KITSUMKALUM RIVER
CHANNEL STABILITY ASSESSMENT

AERIAL AND GROUND INSPECTION
APRIL 22 to 23, 2009
COMPILATION OF DIGITAL AND VIDEO IMAGERY

PREPARED FOR:

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May 6, 2009

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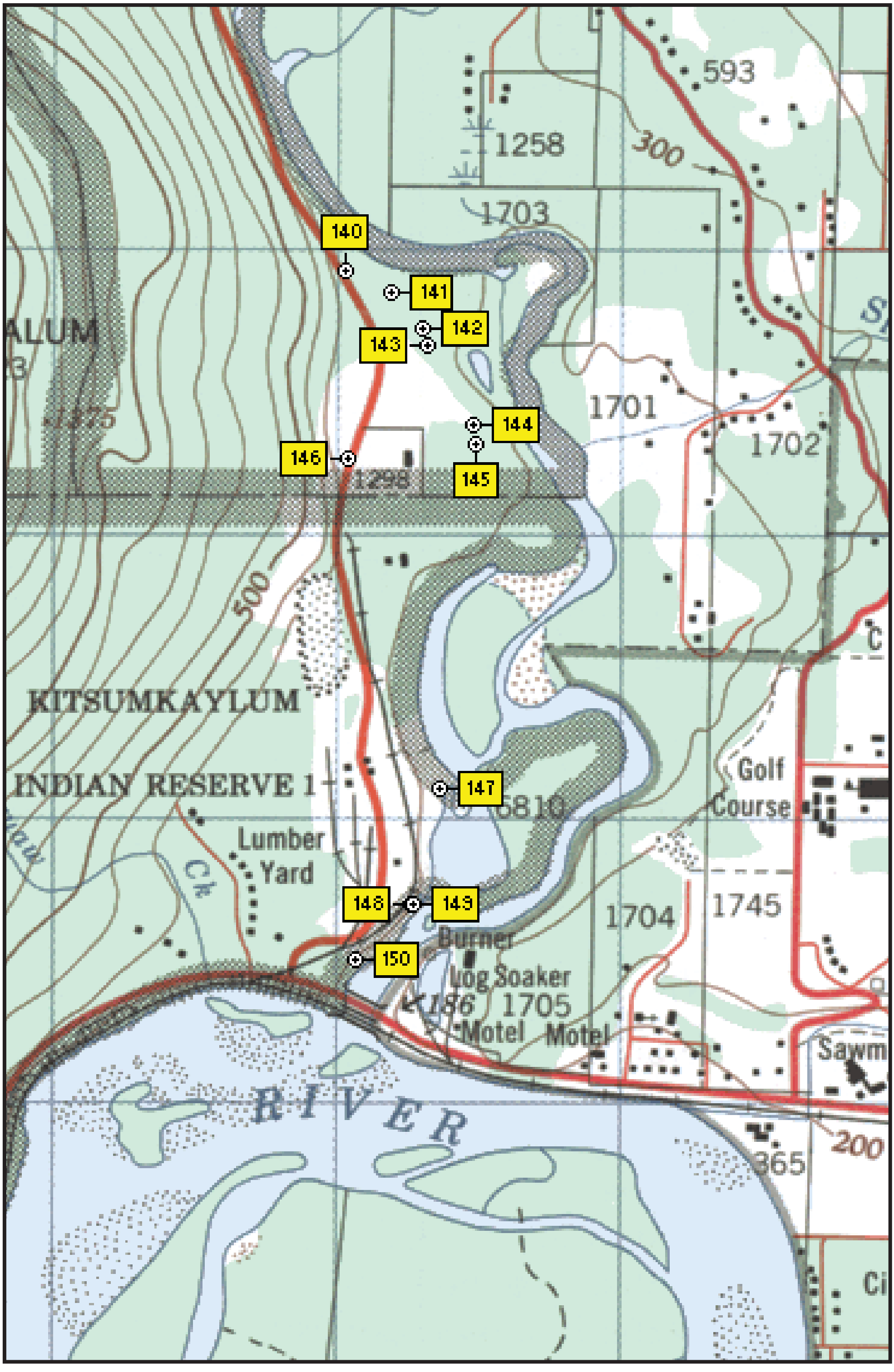
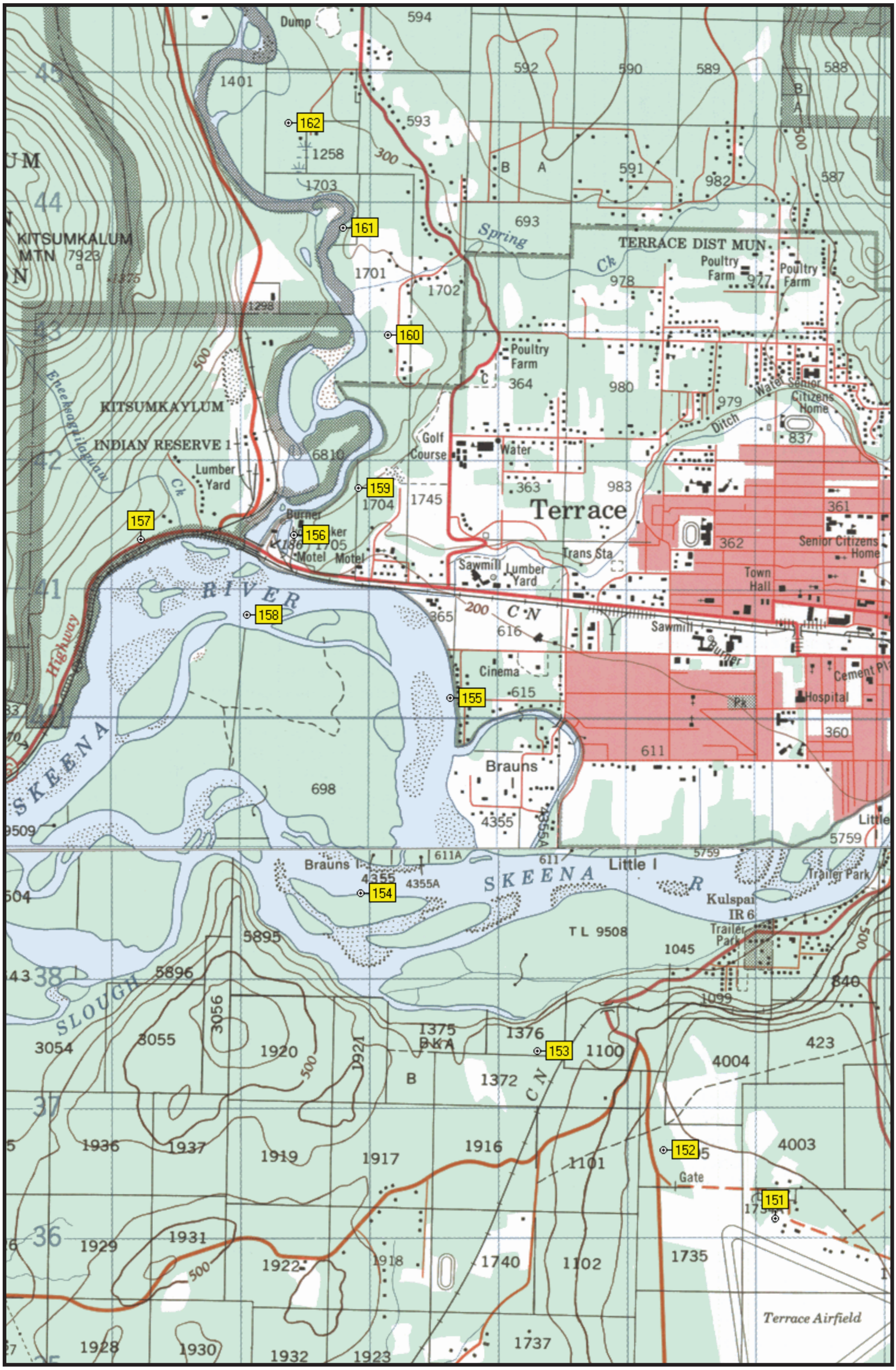
DVD 1 - Video Tape 1 documenting the helicopter inspection
DVD 2 - Still photos from the helicopter and ground inspections

SECTION 2

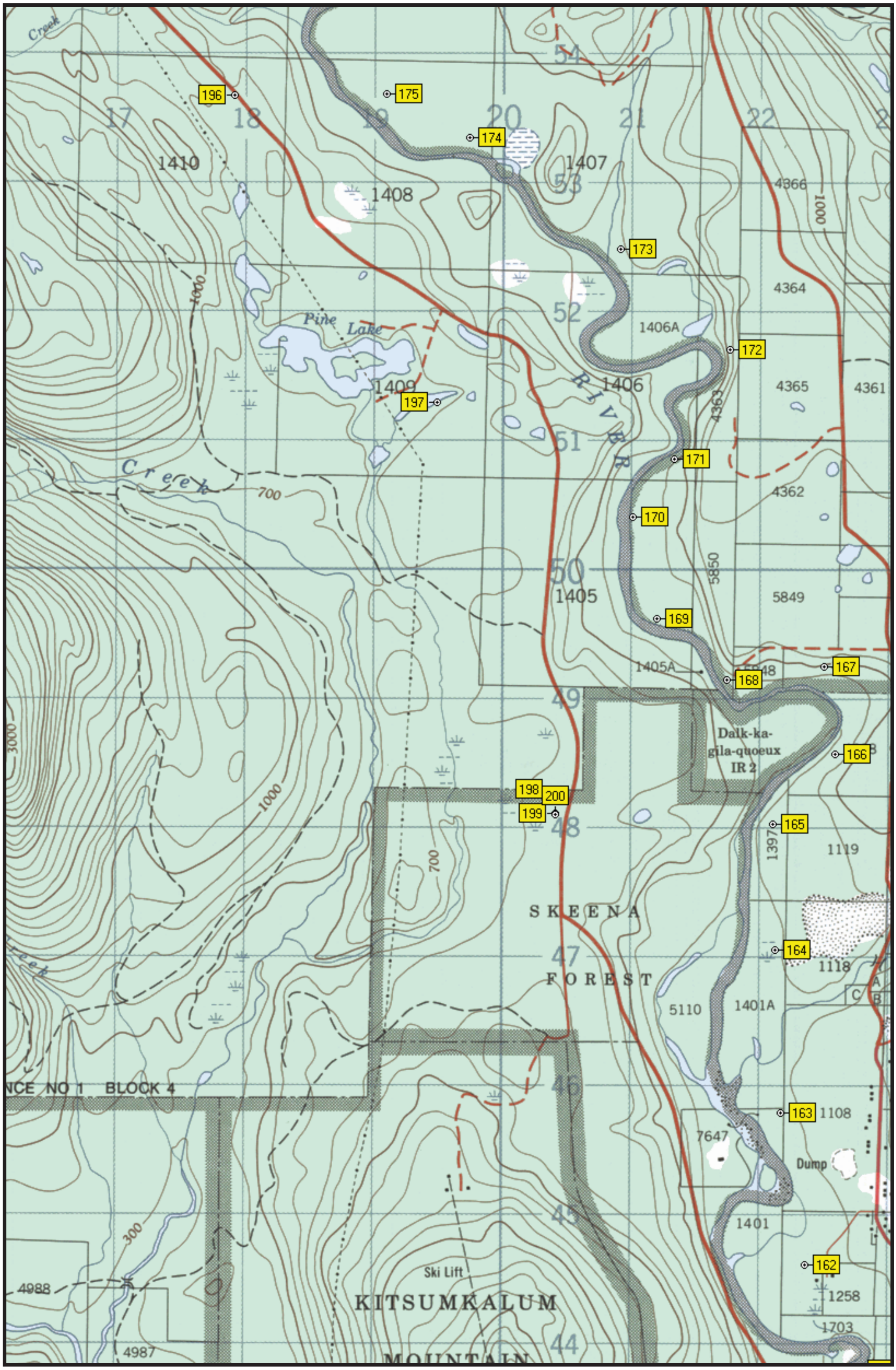
MAPS SHOWING LOCATION GPS OF WAYPOINTS (OR MARKS) DURING THE HELICOPTER INSPECTION



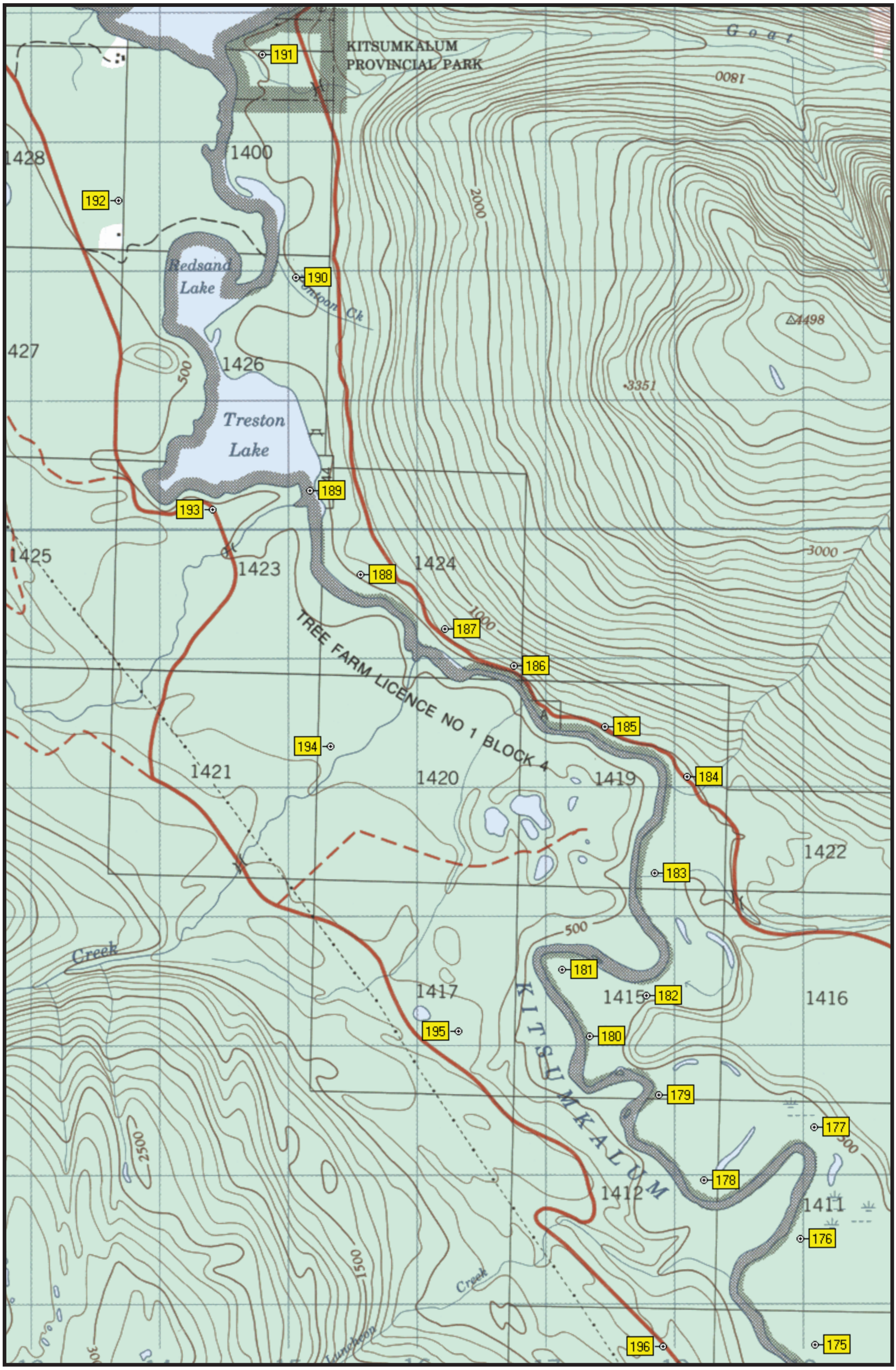
Skeena River at Terrace, April 22, 2009. Waypoints 140 to 150.



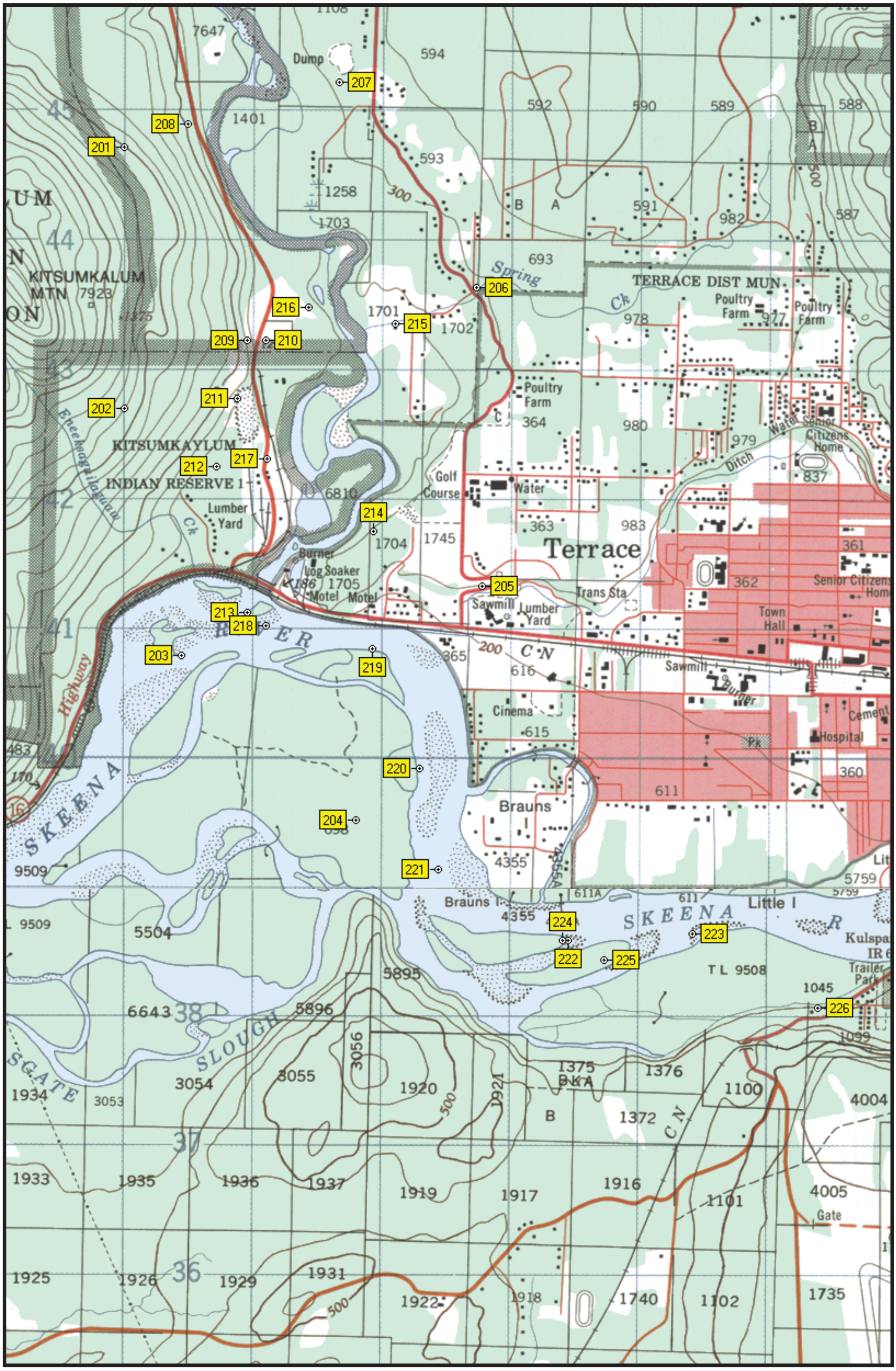
Skeena River at Terrace, April 23, 2009. Waypoints 151 to 162.



Skeena River at Terrace, April 23, 2009. Waypoints 162 to 175 and 196 to 200.



Skeena River at Terrace, April 23, 2009. Waypoints 175 to 196



Skeena River at Terrace, April 23, 2009. Waypoints 221 to 226.

SECTION 3

TABLE OF WAYPOINTS, UTM COORDINATES AND CORRESPONDING TIME STAMPS ON VIDEO IMAGERY

APRIL 23, 2009 - AERIAL CAMCORDER RECORD - TERRACE FIELD INSPECTION									
	DATE	TIME IMAGE TAKEN	DVD #	TIME STAMP ON DVD - MINS	UTM COORDINATES			CAMCORDER STILL #	FLIGHT PATH & COMMENTS
					ZONE	EASTING	NORTHING		
151	23-Apr-09	10:52:43 AM	1	na	09U	527054	6036337	na	
152	23-Apr-09	11:11:44 AM	1	00:54	09U	526180	6036866	na	
153	23-Apr-09	11:12:26 AM	1	01:37	09U	525203	6037640	6398	
154	23-Apr-09	11:13:12 AM	1	02:23	09U	523837	6038861	6406	
155	23-Apr-09	11:13:51 AM	1	03:15	09U	523541	6040348	6418	
156	23-Apr-09	11:14:35 AM	1	03:45	09U	522318	6041614	6425	
157	23-Apr-09	11:15:13 AM	1	04:23	09U	521132	6041569	6432	
158	23-Apr-09	11:15:49 AM	1	05:02	09U	521959	6040992	6439	
159	23-Apr-09	11:16:33 AM	1	na	09U	522821	6041974	na	
160	23-Apr-09	11:17:19 AM	1	06:28	09U	523044	6043165	6460	
161	23-Apr-09	11:17:56 AM	1	07:05	09U	522691	6043992	6467	
162	23-Apr-09	11:18:30 AM	1	07:39	09U	522265	6044803	6473	
163	23-Apr-09	11:19:09 AM	1	08:18	09U	522076	6045978	6480	
164	23-Apr-09	11:19:48 AM	1	08:56	09U	522021	6047246	6484	
165	23-Apr-09	11:20:19 AM	1	09:29	09U	522006	6048218	6486	
166	23-Apr-09	11:20:51 AM	1	10:00	09U	522490	6048763	6490	
167	23-Apr-09	11:21:20 AM	1	10:29	09U	522395	6049440	6494	
168	23-Apr-09	11:21:57 AM	1	11:05	09U	521644	6049333	6499	
169	23-Apr-09	11:22:33 AM	1	11:43	09U	521099	6049810	6507	
170	23-Apr-09	11:23:07 AM	1	12:16	09U	520903	6050595	6512	
171	23-Apr-09	11:23:31 AM	1	12:40	09U	521226	6051050	6515	
172	23-Apr-09	11:24:05 AM	1	13:14	09U	521653	6051893	6519	
173	23-Apr-09	11:24:46 AM	1	13:53	09U	520804	6052677	6524	
174	23-Apr-09	11:25:34 AM	1	14:43	09U	519632	6053537	6528	
175	23-Apr-09	11:25:58 AM	1	15:06	09U	518978	6053875	6530	
176	23-Apr-09	11:26:31 AM	1	15:39	09U	518867	6054691	6535	
177	23-Apr-09	11:27:00 AM	1	16:09	09U	518973	6055555	6539	
178	23-Apr-09	11:27:42 AM	1	16:50	09U	518119	6055152	6545	
179	23-Apr-09	11:28:12 AM	1	17:20	09U	517766	6055810	6551	
180	23-Apr-09	11:28:47 AM	1	17:56	09U	517233	6056262	6557	
181	23-Apr-09	11:29:19 AM	1	18:27	09U	517015	6056779	6562	
182	23-Apr-09	11:29:47 AM	1	18:54	09U	517667	6056578	6565	
183	23-Apr-09	11:30:21 AM	1	19:28	09U	517738	6057532	6572	
184	23-Apr-09	11:30:48 AM	1	19:56	09U	517983	6058271	6577	
185	23-Apr-09	11:31:13 AM	1	20:20	09U	517349	6058662	6580	
186	23-Apr-09	11:31:44 AM	1	20:51	09U	516639	6059137	6585	
187	23-Apr-09	11:32:07 AM	1	21:14	09U	516101	6059423	6589	
188	23-Apr-09	11:32:36 AM	1	21:45	09U	515445	6059845	6594	
189	23-Apr-09	11:33:07 AM	1	22:15	09U	515057	6060497	6596	

APRIL 23, 2009 - AERIAL CAMCORDER RECORD - TERRACE FIELD INSPECTION									
	DATE	TIME IMAGE TAKEN	DVD #	TIME STAMP ON DVD - MINS	UTM COORDINATES			CAMCORDER STILL #	FLIGHT PATH & COMMENTS
					ZONE	EASTING	NORTHING		
190	23-Apr-09	11:34:09 AM	1	23:17	09U	514949	6062151	6604	
191	23-Apr-09	11:35:03 AM	1	24:10	09U	514686	6063876	6611	
192	23-Apr-09	11:36:09 AM	1	25:17	09U	513566	6062746	6616	
193	23-Apr-09	11:37:14 AM	1	26;22	09U	514299	6060348	6623	
194	23-Apr-09	11:38:06 AM	1	27:13	09U	515216	6058514	6627	
195	23-Apr-09	11:38:58 AM	1	28:06	09U	516211	6056303	6636	
196	23-Apr-09	11:39:59 AM	1	29:07	09U	517803	6053861	6643	
197	23-Apr-09	11:40:58 AM	1	30:05	09U	519384	6051481	6651	
198	23-Apr-09	11:41:59 AM	1	na	09U	520283	6048489	na	
199	23-Apr-09	11:42:03 AM	1	na	09U	520314	6048300	na	
200	23-Apr-09	11:42:03 AM	1	31:13	09U	520315	6048291	6663	
201	23-Apr-09	11:43:13 AM	1	32:22	09U	520892	6044900	6673	
202	23-Apr-09	11:43:56 AM	1	33:03	09U	520900	6042885	6682	
203	23-Apr-09	11:44:39 AM	1	33:46	09U	521354	6040982	6691	
204	23-Apr-09	11:45:21 AM	1	34:27	09U	522709	6039711	6700	
205	23-Apr-09	11:46:09 AM	1	35:16	09U	523677	6041523	6710	
206	23-Apr-09	11:47:09 AM	1	36:15	09U	523629	6043826	6723	
207	23-Apr-09	11:48:03 AM	1	37:10	09U	522556	6045405	6732	
208	23-Apr-09	11:48:50 AM	1	37:58	09U	521386	6045080	6734	
209	23-Apr-09	11:50:12 AM	1	39:18	09U	521850	6043413	6741	
210	23-Apr-09	11:50:59 AM	1	40:05	09U	521994	6043418	na	
211	23-Apr-09	11:52:09 AM	1	41:15	09U	521783	6042963	6757	
212	23-Apr-09	11:52:38 AM	1	41:45	09U	521616	6042434	6761	
213	23-Apr-09	11:53:22 AM	1	42:28	09U	521865	6041311	6765	
214	23-Apr-09	11:54:10 AM	1	43:15	09U	522833	6041945	6771	
215	23-Apr-09	11:55:32 AM	1	44:38	09U	523003	6043541	6785	
216	23-Apr-09	11:56:10 AM	1	45:17	09U	522327	6043670	6793	
217	23-Apr-09	11:56:55 AM	1	46:01	09U	522008	6042501	6803	
218	23-Apr-09	11:57:56 AM	1	47:01	09U	522003	6041209	6812	
219	23-Apr-09	11:58:32 AM	1	47:38	09U	522828	6041036	6825	
220	23-Apr-09	11:59:30 AM	1	48:36	09U	523201	6040112	6839	
221	23-Apr-09	12:00:08 PM	1	49:16	09U	523351	6039334	6845	
222	23-Apr-09	12:01:00 PM	1	50:06	09U	524359	6038781	6860	
223	23-Apr-09	12:01:51 PM	1	50:58	09U	525325	6038834	6870	
224	23-Apr-09	12:04:29 PM	1	na	09U	524321	6038781	na	
225	23-Apr-09	12:04:43 PM	1	53:50	09U	524641	6038632	6911	
226	23-Apr-09	12:05:52 PM	1	54:59	09U	526307	6038265	6923	

SECTION 4

GOOGLE EARTH IMAGERY SHOWING THE LOCATION OF STILL PHOTOS TAKEN FROM THE HELICOPTER WITH THE VIDEO CAMERA AND THUMBNAIL PHOTOS OF STILL IMAGES TAKEN FROM THE HELICOPTER WITH THE VIDEO CAMERA

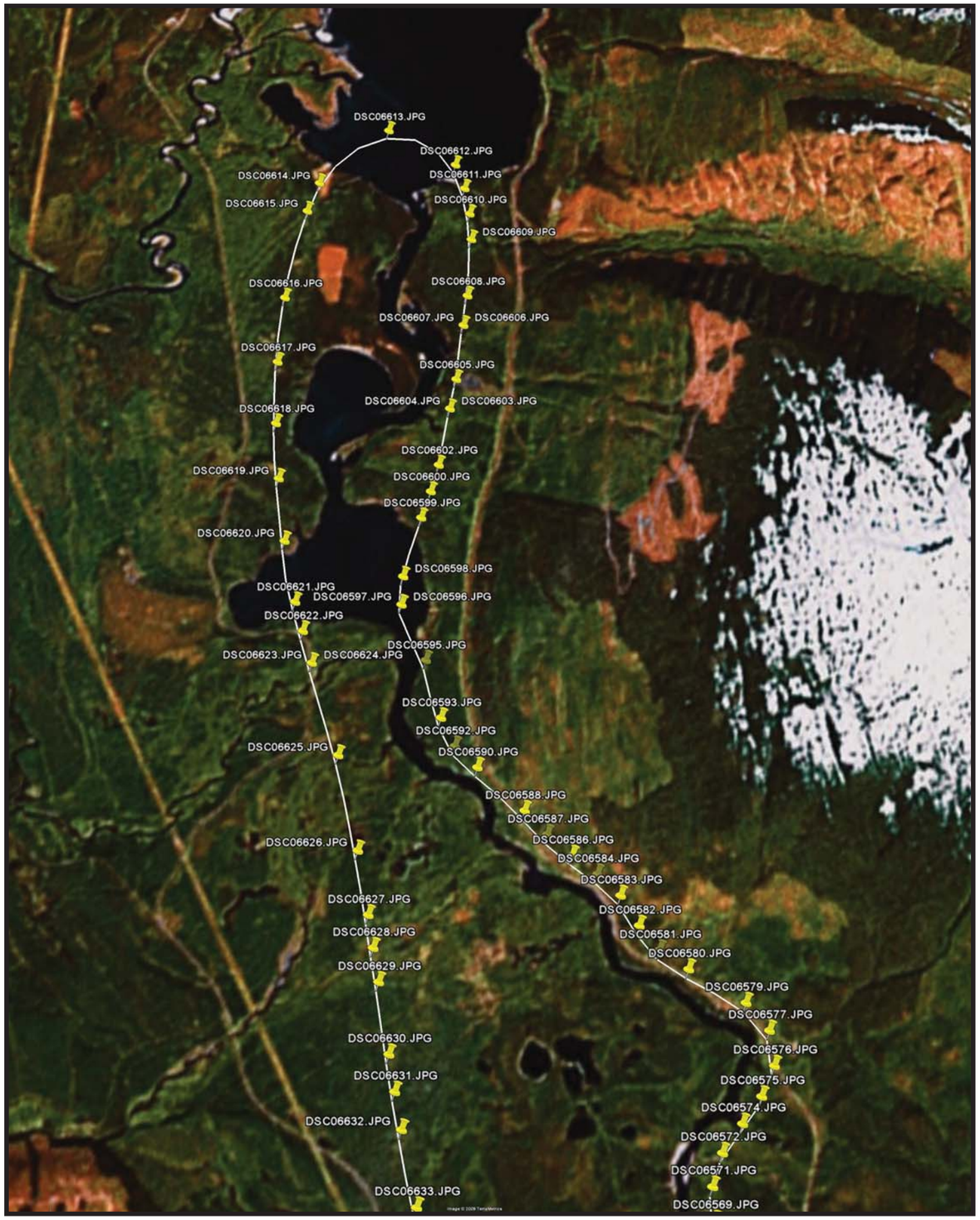


Figure 4-1: Location of camcorder photos, sheet 1 (Google Earth imagery).

Figure 4-2: Location of camcorder photos, sheet 2 (Google Earth imagery).

Figure 4-3: Location of camcorder photos, sheet 3 (Google Earth imagery).

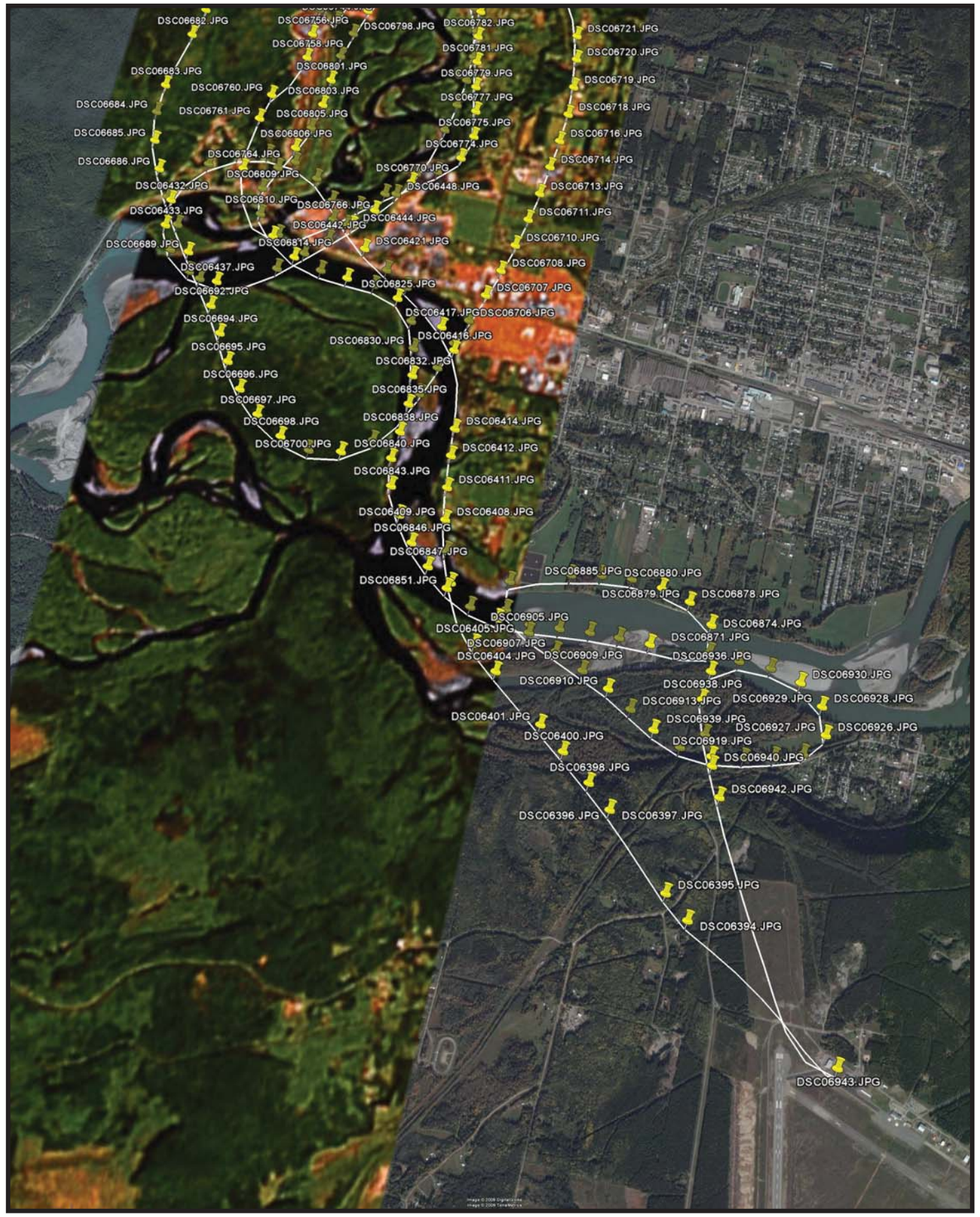


Figure 4-4: Location of camcorder photos, sheet 4 (Google Earth imagery).

SECTION 5

GOOGLE EARTH IMAGERY SHOWING THE LOCATION OF STILL PHOTOS TAKEN FROM THE HELICOPTER WITH THE NIKON CAMERA
AND
THUMBNAIL PHOTOS OF STILL IMAGES TAKEN FROM THE HELICOPTER WITH THE NIKON CAMERA (BY DAVE GORDON)

Figure 5-1: Location of Nikon photos, sheet 1 (Google Earth imagery).

Figure 5-2: Location of Nikon photos, sheet 2 (Google Earth imagery).

Figure 5-3: Location of Nikon photos, sheet 3 (Google Earth imagery).

Figure 5-4: Location of Nikon photos, sheet 4 (Google Earth imagery).

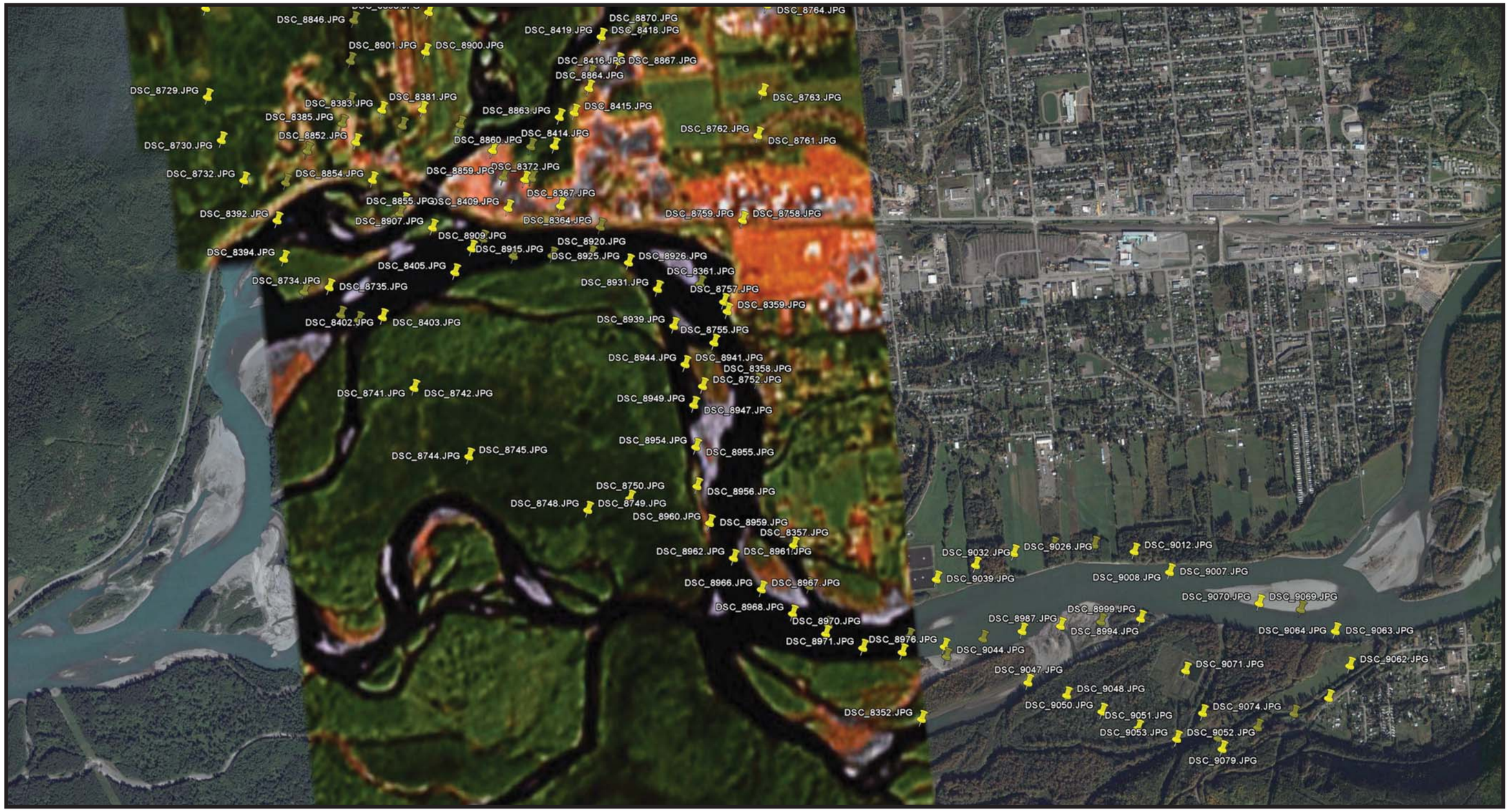


Figure 5-5: Location of Nikon photos, sheet 5 (Google Earth imagery).

SECTION 6

GROUND INSPECTION PHOTOGRAPHS (WITH DON ROBERTS) AND FIELD NOTES

April 22, 2009

MM 09 5362 to 5366

April 22 on Kitsumkalum River with Don Roberts.
GPS Mark 140. This is at the nose of a short spur and the closest point between the Kitsumkalum River and the Nass Road. Time is 11:25 am.

Panorama looking downstream. There are three fir trees which have recently fallen into the water. Don tells me that this bend has eroded rapidly over the last few years and that in 2007 the water level was up to the road, or the small spur we are standing on, but did not overtop the road.

April 22, 2009

MM 09 5367 to 5372

Looking upstream along the same eroding bend as the previous photo with Don in the center of the photograph. Note the scour level on the top of the bank which is about 1.5 m higher than the adjacent flood plain.

April 22, 2009

MM 09 5373 & 5374

GPS Mark 141

Two photos of Don showing the erosion scour lines on the bank. Mitch Drews of DFO suggested a set-back berm could be placed 50 ft from the river in this area. The river is now very close (3 to 4 m) from the flagging that has been put up to mark the outside edge of the proposed revetment. This indicates how much erosion has recently occured. The flagging was put in during April 2007 before the June flood.

April 22, 2009

MM 09 5375 to 5380

Looking upstream over a 50 cm diameter tree that has fallen into the river. Note the prograding point bar on the left bank.

April 22, 2009

MM 09 5381 to 5385

Looking downstream with Don holding the shovel for perspective right beside the pink flagging marking the previously proposed revetment location. It is 7.8 m from the flagging to the hemlocks on top of the small stump by the river. Don mentioned that he placed the flagging 50 ft (15 m) from the bank edge in April 2007.

April 22, 2009

MM 09 5386 to 5392

GPS Mark 142 is standing in a small seasonally wetted channel and is just opposite the areas we might consider for starting the set-back berm.

GPS Mark 143 is at the base of the right bank below the fluvial terrace. Flood waters have recently flowed through this area. The terrace is about 1.5 m high at this point. This would probably be quite a good place to use as a defensive line for what you might want to protect or might not.
Panorama shows the edge of the terrace with Don in the middle of the photograph.

April 22, 2009

MM 09 5393

Mikes right boot showing soil detail.

April 22, 2009

MM 09 5394/5395/5396

GPS Mark 144 is at the toe of the former river channel that was cut off in the 2007 flood.
There is a sizeable Skeena Cellulose waste disposal area located adjacent to this site. This has been topped with fluvial gravels and there is also an active garbage dump here.
There are very thick reddish brown algal mats in the residual pond at the toe of this cut slope. These appear to be related to seepage coming out of the adjacent cut bank. It would be desirable to determine whether there are PCB's or other toxic chemicals in this landfill which are seeping into this section of channel.

April 22, 2009

MM 09 5398 to 5405

Panorama looking downstream over the recently abandoned channel. Don is standing on the bank with his shovel indicating height. Note the reddish brown algal mat at the goe of the cut-slope.

April 22, 2009

MM 09 5406 & 5407

Two photos showing the reddish brown algal mats in the abandoned channel.

April 22, 2009

MM 09 5408

Photo of the shovel with a sample of the reddish brown algal mat in it. This site was formerly a gravel pit which is why it was used as a swimming hole.

April 22, 2009

Looking at algal mats around a root wad.

MM 09 5409 & 5410

GPS Mark 145
Looking at a sand boil where ground water is perculating up out of the river bed over a distance of about 40 cm. There are noticeable concentrations of reddish brown material around the small sand boil.

April 22, 2009

MM 09 5411 to 5418

Looking at the small residual beaver pond at the toe of the landfill. There is a tire in the foreground and several others scattered in the former wetland.

April 22, 2009 MM 09 5420 to 5423

Looking downstream to the outlet of this cut off bend. There is a field on the left bank and a white mound along the edge of the bank which I suspect are sandbags.

April 22, 2009 MM 09 5424

Looking up valley over the active garbage dump. This former wetland pond was top dresssed with river gravels and seeded by Skeena Cellulose. Don indicates bears come here to grass and clover in the spring.

April 22, 2009 MM 09 5425 to 5430

GPS Mark 146 Now on the west side of the Nass River road directly opposite abandoned Kalum Wood Products Ltd. Mill.
There is an approximately 20 cm deep, 10 m wide stream flowing on the right bank side of the valley. This stream is flowing around alders, cottonwoods and various conifers. The stream may have been diverted along the valley wall side of the road following road construction. This may be the source of flood waters which flowed down the road into Kalum Village during the June 2007 flood (rather than water derived from Kalum River). We need to follow this channel upstream to see where it originally enters the valley bottom and see if we can find where it formerly crossed the road and entered Kitsumkalum River. It obviously wasn't originally in this location as there are too many mature trees with water now flowing around their roots.

Panorama looking upstream on the channel with Don standing with the shovel on the left bank. At this point the channel is constricted to about 3 to 4 m in width with a maximum depth of about 30 cm. There is fine sediment and organic material on the channel bed. Some skunk cabbage is beginning to grow so there may have been some water in this area prior to road construction.

April 22, 2009

MM 09 5432 to 5441

GPS Mark 147

Panorama looking downstream at the former log booming area. This is where they would store logs prior to pulling them out of the river and then shipping them to Prince Rupert.

Don mentioned that the incubation time for Oolichan can be predicted by when salmonberry flowers adjacent to the river start to open. Oolichan only spawn in water that has less than 0.01 (I assume percent) salinity; they need to be about 1 mile upstream of the upstream end of the salt wedge. Incubation time is around 55 to 60 days.

April 22, 2009

MM 09 5442 to 5448

Looking upstream showing a stable log jam in which most of the logs are saw cut. There is an approximately 500 Kg class rip-rap berm on the left bank of the residual channel downstream of the log jam. There are fresh beaver-cut alders in the foreground. This site has not operated since 1964.

April 22, 2009 MM 09 5449

Waste steel in the brush. Don indicates there is a buried industrial waste dump at this site. A channel avulsion occurred at this site in 1978.

April 22, 2009

MM 09 5450 to 5458

GPS Mark 148

Now standing on the outlet of the pond.

Panorama looking upstream over the pond, showing sediment and woody debris deposition. Don mentioned that this area is filling in quite rapidiy. Much of the upstream pond surface is now equivalent to the outlet elevation.

April 22, 2009

MM 09 5460 to 5465

Panorama looking downstream into the outlet channel.

April 22, 2009

MM 09 5466

Picture of Don and a tracked vehicle that has been buried in the outlet spillway.

April 22, 2009

MM 09 5467 & 5468

Two more pictures of Don with the buried tracked vehicle.

April 22, 2009 MM 09 5469

GPS Mark 149 is a moss sample for Wynne. This was taken on the spillway coming out of the log pond shown in the previous photo. There is a lot of this moss on the rocks within 1 m of present water level.

GPS Mark 150 is just upstream of the Kalum Highway Bridge, plus a photo of boot showing ground surface.

April 22, 2009 MM 09 5470

Single photo looking downstream to the Highway Bridge with the Railway Bridge in the background. Note that only one span of the railway bridge is now functional and the river used to be substantially wider than the two spans.

April 22, 2009

MM 09 5471 to 5477

Panorama looking downstream to the Highway Bridge with the Railway Bridge in the background.
Note that only one span of the railway bridge is nowfunctional and the river used to be substantially wider than the two spans.

April 22, 2009

MM 09 5478 & 5479

Single photos looking downstream showing the railway span which is located behind the highway bridge.
Don said that at the height of the June 2007 flood the water level was just up to the top of the cylindrical piles.

April 22, 2009

MM 09 5481 to 5487

Now on the right bank between the highway and the railway bridges.

Panorama looking upstream to the Highway Bridge.

April 22, 2009

MM 09 5488

Single photo looking downstream to the railway bridge.

April 22, 2009

MM 09 5489 to 5497

Panorama looking upstream from the center of the Highway Bridge to the upstream channel on Kitsumkalum River.

April 22, 2009

MM 09 5499 TO 5508

Panorama looking downstream from the center of the Highway Brdige to the railway bridge.

April 22, 2009 MM 09 5509 & 5510

Panorama looking downstream to the railway bridge from the highway bridge. These show the lack of a channel underneath the left bank opening.

April 23, 2009

MM 09 5511 to 5513

Second panorama looking downstream to the railway bridge from the highway bridge showing the lack of a channel underneath the left bank opening.