FIGURE
1CD003.28	Dec. 2003		3.4



Contour Interval: 2m
Date of Photography: 03/07/25
Scale of Photography: 1:20000
Survey control derived from existing 1:20000 photography
Survey control based on: UTM Projection, NAD27
Compiled by The ORTHOSHOP, Calgary, September 2003
WO 8856

0 100 200 300 400 500 600 700 800 900 1000m

1:10000

SRK Consulting
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VANGORDA PLATEAU MINE

ORTHO-RECTIFIED MOSAIC, WITH CONTOURS, OF VANGORDA PLATEAU AREA

PROJECT NO.	DATE	FIGURE
1CD003.28	Dec. 2003	3.5

APPENDIX A

From: Shawn Thurber [shawn@orthoshop.com]
Sent: Tuesday, September 02, 2003 2:35 PM
To: Cam Scott
Subject: RE: Contact Prints and Scanning of Faro (Orthoshop)

Follow Up Flag: Follow up
Flag Status: Flagged

Q#12987

Mr. Cam Scott
SRK Consulting Engineers
800, 580 Hornby Street
Vancouver, B.C.
Canada
V6C 3B6

Dear Sir,

As per our telephone conversation I am writing to tell you the prices for the various things we talked about.

For 9" x 9" B/W contact prints the cost is $8.75 per contact print. To make one contact print the cost is $50.00 + G.S.T. and for every contact print after that the cost is $8.75. The initial cost of $50.00 covers the cost to find the roll of film, to make test prints to get the correct settings and the cost to ship via a courier (overnight).

The cost to make 116 contact prints for the 1:10,000 photo will be $1,006.25 + G.S.T. (No Set up fee charged)

The cost to make 56 contact prints for the 1:20,000 photo will be $481.25 + G.S.T. (No Set up fee charged)

To scan the 1:10,000 photography (116 exposures) the cost will be $2,656.00 + G.S.T. Each photo would be scanned for a 5 times enlargement (approx. 1:2,000 scale) We estimate each photo would be 130 MB in size and there would be 29 CDs in total.

To scan the 1:20,000 photography (56 exposures) the cost will be $1,175.00 + G.S.T. Each photo would be scanned for a 4 times enlargement (approx. 1:5,000 scale) We estimate each photo would be 84 MB in size and there would be 8 CDs in total.

Hope this helps you.

If you need any more information please contact me directly.

Best Regards,

Shawn Thurber

==========
Name: Shawn Thurber
Title: Marketing Representative
Company: The Orthoshop
Address: 1723 - 27th Ave. N.E.
Calgary, Alberta, Canada
T2E - 7E1
Phone: (403) 250-7830
Fax: (403) 291-9327
Email: shawn@orthoshop.com
Website: http://www.orthoshop.com ==========

APPENDIX B

From: Shawn Thurber [shawn@orthoshop.com]
Sent: Thursday, October 02, 2003 10:05 AM
To: Cam Scott
Subject: From the Orthoshop (ECW Files)

Cam,

As promised I am writing to tell you about .ecw files.
A lot of our clients really like the option of using .ecw files for their color orthophotos because the file size is usually 20 times smaller than the original tif file. ER Mapper has free software to look at and create .ecw files. A lot of new versions of GIS and CAD software will already work with .ecw files. I will give you the link to look at the different downloads. ER Mapper even has plugins that can be downloaded from their site to make older versions of software able to use .ecw files.

The web address is www.ermapper.com.
When at the site click on Downloads.
Find the software you want to download and click on it.
eg. ER Viewer, Free ECW compressor and the appropriate plugin.
Note: the Free ECW compressor will only compress files that are 500 MB and smaller. If you need to compress larger files please contact me and we can do that for you at the Orthoshop.

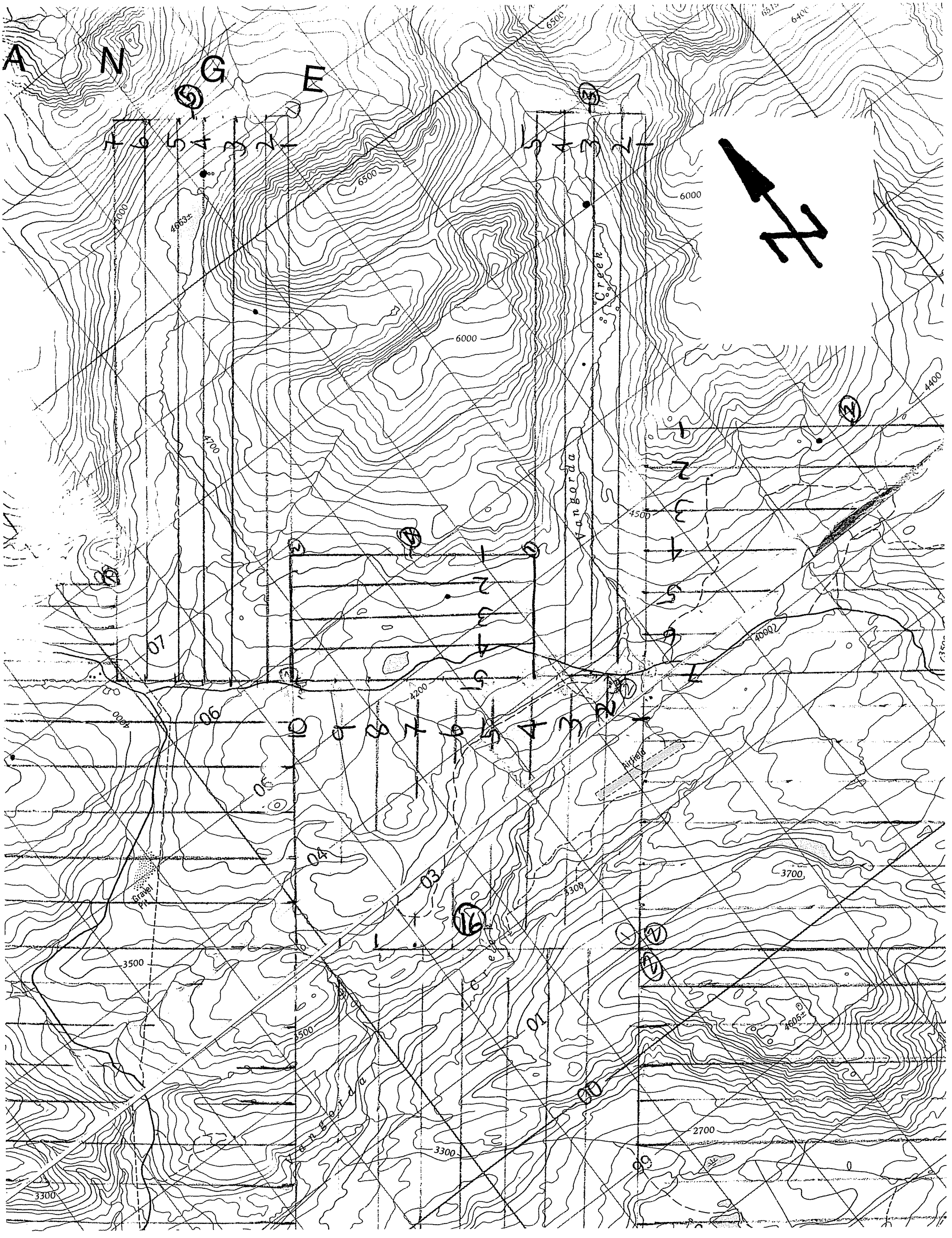
Hope this helps you. I think this should make it so anyone will be able to use the orthophoto with no problems.

If you have any question just give a call and I will be glad to help.

Regards,

==========
Name: Shawn Thurber
Title: Marketing Representative
Company: The Orthoshop
Address: 1723 - 27th Ave. N.E.
Calgary, Alberta, Canada
T2E - 7E1
Phone: (403) 250-7830
Fax: (403) 291-9327
Email: shawn@orthoshop.com
Website: http://www.orthoshop.com ==========

APPENDIX C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6000
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4700
Vangorda
Creek
4400
4500
4000
4200
Airfield
Gravel Pit
3700
3500
3300
4605±
2700
07
06
05
04
03
01
00