CC Greg
Stan.

#10a

DANCE ENVIRONMENTAL INC.

2012 Ecological and Aquatic Monitoring Report Roszell Pit, Puslinch Township. ARA Licence No. 625189.

Prepared for:
CBM Aggregates
55 Industrial Street
Toronto, ON
M4G 3W9
Attn: Collin Evans

Prepared by:
Dance Environmental Inc.
807566 Oxford Rd. 29
R.R.#1
Drumbo, ON
N0J 1G0

December 12, 2012.
DE-382

1.0 BACKGROUND

Dance Environmental Inc. was retained on September 7, 2012 by CBM Aggregates to begin initial data collection on wetland vegetation, fish spawning, and sediment and erosion control monitoring in accordance with the site plans for the Roszell Pit, Puslinch Township.

The Roszell pit was approved for aggregate extraction prior to 2012. The Roszell Pit is licenced for extraction into the water table.

The Summer of 2012 was characterized as a hot dry summer with lower than average precipitation, resulting in low water levels in streams and rivers throughout much of Ontario.

2.0 PURPOSE OF MONITORING

The monitoring which was conducted during the Fall of 2012 was conducted in order to meet ecological mitigation measures and ecological and aquatic monitoring requirements laid out in the site plan conditions for the Roszell Pit.

The vegetation monitoring in Fall 2012 was conducted since some road construction and extraction activities were occurring within the pit licence area. The 2012 vegetation data provides some background conditions information from the Speed River Wetland Complex, but the vegetation monitoring to be conducted in 2013 will provide baseline vegetation information during the Spring and Summer seasons.

The ecological mitigation measures include:

1. The dripline of all forest systems of the pit should be flagged in the field, confirmed by relevant staff, surveyed and shown on the site plans (completely previously).
2. The limits of all wetland systems in proximity to the pit should be flagged in the field, confirmed by relevant staff, surveyed and shown on the site plans (completed previously).
3. The setback (for extraction above the water table) from the wetland system to the west of the site, i.e. lands associated with the Speed River Wetland Complex should be 30m from the limits of the wetland.
4. The setback (for extraction above the water table) from the dripline of the forest system to the west of the site should be 30m.
5. Sediment and erosion control measures should be established along the western limits of the site in areas adjacent to forest and wetland systems on and adjacent to the site. Sediment and erosion control measures should be established prior to soil stripping and berm construction in areas close to these natural features. Sediment and erosion control measures, i.e. silt fencing should be regularly inspected and maintained over the life of the pit. Siltation barriers will be inspected immediately after a significant rainfall event until such time as adequate vegetation has become established on berms or other features which could cause sediment to be introduced into the forest or wetland system adjacent

to the site. The status of sediment and erosion control measures should be documented in the annual compliance assessment report.

6. Prior to final rehabilitation of the site, including final wetland rehabilitation, a Vegetation Management Plan will be prepared and submitted to the Ministry of Natural Resources, GRCA, and the Township of Puslinch. This report should provide details on the type, size, and location of native trees, shrubs and ground cover to be planted in selected areas of the site. On an annual basis, the health of the re-forestation project along the western portion of the site should be documented and submitted to the MNR as part of the annual compliance assessment report.
7. The ecological and aquatic monitoring, as determined by consultation with the MNR, will be implemented upon receipt of the licence.

Ecological and Aquatic Monitoring:

1. Frog call surveys will be undertaken in general accordance with the Canadian Wildlife Service's Marsh Monitoring Program at the Roszell wetland on an annual basis. Three evening visits will be completed when temperatures first exceed 6, 10 and 17°C. The results of these surveys will be provided to the MNR, GRCA and County of Wellington and Township of Puslinch as part of the annual compliance assessment report.
2. Salamander egg mass surveys will be conducted annually at the Roszell wetland. The results of this survey will be provided to the MNR, GRCA and County of Wellington and Township of Puslinch as part of the annual compliance assessment report.
3. During the spring high water period and the summer period, ecological inspections of the Roszell wetland and seepage areas of the Speed River Wetland Complex will be completed, focused on the wetland vegetation and flora. As part of these site inspections, photomonitoring (fixed point photography stations) and permanent 10X10 m vegetation monitoring plots will be established. Staff gauges may be established at some of the monitoring stations. Photo monitoring stations and vegetation monitoring plots will allow for repeated monitoring of events during baseline (pre-extraction), extraction and post-extraction conditions. The results of this survey will be provided to the MNR, GRCA and County of Wellington and Township of Puslinch as part of the annual compliance assessment report.
4. Prior to the initiation of below water table extraction at the site, a comprehensive report documenting existing baseline conditions of the Roszell wetland and seepage areas of the Speed River Wetland Complex will be completed, focused on wetland vegetation, flora, and amphibian breeding habitat. The results of this survey will be provided to the MNR, GRCA and County of Wellington and Township of Puslinch as part of the annual compliance assessment report.
5. Prior to initiation of below water table extraction at Lake 3, (i.e., after Lakes 1 and 2 are in place), a comprehensive report documenting the Roszell wetland and seepage areas of the Speed River Wetland Complex will be completed, focused on wetland vegetation, flora, and amphibian breeding habitat. The results of this

survey will be provided to the MNR, GRCA and County of Wellington and Township of Puslinch as part of the annual compliance assessment report.

6. Should significant changes in wetland vegetation (composition and/or structure) and/or use by amphibian breeding (including population estimates) be detected at any phase of operations at the Roszell Pit, the licensee will contact the MNR immediately to discuss implications and to activate the contingency program, as set out in the hydrogeological recommendations. If changes are observed, then it will be important to establish whether or not any documented changes are directly related to the pit operation versus other potential causes.
7. Annual spawning surveys of Main Creek and Tributaries 7, 8, and 9 will be undertaken to record spawning activity. The results of these spawning surveys will be provided to the MNR, GRCA and County of Wellington and Township of Puslinch as part of the annual compliance assessment report.
8. Prior to opening the pit, the licensee will contact landowners south of Roszell Road to ask permission to access their lands for the purpose of documenting the wetland boundary and characterizing the condition of existing aquatic resource features, i.e. pond, wetland, watercourses. Documentation of these features will be done using methods which can be repeated in the future to assess the impact, if any, of adjacent extraction activities on these features.
9. If the licensee is denied access by these land owners, prior to opening Lake 3, the licensee will again ask permission to access these same lands and monitor as deemed necessary.

3.0 MONITORING METHODS

3.1 Erosion/Sediment Control Monitoring

As a result of the proximity of aggregate extraction to the Speed River Wetland Complex and the topographic relief to the west of the aggregate extraction area, sediment control measures were recommended in the site plans.

Monitoring for the establishment and maintenance of sediment control measures was to be conducted immediately after significant rainfall events. Photos were to be taken of any significant sedimentation found.

3.2 Vegetation Monitoring

Wetland Vegetation Quadrat Sampling

Objective: The objective of the 2012 vegetation quadrat sampling was to document the vegetation composition (species and relative abundance) and structure (vertical structure within the wetland) before extensive extraction had occurred, to record the baseline vegetation community conditions.

The baseline data will provide a basis for comparison as the extraction progresses both above and below the water table. As noted previously, Fall is not an ideal time for monitoring of flowering herbaceous vegetation, and therefore in successive years monitoring will be conducted in Spring and Summer.

Data Collection Methods:
The locations of the six 10x10 m quadrats which were established in 2012 are shown on Figure 1. The exact locations of the 10x10 m quadrats were randomly selected, but were generally placed near the upslope seepage areas of some of the tributaries within the Speed River Wetland Complex adjacent to the Roszell Pit, and were sited near existing piezometer locations. The location of quadrat placement was selected to specifically document vegetation and conditions around significant groundwater seepage features that the hydrogeology consultants had identified and monitored along the eastern margin of the wetland, to the west of the extraction area. Quadrats were placed in these locations since this is where any change in groundwater discharge might be first observed and subsequently where vegetation changes could be first observed.

The centre of each quadrat was marked by a steel T-bar with the top sprayed white. The outer margins of each quadrat were marked by wooden stakes which had the tops sprayed orange. The ground vegetation was to be monitored during early Fall 2012 and in successive years will be monitored in both Spring and late Summer to ensure accurate identification of species and to capture plants blooming at different times throughout the season (CVC 2010). Four 1x1 m quadrats were then set-up to record the herbaceous species and their relative abundance within each of the 10x10 m quadrats. The 1x1 m quadrats were set-up so that the one corner of the quadrat was on the ordinal direction stake, with the quadrat being entirely inside the 10x10 m quadrat, see Figure 2. The percent cover that each species within the 1x1 m quadrat occupied, was recorded. The percent cover within each 1x1 m quadrat that roots, deadfall, or mosses occupied were also recorded. The water depth within each 1x1 quadrant was recorded. These steps were repeated for each of the 4 quadrats within each of the six 10x10 m quadrats. An example of a completed data sheet from 2012, with data from a vegetation plot at the Roszell Pit, is contained in Appendix 1.

In order to capture trends/changes in the higher strata within the 10x10 m quadrat, two transect lines were surveyed within each 10x10 m quadrat. The tree and shrub transect lines were conducted to record information about tree and shrub density, species composition, and strata (canopy, sub-canopy, and understory) in which they are present within each of the six 10x10 m quadrats. Trees or shrubs which were <10cm DBH were identified as being within the understory category for height class. For consistency between all six 10x10 m quadrats, the one transect line that was sampled ran north-south and the other ran east-west across each 10x10m quadrat. Along each of the tree and shrub transect lines data was collected for a1m wide area centered along the entire transect. Standing dead trees were also recorded, along with the strata in which they occurred. An example of a completed data sheet from 2012, with data from the tree and shrub transect, is contained in Appendix 2.

Photomonitoring:
As outlined in the site plans for the Roszell Pit, photomonitoring was to take place at fixed point locations so that photos can document potential changes to the vegetative conditions within the Speed River Wetland Complex adjacent to the Roszell pit.

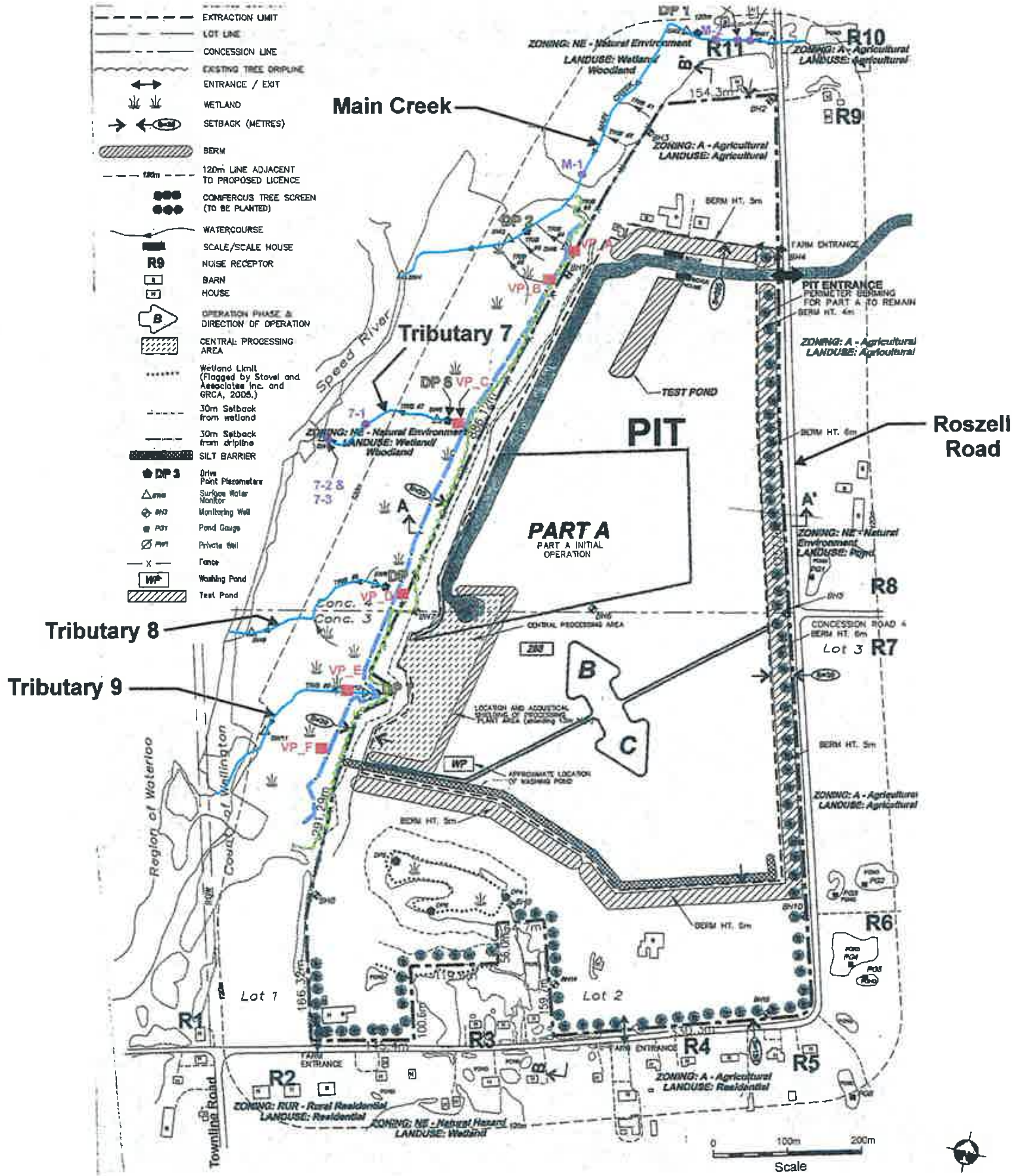


FIGURE 1. Location of Vegetation Plots and Creeks Surveyed and Locations of Trout Redds, 2012, Roszell Pit.

LEGEND

VP_A = Vegetation Plot & Photomonitoring Locations

= Watercourse in Which Spawning Surveys Were Conducted

=Wetland Limit (Flagged by Stovel & Associates Inc. and GRCA, 2005)

= Existing Tree Dripline

M-1 = Trout Redd Location

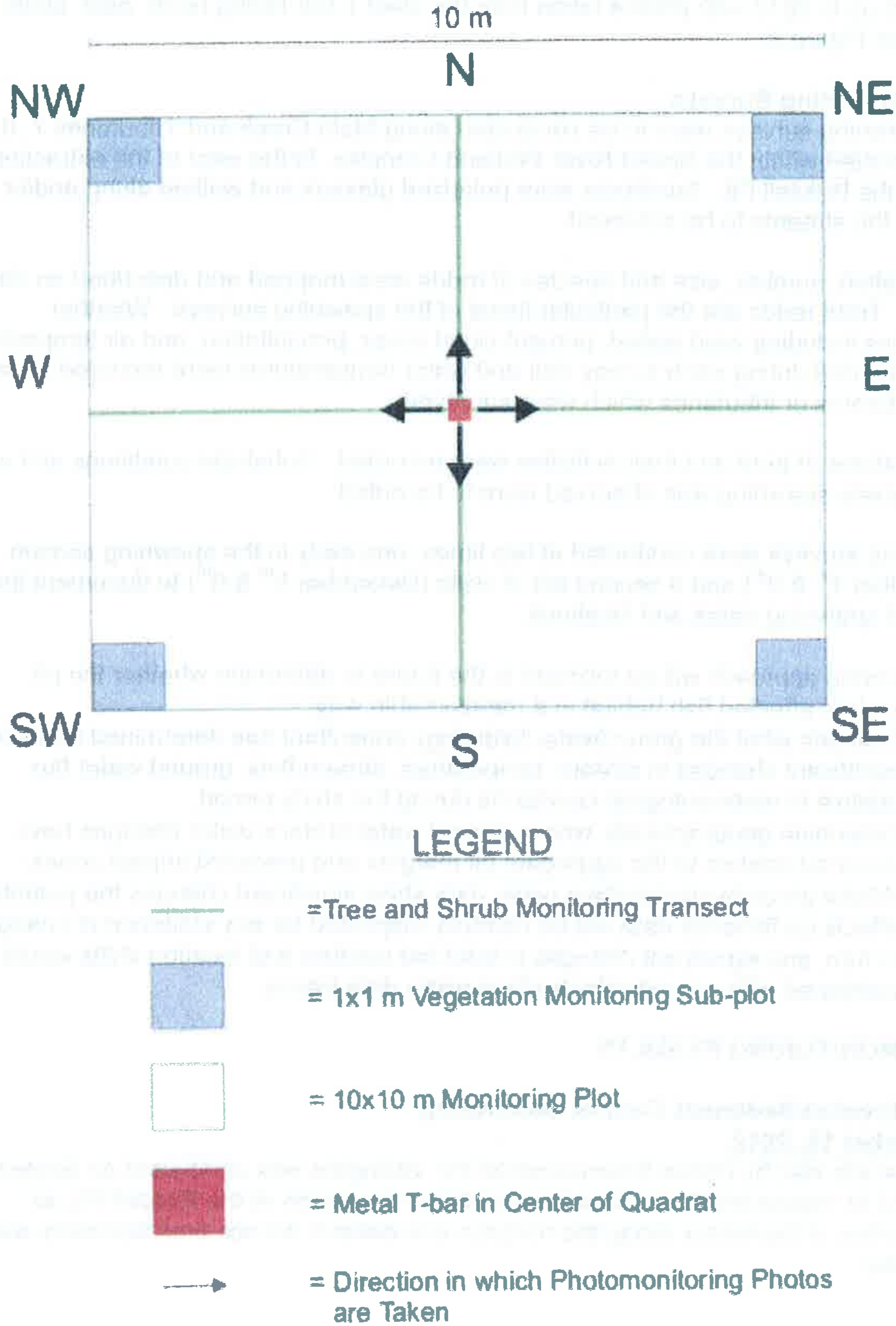
Base Map Source: Operational Plan Page 2 of 6. Stovel and Associates Inc. 2010.

DANCE ENVIRONMENTAL INC.

DE-382

December 12, 2012

Figure 2. Vegetation Monitoring Plot Layout and Position and Direction of Photomonitoring.



Photomonitoring locations were to be located at the steel T-bar in the center of each of the 10x10 m vegetation quadrats. A total of six fixed point photo monitoring locations were set-up in 2012 with photos taken from the steel T-bar facing north, east, south and west, see Figure 2.

3.3 Spawning Surveys

The spawning surveys were to be conducted along Main Creek and Tributaries 7, 8, and 9 located within the Speed River Wetland Complex, to the west of the extraction area of the Roszell Pit. Surveyors wore polarized glasses and walked along and/or in each of the streams to be surveyed.

The location, number, size and species of redds were mapped and described on data sheets. Trout redds are the particular focus of the spawning surveys. Weather conditions including wind speed, percent cloud cover, precipitation, and air temperature were recorded during each survey visit and water temperatures were recorded for each of the streams or tributaries which were surveyed.

Observations of trout and their activities were recorded. Substrate conditions and water depth where spawning was observed were to be noted.

Spawning surveys were conducted at two times: one early in the spawning season (November 7^{th} & 9^{th}) and a second set of visits (December 5^{th} & 6^{th}) to document the range of spawning dates and locations.

The following approach will be followed in the future to determine whether the pit operation has affected fish habitat in a measureable way:

- Evaluate what the groundwater/hydrology consultant has determined about any significant changes in stream temperature, stream flow, ground water flux relative to meteorological conditions during the study period;
- Determine geographically where ground water/surface water changes have occurred relative to the aggregate pit margins and predicted impact zones;
- Where groundwater/ surface water data show significant changes the potential effects on fisheries data will be carefully inspected for any evidence of changes
- In turn, any significant changes in trout red number and location shifts would be compared with groundwater/surface water data trends.

4.0 MONITORING RESULTS

4.1 Erosion/Sediment Control Monitoring

September 19, 2012:

An initial site visit by Dance Environmental Inc. biologists was conducted on September 19, 2012 to inspect erosion and sediment control measures at the Roszell Pit, as construction of the berms along the northern and eastern licence area boundary was underway.

Approximately 3-4 cm of rain had fallen over the September 17 and 18 period, so therefore in accordance with the site plans an inspection of erosion and sediment control measures was conducted.

A site inspection report summarizing the findings of the September 19, 2012 inspection was submitted to CBM staff on September 20, 2012. The site inspection report noted that the northern berm seemed to be completed but the eastern berm was still under construction with equipment working to shape the berm. It was noted that neither the eastern nor northern berm showed any signs of being seeded.

No siltation fencing was observed to be present on the portions of the site visited, including the area between the berm and the wetland and springs to the west.

Despite the rainfall during the previous days, no significant erosion of soil from the berms had occurred.

Recommendations of the site inspection included:

- Both the northern and eastern berms should be seeded or otherwise treated to stabilize soils as soon as possible.
- The berm soils should not be left unprotected going through the Winter and Spring.
- Particular attention should be given to the northern berm adjacent to the wetland and springs.
- Silt fencing should be installed immediately as it as it is noted in the Site Plans Ecological Mitigation Item 5 that these measure should have been in place prior to stripping and berm construction.

October 1, 2012:
During the vegetation plot set-up and monitoring on October 1, 2012 construction activities on the north and eastern berm were noted. However, no significant rainfall events occurred at this time.

CBM staff were provided with an update on the sediment and erosion control status on October 10, 2012 via email. The October 10, 2012 email noted that no silt fence had been installed in areas noted in the September 19, 2012 site inspection report, despite topsoil placement on the berms progressing. No sediment was found to be moving into the wetland to the west of the pit licence area.

Checks for erosion/sedimentation were also made during site visits on October 31, November 7 & 9, and December 5 & 6, 2012. No sediment was found to be leaving the site, nor entering the PSW to the west on any of these dates. As of December 6, 2012 no sediment control fence had been installed.

4.2 Vegetation Monitoring

A total of six permanent vegetation monitoring plots were set-up near the eastern edge of the Speed River Wetland Complex, adjacent to extraction area of the Roszell Pit.

Vegetation monitoring quadrats were set-up on September 28, 2012 (Plots A, B, and C) and October 1, 2012 (Plots D, E, and F). Vegetation plot data were collected at the 4 sub-plots of each of the six vegetation plots on either September 28, 2012 or October 1, 2012. No significant frost damage was evident to the plant communities sampled.

The UTM co-ordinates (obtained with a hand-held GPS) for the vegetation monitoring plots A to F are shown in Table 1.

Table 1. UTM Co-ordinates for the Center of Vegetation Monitoring Plots and Photo Monitoring Locations

Plot Name	UTM Co-ordinates
Plot A	17T 0557139 4812349
Plot B	17T 0557132 4812259
Plot C	17T 0557057 4811973
Plot D	17T 0557042 4811849
Plot E	17T 0557005 4811745
Plot F	17T 0557017 4811664

It was noted that cattle from the farm to the north of the Roszell Pit had access to the Speed River Wetland Complex in the area of vegetation plots A and B.

Vegetation Plot A:
Vegetation plot A was located in the upslope area where seepage begins which becomes Tributary #4, See Figure 1. The dominant taxa, their percent cover, and total number of species for each sub-plot are shown in Appendix 3.
The tree and shrub transect data indicates limited abundance of trees and shrubs within vegetation Plot A with a maximum of 9 trees or shrubs in total per transect, all of which were in the understory (<10cm DBH). Three tree and shrub species were located along the N-S and E-W transects in total including: Eastern White Cedar, Yellow Birch and Glossy Buckthorn.

Vegetation Plot B:
Vegetation Plot B was located approximately 33 m to the southwest of Plot A, near the eastern wetland edge of the Speed River Wetland Complex. Vegetation Plot B was located in the upstream seepage area of Tributary #6, see Figure 1. The dominant taxa, their percent cover, and total number of species for each sub-plot are shown in Appendix 3. No standing water was present within the 10x10 m quadrat but the soil within the vegetation plots were saturated with water, indicating water to be just below the surface.

A total of 4 tree and shrub species were located within the area sampled along the north-south and east-west transects including: Eastern White Cedar, Glossy Buckthorn, Yellow Birch, and Alternate-leaved Dogwood. Within vegetation Plot B a maximum of 21 trees or shrubs in total per transect were found, with all occurring in the understory (<10cm DBH).

The tree and shrub transect data indicates Plot B contains slightly more trees and shrubs than Plot A (and similar in that they were all in the understory), but it is still a generally open habitat of predominantly herbaceous vegetation. No dead trees or shrubs were located within the north-south or the east-west transects.

Vegetation Plot C:
The vegetation Plot C was located in fresh-moist cedar swamp. Vegetation Plot C was located in the upstream seepage area of Tributary #7 and near drive point piezometer DP8, see Figure 1. The dominant taxa, their percent cover, and total number of species for each sub-plot are shown in Appendix 3. Within the 4 vegetation quadrats sampled in Plot C, water depths were a maximum of 1mm and the soils were saturated indicating where there was no surface water, there was water near the surface.

Tree and shrub diversity within the transects was very limited, with only two species being present, Glossy Buckthorn and Eastern White Cedar. Eastern White Cedar was present in the canopy, sub-canopy and understory.

Vegetation Plot D:
The vegetation Plot D was located in wet cedar swamp located in the upstream seepage area which enters Tributary #8 near the eastern edge of the wetland. Vegetation Plot D was located just east of drive point piezometer DP3. The dominant taxa, their percent cover, and total number of species for each sub-plot are shown in Appendix 3.

Within vegetation Plot D two tree species were encountered along the north-south and east-west transects: Eastern White Cedar and Yellow Birch. This vegetation plot is located within cedar swamp, with Eastern White Cedar and Yellow Birch noted as canopy species along the transects conducted for Plot D. Within the north-south and east-west transects combined a total of 10 dead Eastern White Cedar were noted within the understory.

Vegetation Plot E:
The vegetation Plot E was located in fresh-moist cedar swamp. Vegetation Plot E was located in a seepage area approximately 30m downslope of the trail along the Speed River. The seepage area in which vegetation plot E was located is part of Tributary #9 and is located downslope of drive point piezometer DP7, see Figure 1. The dominant taxa, their percent cover, and total number of species for each sub-plot are shown in Appendix 3.

A total of 4 tree and shrub species were located within the area sampled along the north-south and east-west transects including: Eastern White Cedar, Glossy Buckthorn, Yellow Birch, and Black Ash. Within vegetation plot F Glossy Buckthorn dominated the understory of both the north-south and east-west transects. The majority of trees and shrubs in the vegetation plot were alive but 1 dead Black Ash of canopy height and 1 dead Eastern White Cedar were found in the understory.

Vegetation Plot F:
The vegetation Plot F was located in a fresh-moist cedar swamp, dense with Eastern White Cedar. Vegetation Plot F was located in a seepage area downslope of the trail along the Speed River, to the west of the southeastern corner of the extraction area of the Roszell Pit. The closest drive point piezometer is DP7, to the northeast. Vegetation plot F is not in a seepage area with contributes to a tributary through surface water flow, Tributary #9 is the closest tributary to this vegetation plot and is located to the west of it.

The tree and shrub transect data from vegetation plot F indicates a low tree diversity with only Eastern White Cedar and a single White Birch being present, and no shrub species along the transects sampled. The vegetation plot data indicates the vegetation plot to have both a dense canopy and understory of Eastern White Cedar, with only a single standing dead Eastern White Cedar in the canopy.

Photo Monitoring Stations:
A total of six fixed point photo stations were established in 2012, which provide baseline photos of the Speed River Wetland Complex located to the west of the Roszell pit. Photos were taken at each photo monitoring station facing north, east, south and west, from the center T-bar of the 10x10 m plots. Photos were taken at all of the photo monitoring stations on October 1, 2012. A photo from each of the six vegetation plots can be seen in Appendix 4.

4.3 Trout Redds

Two surveyors: Kevin Dance and Ken Dance undertook the redd surveys. The Main Creek and Tributaries 7 & 8 were surveyed on November 7 and December 5, 2012. Tributary 9 was surveyed on November 9 and December 6, 2012.

Although the water temperatures were 6.0^{oC}, temperatures at which Brook Trout spawn, the November visits yielded few redd sightings and the December visits are thought to indicate the numbers and locations of trout redds for 2012.

Table 2 lists the redd numbers by watercourse. Main Creek had the most redds with redds occurring in 4 locations. Tributary 7 had 5 redds distributed over 3 locations, while tributaries 8 & 9 had no redds.

The locations of the Main Creek and Tributary 7 redds, are shown on Figure 1.

Field data sheets have been archived for future reference.

This redd monitoring data provides baseline data before extensive extraction occurs in the Roszell Pit.

Table 2. Brook Trout Redd Survey Results, Roszell Pit: 2012

Tributary Name	Station	Details
Main Creek	M-1	Multiple redd -2 or 3 redds
	M-2	2 redds
	M-3	1 redd
	M-4	3 redds
Tributary 7	7-1	2 redds
	7-2	2 redds
	7-3	1 redd
Tributary 8	No redds	
Tributary 9	No redds	

5.0 Discussion

Data interpretation in the future will assess the relative abundance of the obligate wetland plants as well as the relative abundance of non-native species (such as Glossy Buckthorn, and Coltsfoot) and herbaceous species of drier habitats as their increased abundance may indicate changes in groundwater discharge.

We will use a soil moisture probe in successive years in order to collect information on soil moisture at each of the sub-plots. Soil moisture will be determined near the staked corner of each of the four sub-plots in each of the six vegetation monitoring locations.

As outlined in the Site Plans for the Roszell Pit, vegetation monitoring in 2013 will be conducted in the Spring and Summer. Conducting the vegetation monitoring in the Spring and Summer will mean that any Spring flowering plants within the vegetation subplots will be able to be recorded and will cover the time when most flowering plants, sedges and grasses are in flower and this will facilitate identification to species.

6.0 BIBLIOGRAPHY

Argus, G.W., K.M. Pryer, D.J. White and C.J. Keddy. 1982-87. Atlas of Rare Vascular Plants of Ontario. Parts 1 to 4. National Museums of Canada. Ottawa.

Credit Valley Conservation (CVC). 2010. Monitoring Wetland Integrity within the Credit River Watershed: Chapter 3 wetland vegetation 2005-2009. Credit Valley Conservation. Meadowvale, ON.

Dougan & Associates. 2009. Guelph Natural Heritage Strategy. Phase 2: Terrestrial Inventory and Natural Heritage System. VOLUME 2: TECHNICAL APPENDICES. Pp 46.

Lee, H. et al. 1998. Ecological Land Classification for Southern Ontario, First Approximation and Its Application. SCSS Field Guide FG-02.

Oldham, M.J., W.D. Bakowsky and D.A. Sutherland. 1995. Floristic Quality Assessment System for Southern Ontario. NHIC, MNR, Peterborough.

Riley, J.L. et al.. 1989. Distribution and Status of the Vascular Plants of Central Region, Ontario Ministry of Natural Resources. Ontario Ministry of Natural Resources. Pp.110.

Report prepared by:

K.W. Dance, M.Sc.
President
Dance Environmental Inc.

K.S. Dance, M.E.S.
Terrestrial and Wetland Biologist
Dance Environmental Inc.

APPENDIX 1.

Completed Herbaceous Vegetation Data Form

for a Sub-plot, 2012

Roszell Pit

Dance Environmental Inc.

Herbaceous Monitoring Plots

SPECIES LIST

Site:	Roszell Pit		
Sampling Plot #:	F	Subplot #:	N W
UTM (centre of Plot):			
Date:	Oct, 1/12	Time:	Start
Surveyor(s):	KSD, KWD		End
Weather:		Water Depth:	Ø

Species	Solitary	<1%	1-5%	6-15%	16-30%	31-50%	51-75%	76-100%	Notes
Canada mayflower		✓							
Moss sp.				✓					
Glossy Buckthorn		✓							seedlings
Sedge sp.		✓							
Eastern White Cedar	✓								seedling
dead wood		✓							
liverwort sp.	✓								

APPENDIX 2.

Completed Tree and Shrub Inventory Data Form

for a Sub-plot, 2012

Roszell Pit

Dance Environmental Inc.
Tree Monitoring Inventory
SPECIES LIST

Page 1 of 2

Site:	Roszell Pit
Sampling Plot #:	F ; north-South transect
UTM (centre of Plot):	See photomonitoring Photo log
Date:	Oct. 1/12 — Time: Start
Surveyor(s):	KSD, KWD — End
Weather:	

Layers: 1=canopy 2=sub-canopy 3=understorey 4=ground layer

Species	Alive or Dead	Canopy Layer 1	2	3
Eastern Wh. Cedar	A	9+4=13	1	6+8=14
	D	0	0	0
White Birch	A	1		

Notes:

Dance Environmental Inc.
Shrub Monitoring Inventory
PLANT SPECIES LIST

Page 2 of 2

Site:	Roszell Pit
Sampling Plot #:	F ; East-west transect
UTM (centre of Plot):	see photomonitoring photo log
Date:	Oct. 1/12 — Time: Start
Surveyor(s):	KSD, KWD — End
Weather:	

Layers: 1=canopy 2=sub-canopy 3=understorey 4=ground layer

Species	Alive or Dead	Canopy Layer 1	2	3
Eastern white Cedar	A	8+4=12	3+3=6	2+2=4
	D	1	0	0

Notes:

APPENDIX 3.

Summary of Herbaceous Vegetation

in each Sub-plot

Appendix 3. Summary of Herbaceous Vegetation in each Sub-plot.

Plot	Sub-plot	Dominant Taxa & Percent Cover for the Taxa	Number of Taxa in the Sub-plot	Comments
A	NE	*Carex hystericina* (51-75%); Common Mint (31-50%) *Poa compressa* (6-15%)	21	Deadfall encompasses 6-15% of cover in sub-plot.
	NW	Moss sp. (51-75%) Bulblet Fern (6-15%) *Agrostis sp.* (6-15%)	16	Glossy Buckthorn seedlings present (<1%).
	SW	Coltsfoot (31-15%) *Carex sp.* (6-15%) Bulblet Fern (6-15%) Field Horsetail (6-15%)	14	Common Buckthorn sapling present (solitary).
	SE	*Carex sp.* (31-50%) Watercress (31-50%) Bluegrass (16-30%)	16	Deadfall encompasses 6-15% of cover in sub-plot.
B	NE	Carex *hystericina* (31-50%) Moss sp. (1-5%)	18	Glossy Buckthorn seedlings present (<1%).
	NW	Yellow Birch –saplings (51-75%) Moss Spp. (51-75%) Glossy Buckthorn –seedlings (31-50%)	10	Deadfall encompasses 6-15% of cover in sub-plot.
	SW	*Poa compressa* (31-50%) Tall Buttercup (6-15%)	14	Glossy Buckthorn seedlings present (<1%).
	SE	Tall Buttercup (76-100%) *Poa compressa* (6-15%) *Carex hystericina* (6-15%)	15	Deadfall encompasses 6-15% of cover in sub-plot.

Appendix 3. Summary of Herbaceous Vegetation in each Sub-plot.

Plot	Sub-plot	Dominant Taxa & Percent Cover for the Taxa	Number of Taxa in the Sub-plot	Comments
A	NE	*Carex hystericina* (51-75%); Common Mint (31-50%) *Poa compressa* (6-15%)	21	Deadfall encompasses 6-15% of cover in sub-plot.
	NW	Moss sp. (51-75%) Bulblet Fern (6-15%) *Agrostis sp.* (6-15%)	16	Glossy Buckthorn seedlings present (<1%).
	SW	Coltsfoot (31-15%) *Carex sp.* (6-15%) Bulblet Fern (6-15%) Field Horsetail (6-15%)	14	Common Buckthorn sapling present (solitary).
	SE	*Carex sp.* (31-50%) Watercress (31-50%) Bluegrass (16-30%)	16	Deadfall encompasses 6-15% of cover in sub-plot.
B	NE	Carex *hystericina* (31-50%) Moss sp. (1-5%)	18	Glossy Buckthorn seedlings present (<1%).
	NW	Yellow Birch –saplings (51-75%) Moss Spp. (51-75%) Glossy Buckthorn –seedlings (31-50%)	10	Deadfall encompasses 6-15% of cover in sub-plot.
	SW	*Poa compressa* (31-50%) Tall Buttercup (6-15%)	14	Glossy Buckthorn seedlings present (<1%).
	SE	Tall Buttercup (76-100%) *Poa compressa* (6-15%) *Carex hystericina* (6-15%)	15	Deadfall encompasses 6-15% of cover in sub-plot.

Appendix 3. Summary of Herbaceous Vegetation in each Sub-plot Cont'd.

Plot	Sub-plot	Dominant Taxa & Percent Cover for the Taxa	Number of Taxa in the Sub-plot	Comments
C	NE	*Carex sp.* (51-75%) Bulblet Fern (6-15%)	9	Glossy Buckthorn seedlings present (<1%).
	NW	*Carex sp.* (6-15%) Dwarf Scouring Rush (1-5%) Shade Horsetail (1-5%)	7	Glossy Buckthorn seedlings present (<1%).
	SW	Shade Horsetail (6-15%) Bulblet Fern (6-15%) Rough-leaved Goldenrod (1-5%) Moss Sp. (1-5%)	10	
	SE	Shade Horsetail (31-50%) Coltsfoot (16-15%) Bulblet Fern (1-5%)	9	Bare soil comprised 6-15% cover.
D	NE	Dwarf Scouring Rush (51-75%) Bulblet Fern (16-31%)	3	Deadfall comprised 1-5% of cover within the plot.
	NW	Bulblet Fern (31-50%) Shade Horsetail (1-5%) Dwarf Scouring Rush (1-5%)	4	The roots of Eastern White Cedar comprised 6-15% of the plot. Common Buckthorn seedling present (solitary).
	SW	*Carex sp.* (16-30%) Bulblet Fern (1-5%)	6	The roots of Eastern White Cedar comprised 51-75% of the plot.
	SE	Bulblet Fern (16-30%)	4	Deadfall comprised 16-30% cover. Stone comprised 6-15% cover. Glossy Buckthorn seedlings present (solitary).

Appendix 3. Summary of Herbaceous Vegetation in each Sub-plot Cont'd.

Plot	Sub-plot	Dominant Taxa & Percent Cover for the Taxa	Number of Taxa in the Sub-plot	Comments
E	NE	Marsh Fern (<1%) Cinnamon Fern (<1%) Moss sp. (<1%)	3	Majority of plot was unvegetated.
	NW	Grass sp. (76-100%) Moss spp. (51-75) Shade Horsetail (6-15%	10	Buckthorn sp. Seeding were present (<1%)
	SW	Moss sp. (1-5%) Marsh Fern (<1%) *Carex sp.* (<1%) Glossy Buckthorn (<1%)	4	Deadfall comprised 16-30% of cover within the plot.
	SE	Moss Sp. (6-15%) Bulblet Fern (<1%) Grass sp. (<1%) Buckthorn Sp. (<1%)	5	Deadfall comprised 6-15% of cover. Roots of Eastern White Cedar comprised 6-15% of cover within the plot.
F	NE	Moss sp. (1-5%) Bulblet Fern (<1%)	2	Deadfall comprised 6-15% of cover within the plot.
	NW	Moss Sp. (6-15%) Canada Mayflower (<1%) *Carex sp.* (<1%)	7	Glossy Buckthorn seedlings present (<1%).
	SW	Dwarf Scouring Rush (31-50%) Moss Sp. (31-50%)	10	Glossy Buckthorn seedlings present (<1%).
	SE	Moss Sp. (<1%) Glossy Buckthorn (<1%)	3	Bare soil comprised 51-75% of cover.

APPENDIX 4.

Photos of Vegetation Monitoring
Plots A-F,
2012

Photo 1. Vegetation Plot A, facing N from Steel T-bar.

Photo 2. Vegetation Plot B, facing E from Steel T-bar.

Photo 3. Vegetation Plot C, facing E from Steel T-bar.

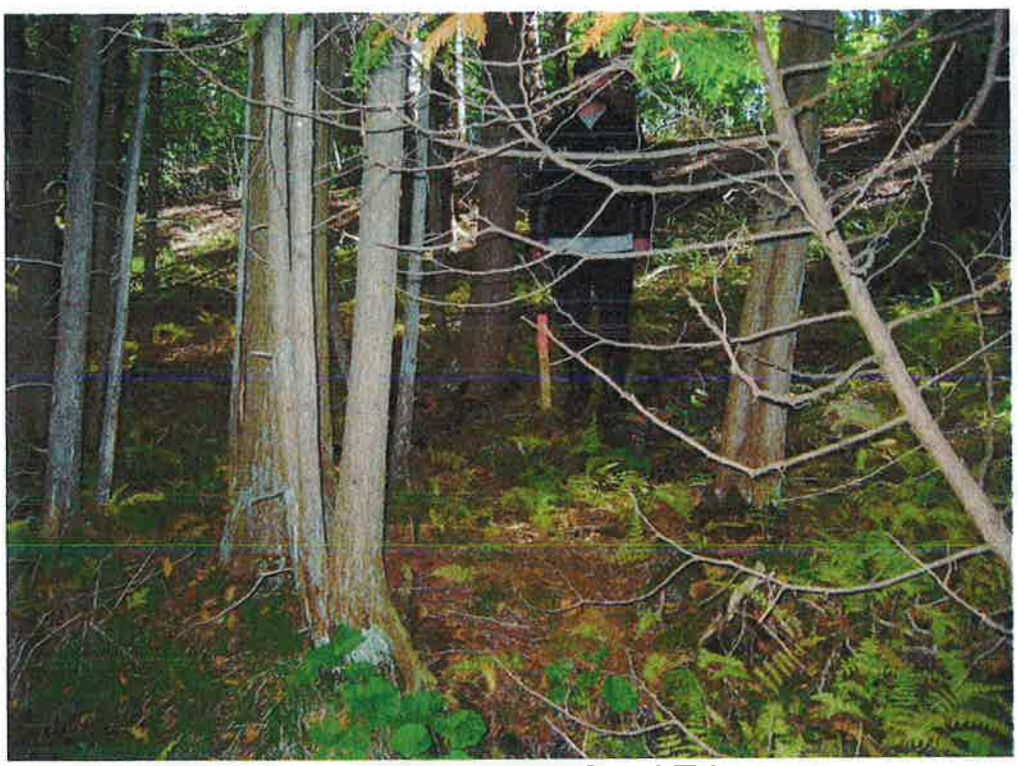


Photo 4. Vegetation Plot D, facing E from Steel T-bar.

Photo 5. Vegetation Plot E, facing E from Steel T-bar.

Photo 6. Vegetation Plot F, facing E from Steel T-bar.

APPENDIX 5.

C.V.s
of
E.I.S. Authors.

K.W. Dance, M.Sc.

K.S. Dance, M.E.S.

KEN DANCE
CONSULTING BIOLOGIST

EDUCATION

- M.Sc., Biology, 1977; University of Waterloo
- B.Sc., Honours Biology, 1975; University of Waterloo

COURSES

- Butternut Health Assessment Workshop – OMNR, 2010
- Preparation of E.I.S. Reports – OMNR, 1995
- Bioassessments & Biological Criteria for Warmwater Streams – AFS 1993
- Ontario Wetland Evaluation System, 3rd Edition – OMNR, 1993
- Creating and Using Wetlands – University of Wisconsin, 1992
- Fluvial Geomorphology – University of Guelph and AFS, 1992

PROFESSIONAL EXPERIENCE

1991 to date. Consulting Biologist and President, Dance Environmental Inc. The firm has completed over 360 assignments.

Mr. Dance has been consulting for 35 years and has gained extensive experience on the following types of studies: ecological inventory, biological monitoring, environmental planning, Species at Risk Overall Benefit Plans, watershed management, no net loss of fish habitat, tree saving plans, vegetation management, wetland Environmental Impact Studies, non-game wildlife and environmental assessments.

He also has experience in biological resource inventory, impact prediction, management option development and comparison, attendance at public information centres and as an expert witness before boards and tribunals.

1988-1991 Senior Biologist, Ecologistics Limited. As Senior Biologist, Ken was responsible for review of all biological projects. He consulted to private and public sector clients on management of fish, vegetation, and wildlife resources.

1985-1988 Associate and Manager of Biological Services, Gartner Lee Limited. Mr. Dance consulted to industrial and government clients.

1982-1985 Senior Biologist and Project Manager, Gartner Lee Limited.

1977-1982 Biologist and Project Manager, Ecologistics Limited.

1975-1976 Research Technician, University of Waterloo. Mr. Dance acted as a research technician on a PLUARG contract study of two streams.

KEN DANCE
CONSULTING BIOLOGIST

PROJECT EXAMPLES

E.I.S. Reports

Undertook inventory, site assessments and reporting for over one thousand sites relating to residential, industrial, aggregate and waste management proposals.

Highways and Roads

Examples of Environmental Assessment and highway construction projects, which Mr. Dance has worked on follow.

- Parkhill Road and Bridge, Cambridge – inspection of in-water construction to minimize erosion and sedimentation and construction of fish pool habitat.
- Gordon Street Bridge, Guelph – inspection of in-water construction and placement of fish habitat rock, 2000-2002.
- Highway 60 at Huntsville – inspection of in-water work during replacement of 4 culverts, including trout habitat; inspection of tree and shrub plantings.
- Highway 35 Minden – inspection of stream habitat restoration construction and inspection of tree and shrub plantings.
- Wellington County Roads – fisheries assessments for 3 culvert replacements.

Wastewater Management

- Etobicoke and Mimico Creek Watersheds: Toronto Wet Weather Flow Management Master Plan – ecological consultant addressing fish, wildlife, forests, wetlands and Lake Ontario near shore habitat.
- Thunder Bay Water Pollution Prevention Study – biological consultant addressing fish, wildlife, forests, wetlands and Lake Superior near shore habitat.
- Cincinnati and Cleveland, Ohio – CSO Review Studies: biological consultant addressing existing impacts on aquatic ecosystems and advice regarding solution options.
- Wastewater Treatment Plant Class E.A.s: biological consultant for Ayr, Flesherton, Ingersoll, Keswick, Lambeth, Tavistock and Wellesley plant upgrades/expansions.

Water Supply

Biological/fisheries assessment regarding water taking and/or facility siting for projects in Elmira, Georgetown, Acton, Cambridge, Caledon and Brampton.

Publications

Published chapters in three books. Over forty papers on fish, wildlife, wetland and vegetation management, as well as water quality and fisheries. Articles in publications such as Ontario Birds, Ontario Field Biologist, Newsletter of the Field Botanists of Ontario, Recreation Canada, Landscape Architectural Review and the Water Research Journal of Canada.

04/12

Kevin Dance, M.E.S.
Terrestrial Biologist and Project Manager

EDUCATION

- Masters of Environment and Resource Studies, (2011); University of Waterloo, Waterloo, Ontario. *Thesis Title: "Raptor Mortality and Behavior at Wind Turbines Along the North Shore of Lake Erie During Autumn Migration 2006-2007"*
- Honours Bachelor of Environment and Resource Studies with Parks Option, (2006); University of Waterloo, Waterloo, Ontario

CERTIFICATIONS & PROFESSIONAL ASSOCIATIONS

- OMNR, Ontario Wetland Evaluation System, North Bay, 2012
- OMNR Ecological Land Classification for Southern Ontario, Lindsay, 2010
- Diploma of Environmental Assessment, University of Waterloo, 2006
- Transportation of Dangerous Goods, Safety Services Canada, 2008
- Member, Hawk Migration Association of North America
- Member, Bird Studies Canada (BSC)
- Member, Ontario Field Ornithologists (OFO)
- Member, Kitchener-Waterloo Field Naturalist Club (KWFN)

AREAS OF PROFESSIONAL EXPERIENCE

Dance Environmental Inc. is a firm which has been providing environmental consulting services for over 20 years (est. 1991) throughout Ontario.

Kevin Dance has over 5 years of consulting experience on a wide range of projects throughout Ontario. Kevin specializes in inventories, evaluations, research and impact studies of natural resources. He is experienced in identifying important natural features and evaluating the significance and sensitivity of these features. Kevin regularly works with multidisciplinary study teams focusing on the management of terrestrial and wetland ecosystems.

Terrestrial Vegetation and Wildlife Studies
Kevin has worked on various studies investigating a variety of wildlife habitats, determining wildlife populations including numbers and seasonal trends and monitoring of long-term impacts of developments on species. Kevin has conducted a wide range of monitoring surveys and inventories to identify the presence of wildlife on study sites as well as species specific guided surveys for Species at Risk and Species of Conservation Concern including Bobolink, Barn Swallow, Eastern Meadowlark, American Badger, Blanding's Turtle, Jefferson Salamander, Common Nighthawk, Eastern Whip-poor-will, Henslow's Sparrow, Short-eared Owl and Least Bittern. He has completed numerous detailed vegetation community mapping inventories and conducted vegetation monitoring at permanent sample plots, as well as transects and random sample quadrats to assess short-term and long-term impacts of developments on vegetation. Kevin is trained and experienced in applying the Ecological Land Classification System in projects in southern Ontario to delineate, describe and map vegetation communities.

Aquatic Studies
Kevin has assisted with numerous long-term fish monitoring programs using electrofishing to sample reaches of streams to assess and monitor development impacts to cold water streams. Kevin has experience collecting fish during electrofishing sampling, fish identification, marking and measuring. He also has experience identifying aquatic and wetland vegetation as well as collection of aquatic habitat data including stream depth, temperature, stream bed composition,

Office: 68 Hohner Avenue Kitchener, Ontario, N2H 2V4 **Tel:** (519) 504-4819 **Email:** kevin_dancenv@rogers.com

flow speed and invertebrate sampling. Kevin has assisted with electrofishing surveys and aquatic habitat assessments within Wellington County and the Region of Waterloo.

Kevin's specific terrestrial expertise includes:
- wildlife and vegetation habitat mapping, evaluations, and research.
- surveys of plants, birds, mammals, reptiles, amphibians, dragonflies and butterflies.
- identification of rare and sensitive species and habitats.
- development of monitoring methodologies for Species at Risk
- preparing "Overall Benefit Plans" for Species at Risk
- Obtaining permitting from MNR to conduct Jefferson Salamander trapping surveys
- over 10 years of bird identification experience
- analysis of potential wildlife corridors.
- Short-term and long-term monitoring techniques for fauna

Wetland Studies
Kevin is certified to conduct Ontario Wetland Evaluations and has worked in habitats throughout Ontario using the Ontario Wetland Evaluation System for Wetlands in southern and northern Ontario. Kevin has also participated in numerous studies focusing on the impact of development on wetland ecology and function.

Kevin's specific wetland expertise includes:
- inventories and mapping of wetland flora and fauna.
- wetland evaluations using the Ontario Wetland Evaluation System (OWES).
- wetland boundary delineation
- wetland Environmental Impact Studies (EISs).

Renewable Energy Projects
Wind Power / Solar Projects
Kevin has extensive experience conducting and organizing both pre-construction and post-construction studies at wind farms in Ontario, Manitoba and Alberta. Kevin has been involved in a range of roles for post-construction studies including the development of monitoring methodologies for mortality searches, scavenger removal trials and searcher efficiency studies. Kevin has been involved in post-construction studies at four large scale wind farms and has conducted pre-construction studies at over a fifteen wind farms throughout Ontario, Manitoba and Alberta. Kevin has conducted field surveys or records reviews for over a dozen proposed solar parks.

Kevin's specific renewable energy expertise includes:
Wind
- development of mortality search methodologies and conducting mortality searches
- organizing and conducting scavenger removal studies and searcher efficiency trials
- identification of bird and bat fatalities
- incorporation of provincial and federal government policies and guidelines into monitoring methodologies
- developing study methods for pre-construction wind farm studies, including: migration surveys (dawn and dusk), daytime soaring surveys, waterfowl surveys, shorebird surveys, winter raptor and diurnal owl surveys, walking transect surveys, and driving transect surveys.
- identification of and evaluating habitats of significant wildlife species
- use of marine radar for determining bat passage rates and abundance

Solar
- collection of field data required to complete wetland evaluations
- identification and mapping of wetland boundaries
- evaluation and identification of significant wildlife habitats
- conducting records reviews

EMPLOYMENT HISTORY

Terrestrial Biologist and Project Manager
Dance Environmental Inc., Kitchener, Ontario. 2011 to present

Terrestrial and Wetland Biologist
Natural Resource Solutions Inc., Waterloo, Ontario. 2008 to 2011

Environmental Scientist
Stantec Ltd., Guelph, Ontario. 2006 to 2007

Avian Field Technician –Wood Thrush research within the Region of Waterloo.
Canadian Wildlife Service and University of Waterloo, Waterloo, Ontario 2003 to 2005

Terrestrial Biologist
Dance Environmental Inc., Drumbo, Ontario 2001 to 2003

PUBLICATIONS AND PRESENTATIONS

Dance, K.S. 2011. "Raptors and Wind Farms". Oral Presentation. Ruthven Park 2nd Annual For The Birds Festival. September 17, 2011.

Dance, K. S. 2010. On the Wind: A Discussion of Raptors and the Wind Industry. Oral Presentation. Owen Sound Field Naturalist Club (OSFN). September 9, 2010.

Dance, K. S., Dance, K. W. 2010. "Raptors on the Wind". Oral Presentation. Kitchener-Waterloo Field Naturalist Club (KWFN). March 22, 2010.

Dance, K. S., Dance, K. W. 2010. Review of Raptor and Turbine Interaction Literature: the Case of the Erie Shores Wind Farm. Oral Presentation. RARE Charitable Research Reserve, Cambridge, ON. January 23, 2010.

Dance, K. S. R. James, L. Friesen, S. Murphy. 2009. "Raptor Behavior and Mortality (Erie Shores Wind Farm)". Poster Presentation. Canadian Wind Energy Association Annual Conference & Exhibition. September 20-23, 2009.

Dance, K. S. R. James, L. Friesen, S. Murphy. 2009. "Migrant Raptor Behavior and Mortality (at the Erie Shores Wind Farm)". Poster Presentation. A.D. Latornell Conservation Symposium. Nottawasaga, Ontario.

ac Stan

#16b

Dufferin Aggregates
2300 Steeles Ave W, 4th Floor
Concord, ON L4K 5X6
Canada

December 14, 2012

Al Murray
Guelph Area Team Supervisor
Ministry of Natural Resources
Guelph District
1 Stone Road West
Guelph, Ontario
N1G 4Y2

RECEIVED
DEC 14 2012
Township of Puslinch

Attention: Mr. Al Murray

Re: Monthly Monitoring Report
Mill Creek Pit, License #5738
Township of Puslinch, Wellington County

Please find enclosed the required monitoring data for the month of November 2012. As indicated, there were no exceedences in this month.

If you have any questions, please do not hesitate to call.

Sincerely,

Ron Van Ooteghem
Site Manager

C.c.
Brenda Law (Township of Puslinch)
Sonja Strynatka (GRCA)
Kevin Mitchell (Dufferin Aggregates)
University of Guelph

Monthly Reporting
Mill Creek Aggregates Pit
November 2012

Date	DP21 (mASL)	Threshold Value (mASL)	Exceedance
12-Nov-12	305.92	305.58	NO
16-Nov-12	305.80	305.58	NO
22-Nov-12	305.76	305.58	NO
28-Nov-12	305.74	305.58	NO

Date	BH13 (mASL)	DP21 (mASL)	Head Difference (m)	Threshold Value (m)	Exceedance
12-Nov-12	306.17	305.92	0.25	0.09	NO
16-Nov-12	306.06	305.80	0.26	0.09	NO
22-Nov-12	306.03	305.76	0.27	0.09	NO
28-Nov-12	306.01	305.74	0.27	0.09	NO

Date	DP17 (mASL)	Threshold Value (mASL)	Exceedance
12-Nov-12	305.33	305.17	NO
16-Nov-12	305.26	305.17	NO
22-Nov-12	305.25	305.17	NO
28-Nov-12	305.24	305.17	NO

Date	BH92-12 (mASL)	DP17 (mASL)	Head Difference (m)	Threshold Value (m)	Exceedance
12-Nov-12	305.44	305.33	0.11	0.04	NO
16-Nov-12	305.40	305.26	0.14	0.04	NO
22-Nov-12	305.36	305.25	0.11	0.04	NO
28-Nov-12	305.34	305.24	0.10	0.04	NO

Date	DP3 (mASL)	Threshold Value (mASL)	Exceedance
12-Nov-12	304.84	304.54	NO
16-Nov-12	304.70	304.54	NO
22-Nov-12	304.68	304.54	NO
28-Nov-12	304.66	304.54	NO

Date	DP6 (mASL)	DP3 (mASL)	Head Difference (m)	Threshold Value (m)	Exceedance
12-Nov-12	305.46	304.84	0.62	0.55	NO
16-Nov-12	305.41	304.70	0.71	0.55	NO
22-Nov-12	305.37	304.68	0.69	0.55	NO
28-Nov-12	305.33	304.66	0.67	0.55	NO

Date	DP2 (mASL)	Threshold Value (mASL)	Exceedance
12-Nov-12	304.23	303.55	NO
16-Nov-12	304.20	303.55	NO
22-Nov-12	304.16	303.55	NO
28-Nov-12	304.16	303.55	NO

Date	BH92-27 (mASL)	DP2 (mASL)	Head Difference (m)	Threshold Value (m)	Exceedance
12-Nov-12	304.74	304.23	0.51	0.34	NO
16-Nov-12	304.70	304.20	0.50	0.34	NO
22-Nov-12	304.69	304.16	0.53	0.34	NO
28-Nov-12	304.68	304.16	0.52	0.34	NO

Date	DP1 (mASL)	Threshold Value (mASL)	Exceedance
12-Nov-12	304.23	303.96	NO
16-Nov-12	304.08	303.96	NO
22-Nov-12	304.23	303.96	NO
28-Nov-12	304.08	303.96	NO

Date	BH92-29 (mASL)	DP1 (mASL)	Head Difference (m)	Threshold Value (m)	Exceedance
12-Nov-12	304.83	304.23	0.60	0.19	NO
16-Nov-12	304.80	304.08	0.72	0.19	NO
22-Nov-12	304.81	304.23	0.58	0.19	NO
28-Nov-12	304.80	304.08	0.72	0.19	NO

Date	DP5C (mASL)	Threshold Value (mASL)	Exceedance
12-Nov-12	303.29	302.84	NO
16-Nov-12	303.21	302.84	NO
22-Nov-12	303.22	302.84	NO
28-Nov-12	303.23	302.84	NO

Date	OW5-84 (mASL)	DP5C (mASL)	Head Difference (m)	Threshold Value (m)	Exceedance
12-Nov-12	303.61	303.29	0.32	0.25	NO
16-Nov-12	303.54	303.21	0.33	0.25	NO
22-Nov-12	303.56	303.22	0.34	0.25	NO
28-Nov-12	303.53	303.23	0.30	0.25	NO

Note: No exceedences to report

Monthly Reporting
Mill Creek Aggregates Pit
November 2012

Total Monthly Precipitation (mm):	83	Waterloo-Wellington Airport (October Actual)
Total Monthly Normal Precipitation (mm):	13.7	Waterloo-Wellington Airport (30-year Normal)

Max. Allowable as per PTTW- Main Pond					
(Imperial Gallons)					(Litres)
2,500				per minute	11,365
1,800,000				per day	8,183,000

Date	Below Water Table Extraction (wet tonnes) Phase 2	Below Water Table Extraction (wet tonnes) Phase 3	Water Pumped from Main Pond (gals)	Water Pumped from Active Silt Pond (gals)	Main Pond Level (mASL)	Exceedance Y/N (BELOW 305.5 mASL)	Phase 2 Pond Level (mASL)	Exceedance Y/N (BELOW 305.0 mASL)	Phase 3 Pond Level (mASL)	Exceedance Y/N (BELOW 303.85 mASL)	SP2 Level (mASL)	Exceedance Y/N (ABOVE 305.5 mASL) or (BELOW 304.5 mASL)
1-Nov-12	4400	1400	1,159,238	1,441,898	306.35	NO	305.80	NO	305.02	NO	304.99	NO
2-Nov-12	3600	0	1,164,957	1,112,824	306.34	NO	305.79	NO	305.01	NO	304.98	NO
3-Nov-12	400	0	0	0	306.34	NO	305.79	NO	305.01	NO	304.98	NO
4-Nov-12	0	0	0	0	306.34	NO	305.79	NO	305.01	NO	304.98	NO
5-Nov-12	0	1700	1,180,355	892,855	306.36	NO	305.79	NO	305.02	NO	304.99	NO
6-Nov-12	0	0	1,168,697	1,458,836	306.35	NO	305.79	NO	305.02	NO	304.99	NO
7-Nov-12	0	0	1,160,998	1,411,983	306.47	NO	305.78	NO	305.01	NO	304.98	NO
8-Nov-12	0	0	1,134,161	957,746	306.36	NO	305.78	NO	305.01	NO	304.98	NO
9-Nov-12	0	2300	1,163,637	844,022	306.36	NO	305.78	NO	304.97	NO	304.94	NO
10-Nov-12	1000	1800	0	0	306.36	NO	305.78	NO	304.97	NO	304.94	NO
11-Nov-12	2400	4400	0	0	306.36	NO	305.78	NO	304.97	NO	304.94	NO
12-Nov-12	1200	3400	1,168,477	1,456,196	306.36	NO	305.79	NO	305.02	NO	305.00	NO
13-Nov-12	0	2000	1,174,636	1,478,413	306.35	NO	305.79	NO	305.01	NO	304.99	NO
14-Nov-12	0	0	1,168,477	1,449,377	306.35	NO	305.80	NO	304.99	NO	304.97	NO
15-Nov-12	2400	4800	1,065,971	1,441,898	306.36	NO	305.80	NO	304.96	NO	304.94	NO
16-Nov-12	800	2000	1,149,779	938,609	306.37	NO	305.79	NO	304.96	NO	304.94	NO
17-Nov-12	2400	400	0	0	306.37	NO	305.79	NO	304.96	NO	304.94	NO
18-Nov-12	1600	4800	0	0	306.37	NO	305.79	NO	304.96	NO	304.94	NO
19-Nov-12	0	4000	1,173,096	1,064,431	306.37	NO	305.81	NO	304.95	NO	304.93	NO
20-Nov-12	0	2000	1,170,676	1,148,459	306.38	NO	305.81	NO	304.95	NO	304.93	NO
21-Nov-12	0	0	1,157,698	992,941	306.38	NO	305.80	NO	304.95	NO	304.93	NO
22-Nov-12	0	4600	1,161,218	1,300,238	306.38	NO	305.81	NO	304.95	NO	304.93	NO
23-Nov-12	1400	4400	1,000,200	891,535	306.38	NO	305.82	NO	304.95	NO	304.93	NO
24-Nov-12	1900	3600	0	0	306.38	NO	305.82	NO	304.95	NO	304.93	NO
25-Nov-12	4600	0	0	0	306.38	NO	305.82	NO	304.95	NO	304.93	NO
26-Nov-12	4000	0	1,142,520	957,306	306.39	NO	305.81	NO	304.97	NO	304.95	NO
27-Nov-12	1600	0	1,161,658	1,060,032	306.39	NO	305.80	NO	304.97	NO	304.95	NO
28-Nov-12	0	0	1,155,938	932,670	306.39	NO	305.80	NO	304.97	NO	304.95	NO
29-Nov-12	2400	1700	1,244,806	807,287	306.39	NO	305.80	NO	304.97	NO	304.95	NO
30-Nov-12	0	6900	529,906	737,337	306.40	NO	305.79	NO	304.97	NO	304.95	NO
Total	36100	56200	24,757,099	24,776,896								
Avg./ day	1203.3	1873.33	825,236.63	825,896.54	306.37	NO	305.79	NO	304.98	NO	304.96	NO

Note: No exceedences to report

CC Stn Grg. #6C

LRG
ENVIRONMENTAL

December 19, 2012

Mr. Ron Van Ooteghem
Site Manager, Mill Creek Pit
Dufferin Aggregates, a division of Holcim (Canada) Inc.
P.O. Box 5400
Concord, Ontario
L4K 1B6

Re: Mill Creek Aggregates Pit, Township of Puslinch - Response to Review Comments on the 2010 and 2011 Mill Creek Aggregates Pit Report by Harden Environmental

Dear Sirs:
LRG Environmental, Hims GeoEnvironmental Ltd and GENIVAR Inc. are pleased to respond to comments provided by Harden Environmental (Harden) on the monitoring programs conducted at the Mill Creek Aggregates property. We are specifically responding to:

- The Harden letter of October 19, 2011 and email of January 25, 2012, pertaining to their review of the 2010 Mill Creek annual report, and,
- The Harden letter of September 12, 2012 pertaining to the review of the 2011 annual report, Copies of the Harden correspondence are attached.

Harden's review comments relate to three main issues, as follows:

1) Increased groundwater levels and / or muted seasonal high-low variation in the west side of the site including within the provincially significant wetland;
2) Malfunction of Monitor Nest 92-33, and
3) Quality of streamflow measurements in relation to their intended purpose.

Our responses to the review comments are provided in the following sections.

1.0 Changes in Groundwater Levels and Seasonal Fluctuations

The monitors identified by Harden are as follows: 8-1, 9, OW16A-78, TW16-79, OW1-84, OW2-84, OW4-84, OW5-84, 92-25, 92-26, 92-27, 92-28, 92-29, 92-30, 92-31, 92-32, 92-33, and wetland drivepoint monitors DP10, DP11, DP12, DP15 and DP16. The locations of the monitors in question are illustrated in the attached figure taken from the 2011 Annual Monitoring report (Figure 2 Groundwater Monitor Locations). Harden indicates that seasonal high and seasonal low groundwater levels appear to be muted (relative to historic data), and that in general water levels are higher than historic levels.

Figures 2 to 4, which follow, show the magnitude of the annual groundwater flux, or annual fluctuation (being the difference between the seasonal high elevation and the seasonal low) for the last twenty years, for the above-noted monitors. The figures also provide bar plots depicting the annual precipitation for each year. Groundwater hydrographs for the monitors over the same period are provided in the attached figures taken from the 2011 Annual Monitoring Report. We offer the following comments.

The hydrographs indicate that over the last several years, there has been a general increase in the elevation of the groundwater table in the granular aquifer beneath the western part of the property relative to historic values as was predicted at the time the approvals were granted. Several of the monitors (e.g. BH8-1, located adjacent to the extraction pond in Phase 3) exhibit a more-pronounced increase starting about 2009, relative to other monitors. The hydrographs also illustrate that the seasonal variation is more muted relative to historic trends. This muting effect is also illustrated in Figures 2 to 4 that show the reduction in the magnitude of the difference between the seasonal high elevation and the seasonal low elevation of the water table that has occurred over the last few years, but most noticeably in 2009 and 2010. There appears to have been at least a partial reversal of this trend in 2011 in several of the monitors in question.

Prior to the stripping of topsoil and extraction of the aggregate resource in the areas adjacent to the western limit of extraction and the wetland, the seasonal and annual fluctuations in watertable elevation varied based on the seasonal precipitation and temperature patterns, as well as the total precipitation received at the site that year. For example, in a year when the winter snowpack was significant and the Spring was wet followed by a dry hot summer, the difference between the high and low water table conditions would be increased. In a year of less snowpack and a dry Spring, followed by a wet summer, the seasonal variation would be reduced. This confirms that the water levels in the shallow groundwater monitors and drive points reflected the amount of rainfall received throughout the year, as would be expected.

As the aggregate extraction operation approached the wetland, the seasonal fluctuation in the water table continues to reflect the seasonal precipitation patterns, but they also respond to the activities occurring at the site, and the seasonal variation is more muted, particularly in the vicinity of the extraction ponds and the silt ponds. The progressive development of the extraction pond in Phase 3 was expected to result in a slightly higher water table elevation in the aquifer adjacent to the western limit of the pond and the wetland, relative to pre-extraction levels, because Phase 3 extends through the aquifer from east (higher water table elevation) to west (lower water table elevation). The long-term final water level in the Phase 3 pond is expected to reflect the approximate average groundwater elevation at the mid-point of the aquifer in Phase 3 prior to extraction. The presence of the pond will also tend to mute the magnitude of the seasonal variation in water table elevations in the vicinity of the pond, as is observed in the Phase 1 and Phase 2 ponds.

The extraction operation and the use of the silt ponds has resulted in a general increase in the elevation of the water table and has affected (muted) the magnitude of the seasonal highs and lows, with the greater effect being observed at monitors that are close to the Phase 3 pond and the associated silt ponds. The variations however, are still within historical ranges. Since the seasonal fluctuations continue to be reflective of precipitation patterns, although muted with respect to pre-extraction conditions, we do not anticipate seeing seasonal fluctuations that are outside historical ranges. As noted previously, the 2011 data indicate at least a partial reversal of the recent trends, and continued monitoring will assist in further assessment of the situation.

1.1 Potential Effects on Wetland Vegetation

Groundwater availability is essential in the maintenance of plant communities and individual species within those communities, particularly within sensitive habitat types. While annual groundwater fluctuations are normal, prolonged dry or wet periods, or substantial lack of seasonal fluctuations may result in a shift in community composition and overall habitat type. While this is a natural process in the formation of the natural landscape, concern is warranted if caused by anthropomorphic activities, particularly when adjacent to or within a Provincially Significant Wetland (PSW).

We agree with Harden that the groundwater fluctuations noted since 2009 should continue to be monitored and evaluated to ensure that they are not impacting the adjacent PSW. We also note that the most recent vegetation analysis in 2011 (Pre-Phase 4 Biological Monitoring of the Mill Creek Aggregates' Property, 2011) and 2012 (memorandum dated December 17, 2012) conducted by Paul F. J. Eagles Planning Ltd. concludes that the *"wetland habitat on the property is being maintained"*.

Although the groundwater seasonal fluctuations beneath the western part of the site have been muted since 2009, they continue to remain within historical ranges, and there is no indication that a change in vegetation or habitat composition is occurring on the site. The groundwater level monitoring and vegetation monitoring programs are continuing, thereby providing for continued assessment of the relationship between the PSW function and groundwater fluctuation. If changes within the vegetation composition are noted in future years, mitigative measures should be developed and implemented to ensure that there is no negative impact to the form or function of the PSW.

2.0 Malfunction of Monitor Nest 92-33

The September 12, 2012 Harden letter provides comment on Monitor Nest 92-33, located on the western side of the property west of the extraction area adjacent to the Creek, which malfunctioned in 2010. This monitor location was instrumented in 1992 with nested multi-level pressure transducers and temperature thermistors connected to a surface data logger that recorded groundwater pressure and water temperature information from three horizons in the sand and gravel aquifer adjacent to the Creek.

Since 1992, the monitor has provided useful information with respect to the seasonal variation in groundwater conditions with depth in the area between the limit of extraction and the Creek. The instrumentation finally succumbed to age and malfunctioned in late 2010. The pressure transducer and thermistor instrumentation installed in 1992 were of a permanent, non-removable design that cannot be replaced without drilling another borehole at this location.

Manual monitoring of the shallow groundwater at Monitor 92-33 continues on a monthly frequency, using the accessible standpipe monitor. As well, water level and temperature information were collected at Monitor 92-27 (shallow) and at Monitor 92-31 (intermediate and deep), located at the limit of extraction and within the extraction area to the east, respectively. Monitor nest 92-31 was removed in summer 2011 when the area was extracted; Monitor 92-27 continues to be accessible since it is just beyond (west of) the limit of extraction.

In order to continue to collect groundwater level and water temperature data from the shallow part of the aquifer at monitor 92-33, a newer type of removable datalogger system was installed in the standpipe monitor in March 2012, and data have been collected since that time. In addition, there are two other multi-level monitor installations located adjacent to the Creek to the north and south of the 92-33 location. These monitor locations, designated 92-28 and 92-32, provide similar groundwater pressure and temperature information in the area between the limit of extraction and Mill Creek, as did 92-33. The shallow data logger monitor now installed at 92-33 continues to provide shallow groundwater level and temperature information at that central location.

Given that the western section of Phase 3 has now been fully extracted along the entire length of the limit of extraction, and the pond is established in that area, it is our opinion that the existing instrumentation network is sufficient to continue to monitor the seasonal variation in groundwater conditions between the now-existing Phase 3 pond and Mill Creek. It is our opinion that the multi-level monitors at 92-33 does not need to be replaced at this later-stage of the extraction operation.

As noted by Harden, whereas seasonal peak groundwater temperatures between the Phase 3 pond and Mill Creek have increased since formation of the lake, a similar thermal impact situation at the Phase 1 pond to the east is seen to diminish within a relatively short distance downgradient from that pond. As well, the information obtained at the Phase 1 pond shows that the seasonal maximum pond temperature is not reached until late summer, and there is a time lag of several months before groundwater west of the pond reaches its seasonal maximum. A similar condition applies at the west side of the site between the limit of extraction and Mill Creek, such that there should not be any thermal impact in the Creek.

The in-creek drive point groundwater monitors DP1 and DP2, located in Mill Creek west of monitor 92-33, do not exhibit any upward trend in groundwater discharge temperatures. This demonstrates that any seasonal increase in groundwater temperature adjacent to the Phase 3 pond is ameliorated prior to discharge into Mill Creek. The groundwater discharge continues to provide a cooling influence on the surface water in Mill Creek in the summer and a warming influence through the winter.

2.0 Problems with Surface Water Monitoring

With respect to the Harden comment on surface water flows and their measurement, we have stated in previous annual monitoring reports that trying to estimate groundwater influx to Mill Creek using the surface water flow data alone is not a reliable method, because of the inherent difficulties in using the stage-discharge technique at this property. It should also be noted that the in-stream data loggers can be subject to ice-cover during the winter that produces erroneously high water level readings and stream flow estimates. The accuracy of these stream flow measurement techniques, given the physical conditions at Mill Creek, is likely in the order of within +/- 20% at best. Coupled with the inherent inaccuracy of the stage-discharge curves, the overall reliability will be lower, and thus it is not a suitable method for estimating groundwater influx at the site. The use of the in-stream drivepoint water level data to estimate groundwater discharge into Mill Creek has proven to be a more consistent method of obtaining useful information by which the groundwater / surface water interactions can be monitored and assessed over time.

The challenges in obtaining accurate surface flow estimates are particularly pronounced in the two small tributaries Galt and Pond Creeks. The monitoring stations on these tributaries are referred to as SWM3 and SWM4. As a result we have recommended to Dufferin Aggregates that flow monitoring be discontinued at these two locations, however, continuous water temperature monitoring should be maintained. In addition, continuous water level monitoring and flow estimates should be maintained at SWM1 and SWM2.

We trust that this information is satisfactory at this time. Please contact the undersigned if you have any questions.

Yours truly,

LRG Environmental,	Hims GeoEnvironmental Ltd.	GENIVAR INC.
Lisa Guenther-Wren	Andrew G. Hims, M.Sc., P.Eng	Dan Reeves, M.Sc.
Project Manager	Consulting Engineer	Project Biologist

Harden
Environmental

4622 Nassagaweya-Puslinch Townline R.R. 1 Moffat Ontario Canada L0P 1J0
Phone: 519.826.0099 fax: 519.826.9099 www.hardenv.com

Groundwater Studies
Geochemistry
Phase I / II
Regional Flow Studies
Contaminant Investigations
OMB Hearings
Water Quality Sampling
Monitoring
Groundwater Protection Studies
Groundwater Modelling
Groundwater Mapping

Our File: 0004

October 19, 2011

Township of Puslinch
R.R. 3
Guelph, ON
N1H 6H9

Attention: Brenda Law A.M.C.T.,
Clerk-Treasurer

Dear Mrs. Law:

Re: Review of 2010 Mill Creek Aggregates Pit Report

We are pleased to submit a review of groundwater and surface water conditions at Mill Creek Aggregates site as presented in the 2010 Monitoring Report.

Groundwater Levels

The hydrogeology report prepared by Genivar Inc. does not recognize that there has been a change in seasonal groundwater level variation in the western portion of the site. Since 2009 there has been a decrease in the annual variation of water levels of groundwater monitors 8-I, 9, OW16A-78, TW16-79, OW1-84, OW2-84, OW4-84, OW5-84, 92-25, 92-26, 92-27, 92-28, 92-29, 92-30, 92-31, 92-32 and 92-33. Also wetland monitors DP10, DP11, DP12, DP15 and DP16 have similar trends. It appears that both seasonal highs and seasonal lows are muted with water levels in general being higher than average. Several of these monitors represent water levels in the Provincially Significant Wetland. As was the concern expressed at the Reid's Heritage Lake site, the narrower range of seasonal water levels likely results in prolonged saturation of the root zone in the wetland.

There have been significant changes to water management at the site since 2009 and it would be beneficial for those most familiar with the site to a) comment on environmental impact (if any) of the observed trend b) determine if additional changes are anticipated and c) propose mitigation (if necessary).

Surface Water Flow

There continues to be difficulties in obtaining rating curves for the surface water stations. A review of the stream discharge curves in Appendix C of the Stantec report indicates that stream discharge at SWM1 is calculated to be greater than at SWM2 in January, February, November and December. Also, the cumulative flows of SWM1, SWM3 and SWM4 are greater than the flow at SWM2 between January and March and again between October and December (Figure 9 of Stantec, March 2011). In all cases the flow at SWM2 should be greater than occurs at SWM1 and greater than the cumulative flows of SWM1, SWM3 and SWM4. Therefore, given the inaccuracy of the data, it is not possible to use the streamflow data to evaluate potential impacts to the flow in Mill Creek.

Given the present and historical difficulties in obtaining streamflow data, improved methods must be employed to have meaningful satisfaction of the streamflow measurement condition of the license.

Sincerely,

Harden Environmental Services Ltd.

Stan Denhoed

Stan Denhoed, P.Eng., M.Sc.
Senior Hydrogeologist

Stantec, March 2011, Technical Appendix A, 2010 Surface Water Monitoring Program of the Mill Creek Coordinated Monitoring Program

Genivar, March 2011, Appendix B of the 2010 Mill Creek Coordinated Monitoring Report, Mill Creek Aggregates Pit, Hydrogeology

From: "Brenda Law" <BrendaL@twp.puslinch.on.ca>
To: <ron.vanooteghem@holcim.com>, <kevin.mitchell@holcim.com>, <sstrynatka@grandriver.ca>, <Jason.McLay2@ontario.ca>, <al.murray@mnr.gov.on.ca>
Date: 01/26/2012 10:07 AM
Subject: FW: Mill Creek Aggregates

Please see Stan Denhoed's comments below. We would appreciate receiving a response.

Thank you,
Brenda

From: Stan Denhoed [mailto:sdenhoed@hardenv.com]
Sent: Wednesday, January 25, 2012 1:16 PM
To: Brenda Law; Dennis Lever
Subject: Mill Creek Aggregates

We have not seen a response from Dufferin Construction regarding a) increased water levels west of the extraction area and b) poor quality stream flow measurements. I have raised these issues in two annual reviews of the site and have not had a satisfactory response (none provided in 2011). The increased water levels west of pit are a warning that conditions are changing due to extraction activities. This change is not acknowledged by Dufferin Construction or their consultants and I feel that even if it is an anticipated change, it should be recognized and found to be benign or otherwise. The ongoing issues with stream flow are a housekeeping item and perhaps the stream flow should be scrapped if accurate readings cannot be made and have Dufferin fund another GRCA station instead downgradient of their site. That way we have upgradient at Aberfoyle and downgradient at the new station. This will save Dufferin $$ in the first year probably.

Stan Denhoed, M.Sc. P.Eng.
Senior Hydrogeologist
Harden Environmental Services Ltd.
Phone (519) 826 0099
Cell (519) 994-6488
Toll Free 1-877-336-4633
Fax (519) 826-9099
Website: www.hardenv.com(See attached file: sdenhoed@hardenv.com.vcf)

Harden
Environmental

4622 Nassagaweya-Puslinch Townline R.R. 1 Moffat Ontario Canada L0P 1J0
Phone: 519.826.0099 fax: 519.826.9099 www.hardenv.com

Groundwater Studies
Geochemistry
Phase I / II
Regional Flow Studies
Contaminant Investigations
OMB Hearings
Water Quality Sampling
Monitoring
Groundwater Protection Studies
Groundwater Modelling
Groundwater Mapping

Our File: 0004

September 12, 2012

Township of Puslinch
R.R. 3
Guelph, ON
N1H 6H9

Attention: Brenda Law A.M.C.T.,
Clerk-Treasurer

Dear Mrs. Law:

Re: Review of 2011 Mill Creek Aggregates Pit Report

We are pleased to submit a review of groundwater and surface water conditions at Mill Creek Aggregates site as presented in the 2011Monitoring Report.

Groundwater Levels and Groundwater Temperatures

Groundwater levels are rising in the western portion of the site. The water level rise is found in groundwater monitors and wetland monitors that are located between Mill Creek and the newly formed Phase 3 Pond. The Genivar Report recognizes that the development of a pond in Phase 3 is raising water levels in the adjacent Provincially Significant Wetland.

In conjunction with the rising water levels, groundwater discharge to Mill Creek has increased in volume according to measurements obtained in DP1 and DP2 located northwest of the Phase 3 pond.

Peak groundwater temperatures measured between the Phase 3 pond and Mill Creek have also increased. This is a result of the seasonally warm water in the Phase 3 pond migrating towards Mill Creek. Groundwater temperatures normally peaking at 15 to 16 °C, now peak at 24 to 25 °C. This change in temperature occurs in monitors adjacent to or now within the excavation, but does not occur in monitors closer to Mill Creek (i.e. 92-28, 92-32 and 92-33). A similar thermal impact occurs downgradient of the Phase 1 pond and the thermal impact is found to diminish within

150 metres of the pond. There is not an obvious upward trend in groundwater temperatures beneath Mill Creek as measured in DP1 and DP2.

The water level logger and thermistor for Monitor 92-33 should be replaced as this is an important station for measuring water levels and temperatures between the Phase 3 Pond and Mill Creek.

Surface Water Flow

There continues to be difficulties in obtaining rating curves for the surface water stations. A review of the stream discharge curves in the Stantec Surface Water Report indicates that stream discharge at SWM1 is calculated to be greater than at SWM2 in January, February and August/September.

Given the present and historical difficulties in obtaining streamflow data, improved methods must be employed to have meaningful satisfaction of the streamflow measurement condition of the license.

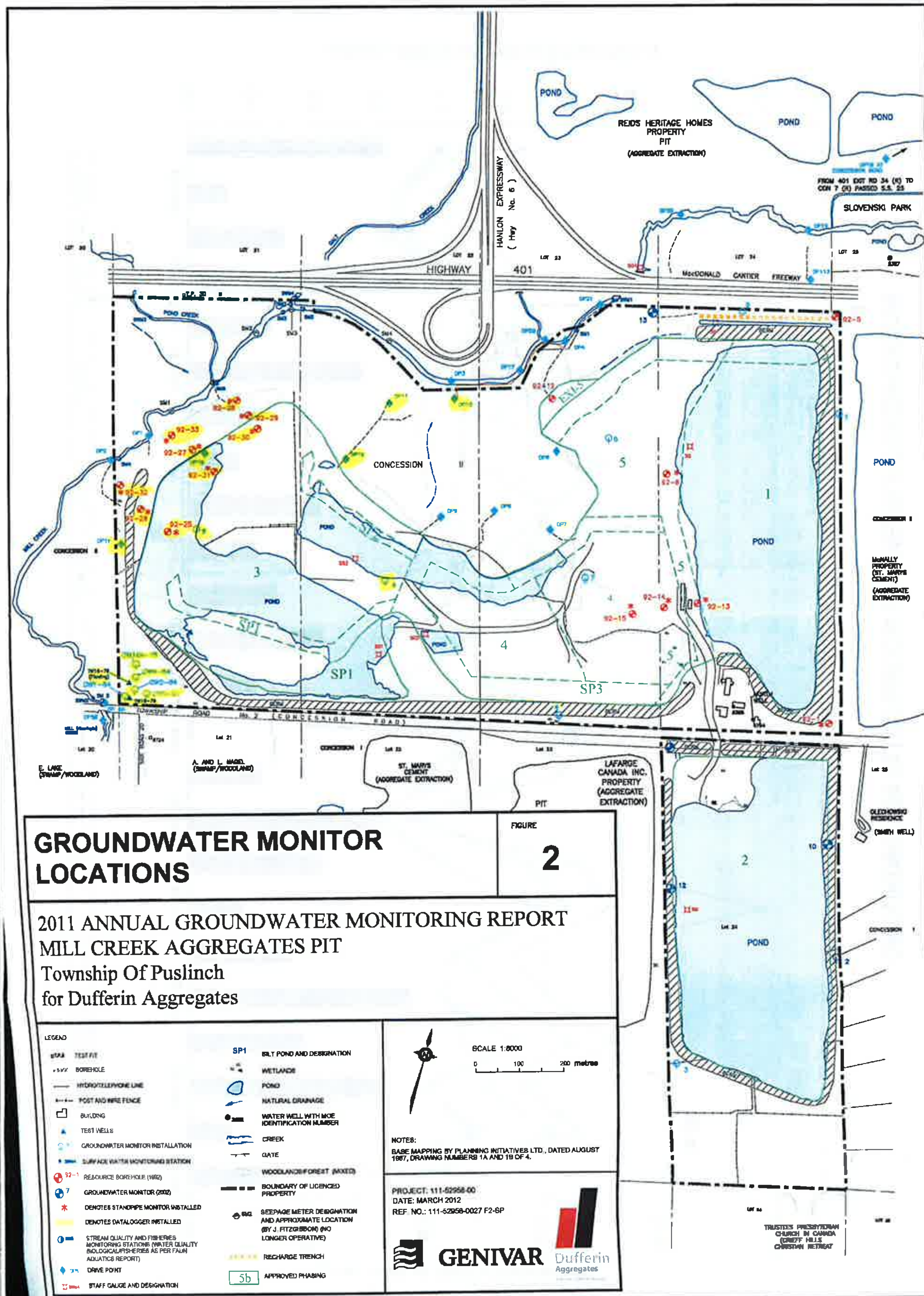
Biological Evaluation

Based on conclusions in his report, Paul Eagles did not find significant plant community changes in the wetland test plots between the Phase 3 Pond and Mill Creek. The Paul Eagles report was not prepared for the 2011 season and it will be interesting to see in his next report if the water level changes observed have an impact (positive or negative) on the wetland flora.

Sincerely,

Harden Environmental Services Ltd.

Stan Denhoed, P.Eng., M.Sc.
Senior Hydrogeologist



GROUNDWATER MONITOR LOCATIONS

FIGURE 2

2011 ANNUAL GROUNDWATER MONITORING REPORT
MILL CREEK AGGREGATES PIT
Township Of Puslinch
for Dufferin Aggregates

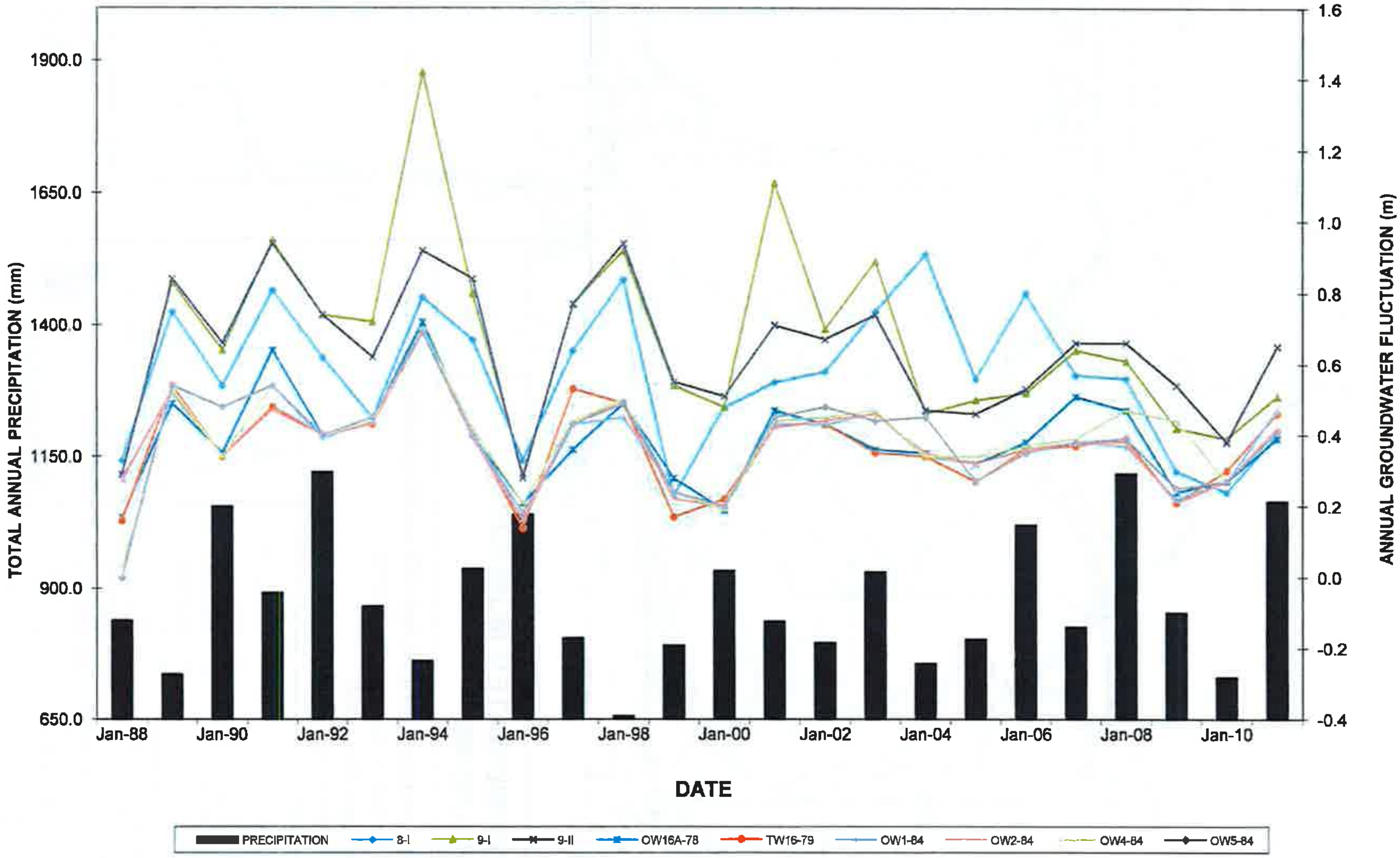
NOTES:
BASE MAPPING BY PLANNING INITIATIVES LTD., DATED AUGUST 1987, DRAWING NUMBERS 1A AND 1B OF 4.

PROJECT: 111-52958-00
DATE: MARCH 2012
REF. NO.: 111-52958-0027 F2-SP

GENIVAR
Dufferin Aggregates

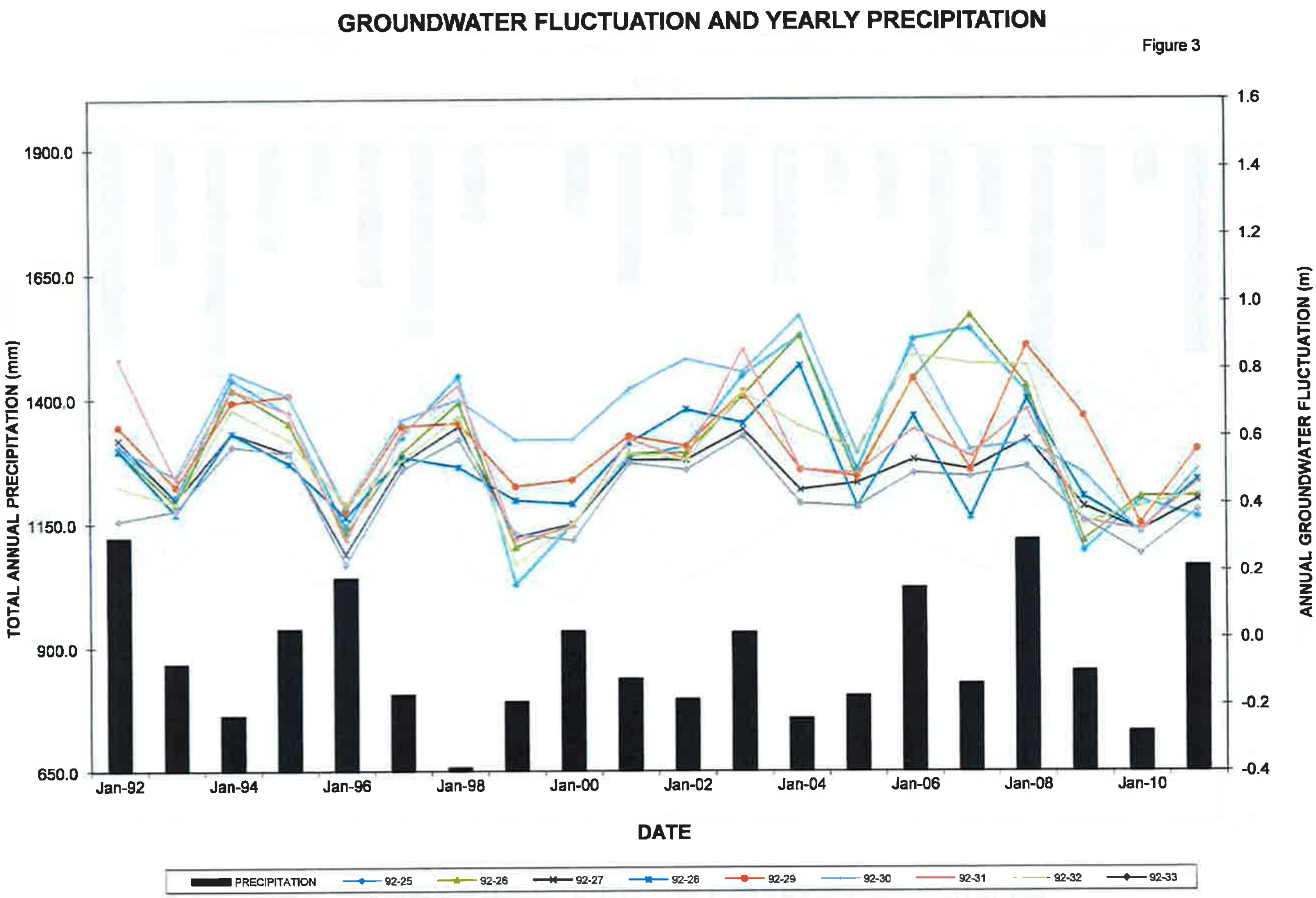
GROUNDWATER FLUCTUATION AND YEARLY PRECIPITATION

Figure 2



7/9/2012 10:55 AM G:\Aggregates\Mill Creek\2012\Harden Letter\Response\Letter- Harden Environmental\Millcreek Fluctuations

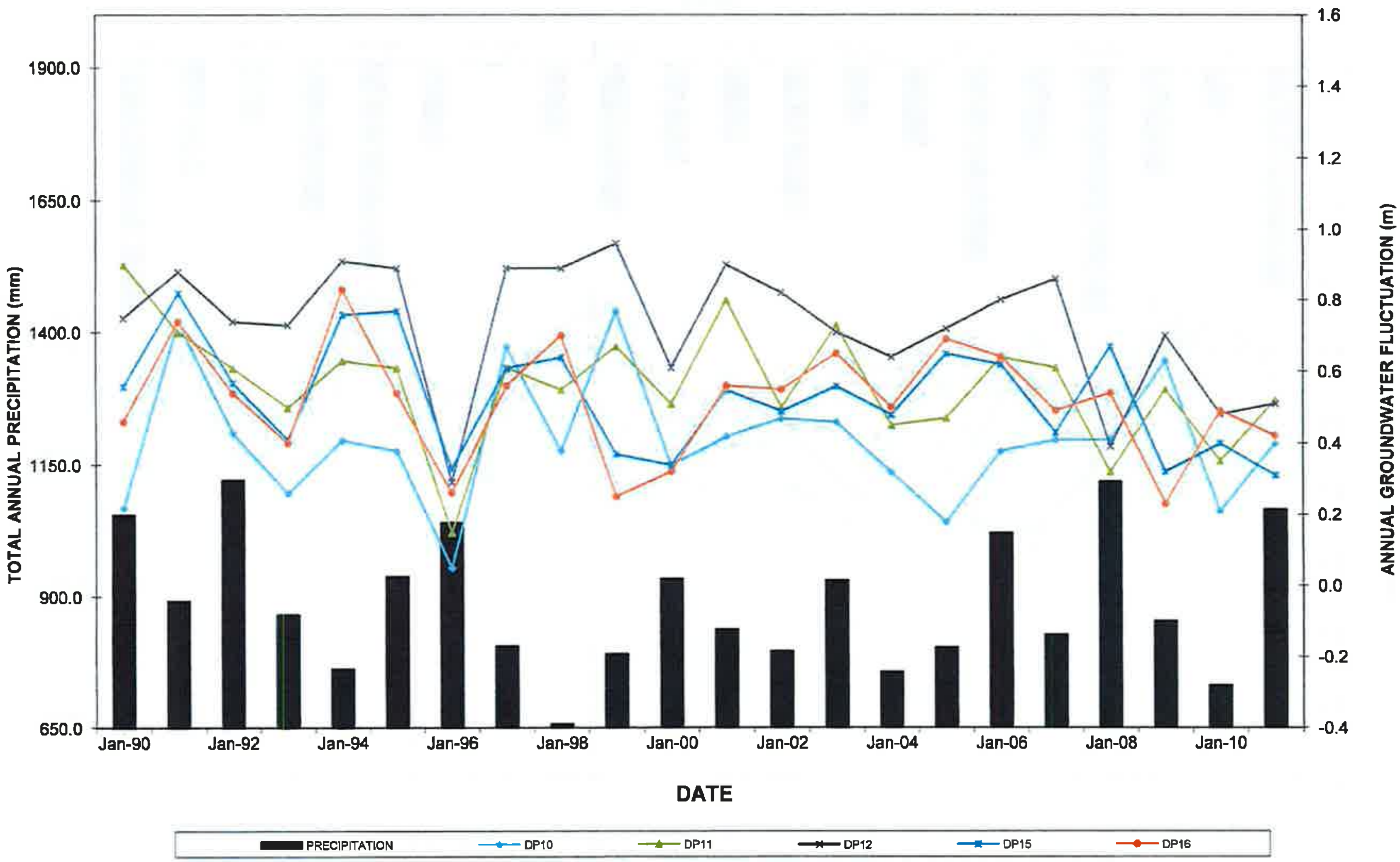
Figure 3



7/9/2012 10:57 AM G:\Aggregates\Mill Creek\2012\Harden Letter\Response\Letter- Harden Environmental\Millcreek Fluctuations

GROUNDWATER FLUCTUATION AND YEARLY PRECIPITATION

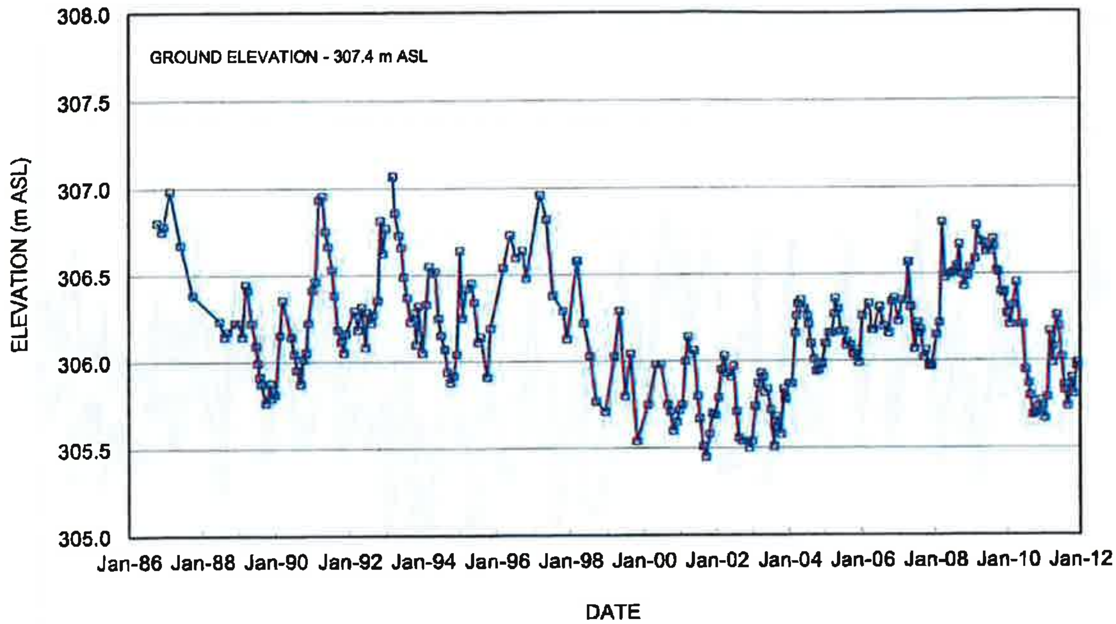
Figure 4



7/9/2012 10:57 AM G:\Aggregates\Mill Creek\2012\Harden Letter\Response\Letter- Harden Environmental\Millcreek Fluctuations

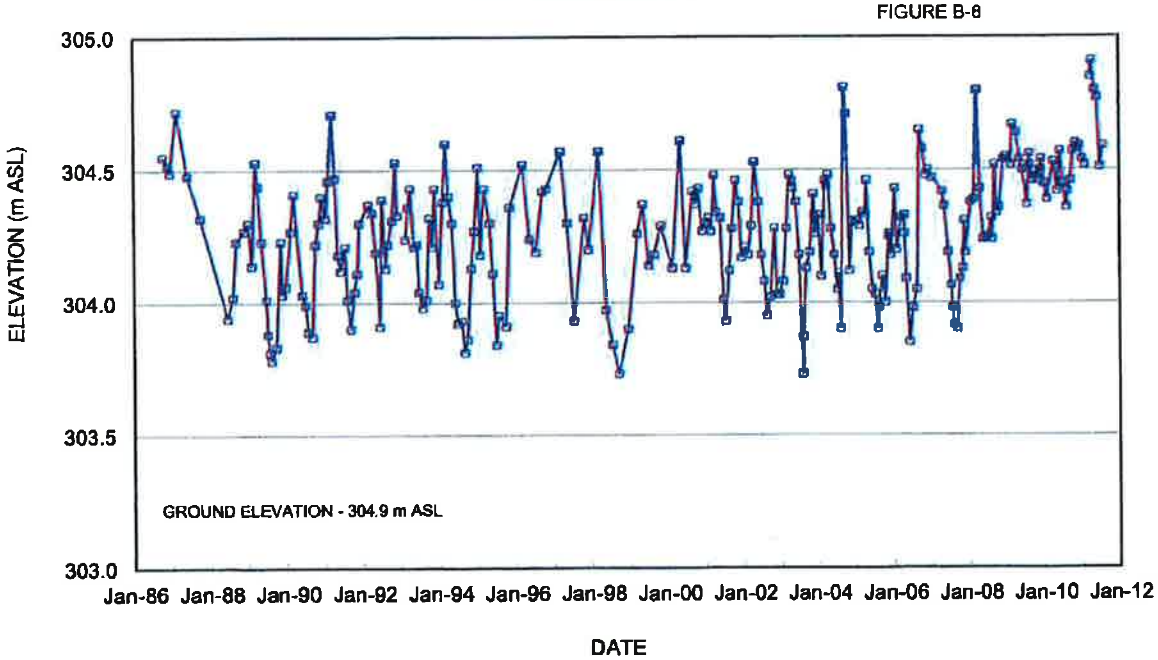
GROUNDWATER HYDROGRAPH
BOREHOLE 7

FIGURE B-7



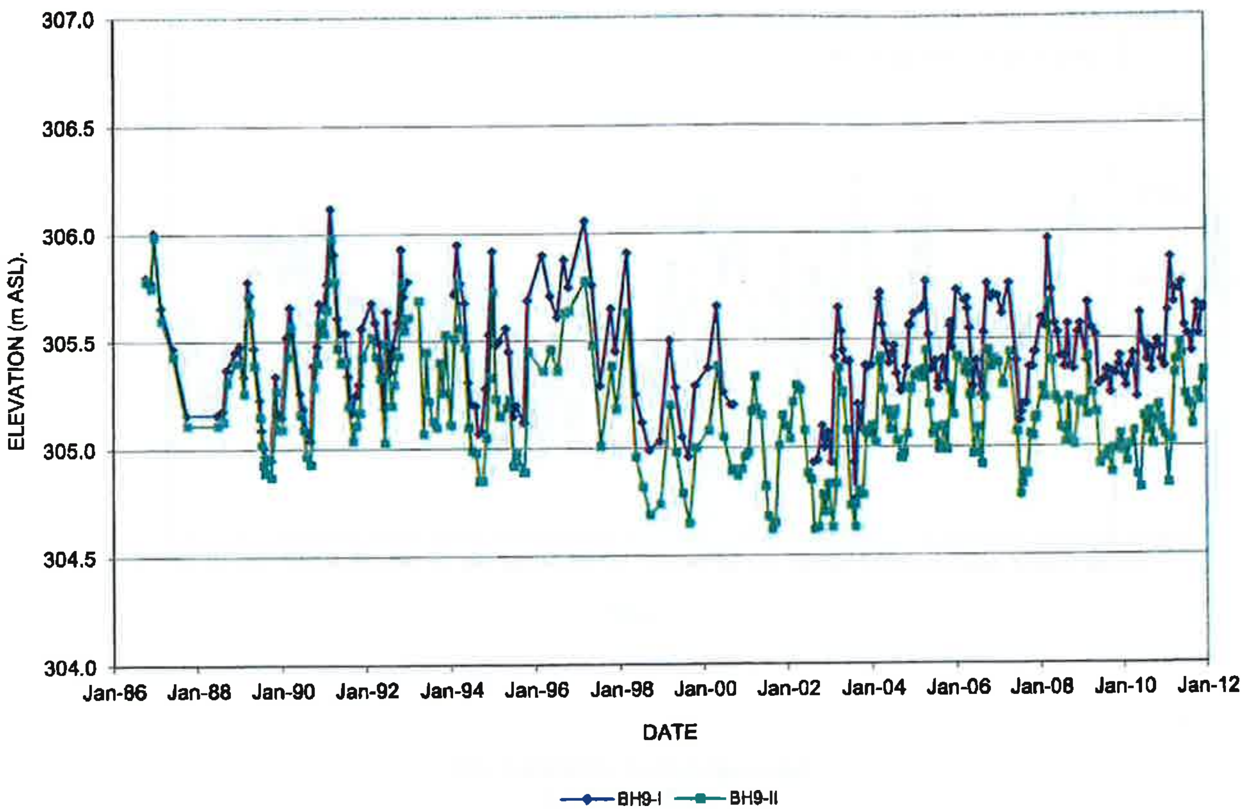
GROUNDWATER HYDROGRAPH
BOREHOLE 8-I

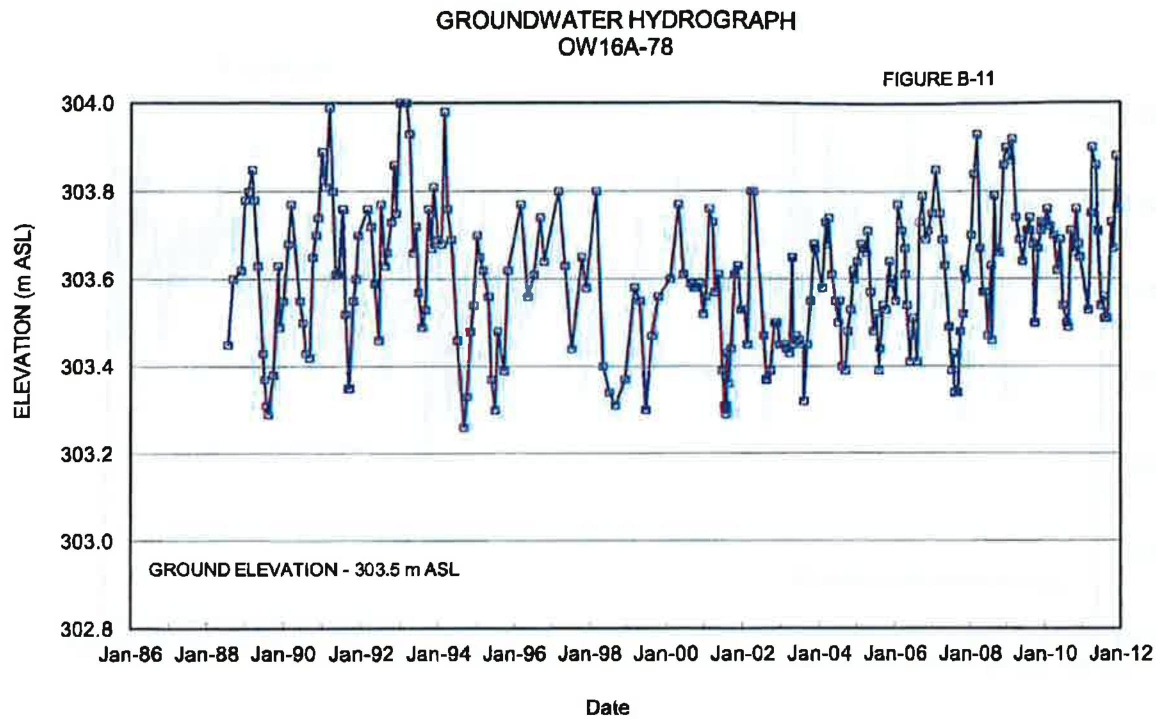
FIGURE B-8

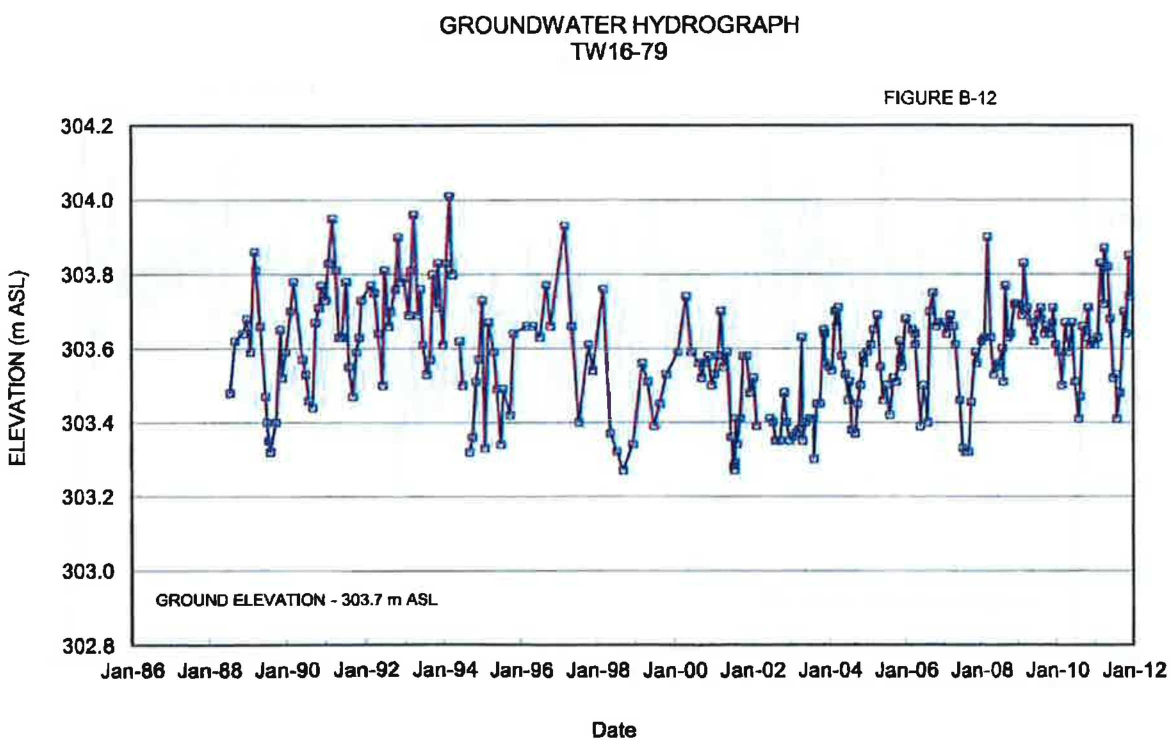


GROUNDWATER HYDROGRAPH
BOREHOLE 9

FIGURE B-9

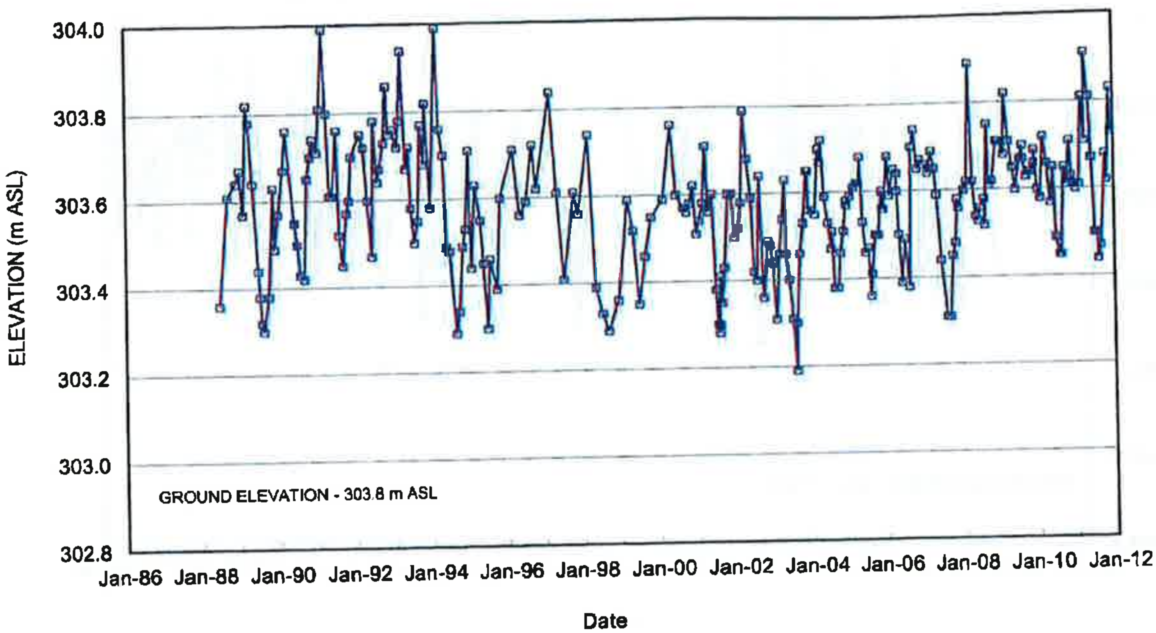



GROUNDWATER HYDROGRAPH
OW16A-78
FIGURE B-11
304.0
303.8
303.6
303.4
303.2
303.0
302.8
ELEVATION (m ASL)
GROUND ELEVATION - 303.5 m ASL
Jan-86 Jan-88 Jan-90 Jan-92 Jan-94 Jan-96 Jan-98 Jan-00 Jan-02 Jan-04 Jan-06 Jan-08 Jan-10 Jan-12
Date


GROUNDWATER HYDROGRAPH
TW16-79
FIGURE B-12
304.2
304.0
303.8
303.6
303.4
303.2
303.0
302.8
ELEVATION (m ASL)
GROUND ELEVATION - 303.7 m ASL
Jan-86 Jan-88 Jan-90 Jan-92 Jan-94 Jan-96 Jan-98 Jan-00 Jan-02 Jan-04 Jan-06 Jan-08 Jan-10 Jan-12
Date

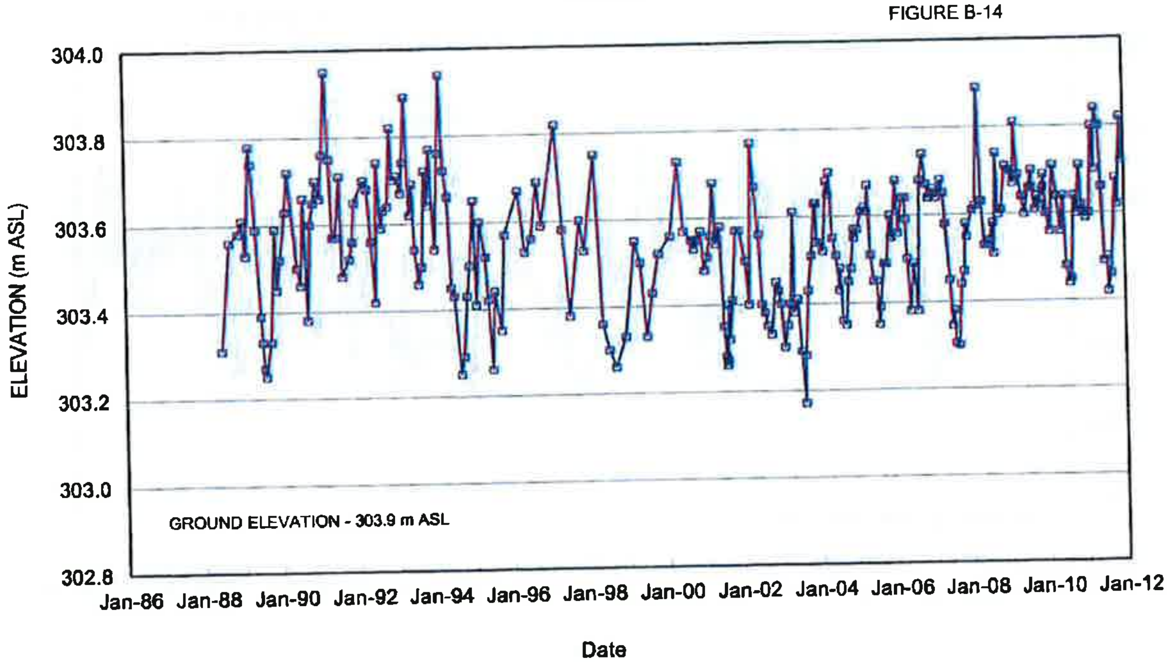
GROUNDWATER HYDROGRAPH
OW1-84

FIGURE B-13



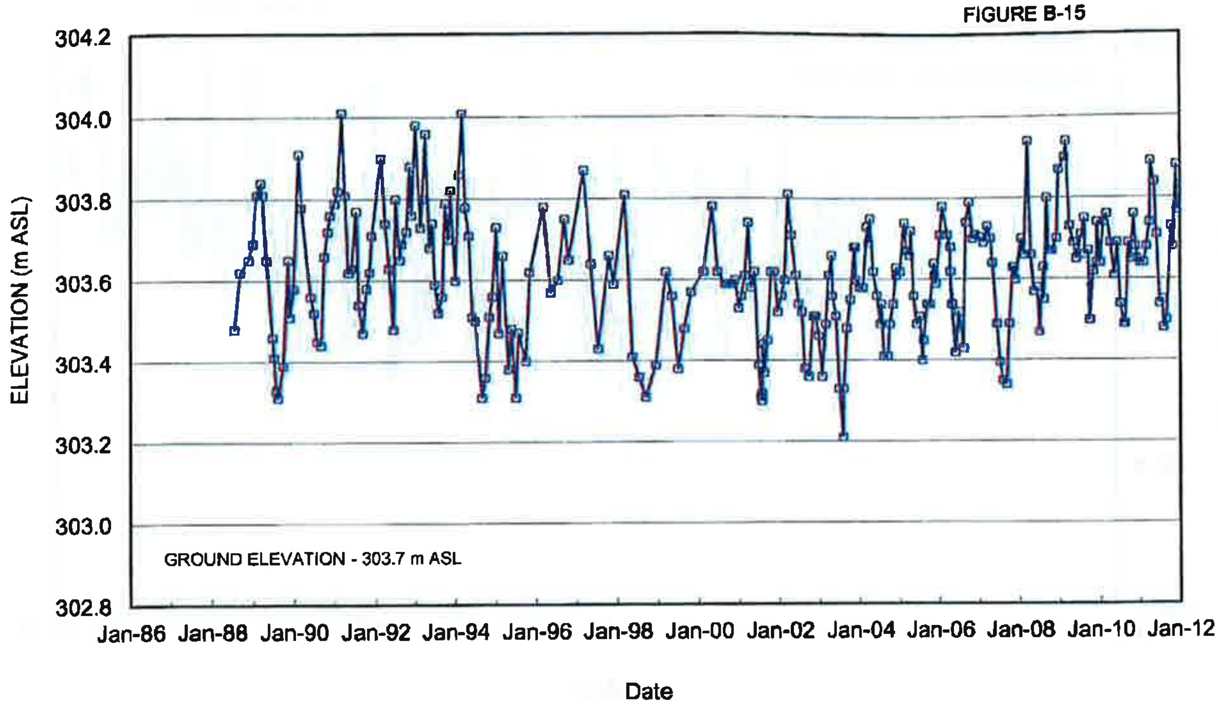
GROUNDWATER HYDROGRAPH
OW2-84

FIGURE B-14



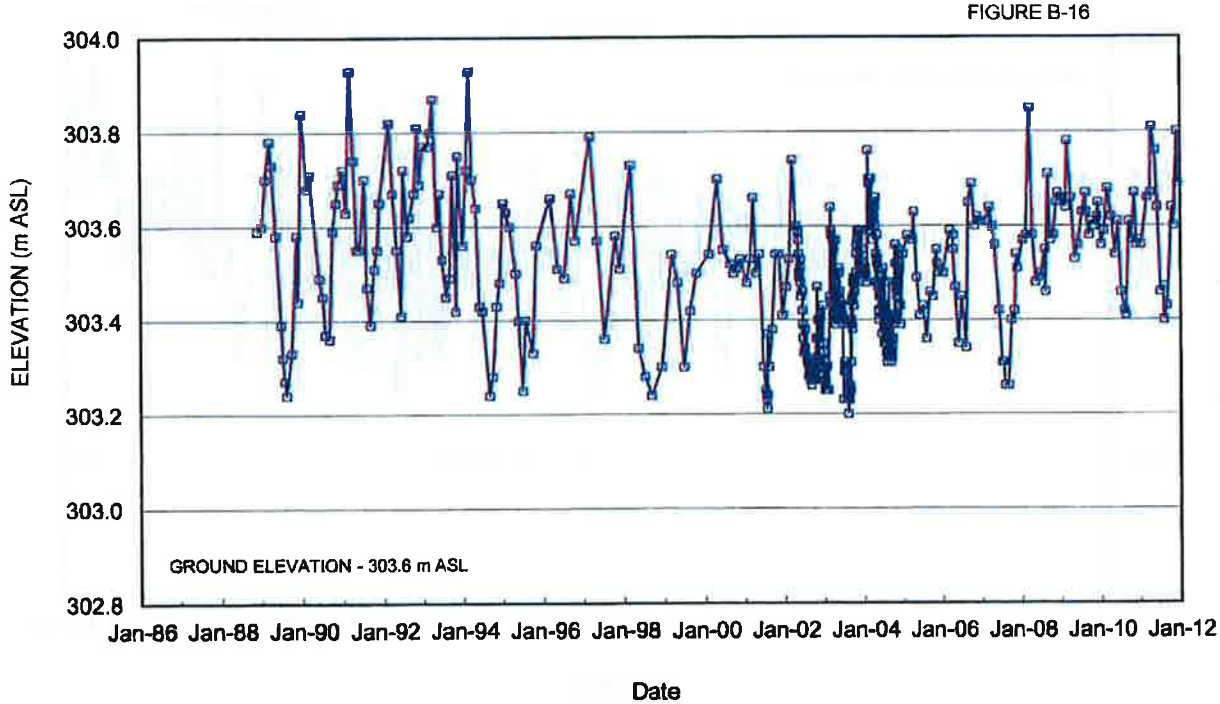
GROUNDWATER HYDROGRAPH
OW4-84

FIGURE B-15



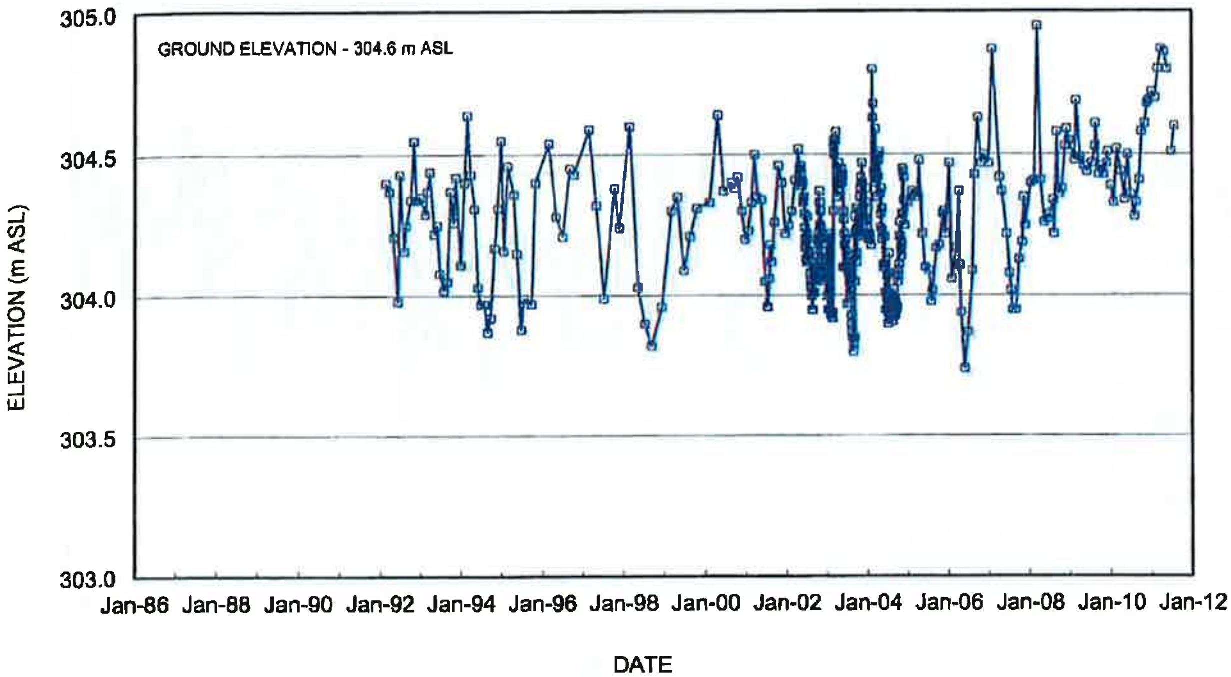
GROUNDWATER HYDROGRAPH
OW5-84

FIGURE B-16



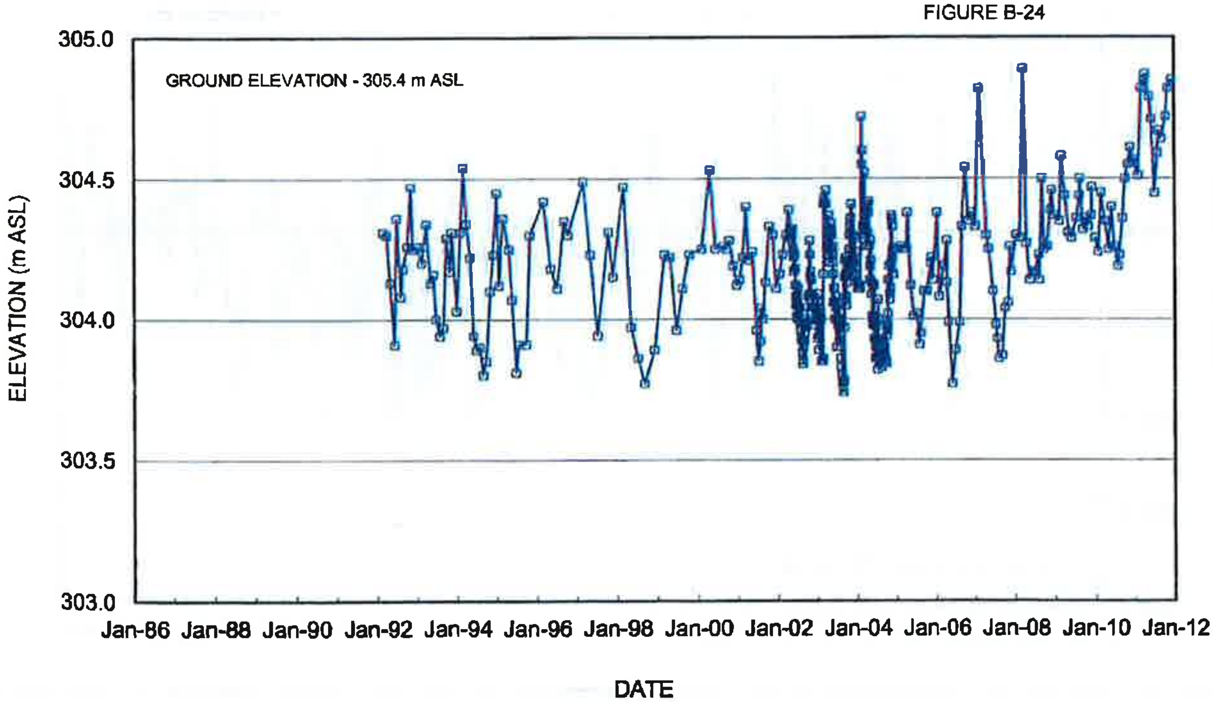
GROUNDWATER HYDROGRAPH
BOREHOLE 92-25

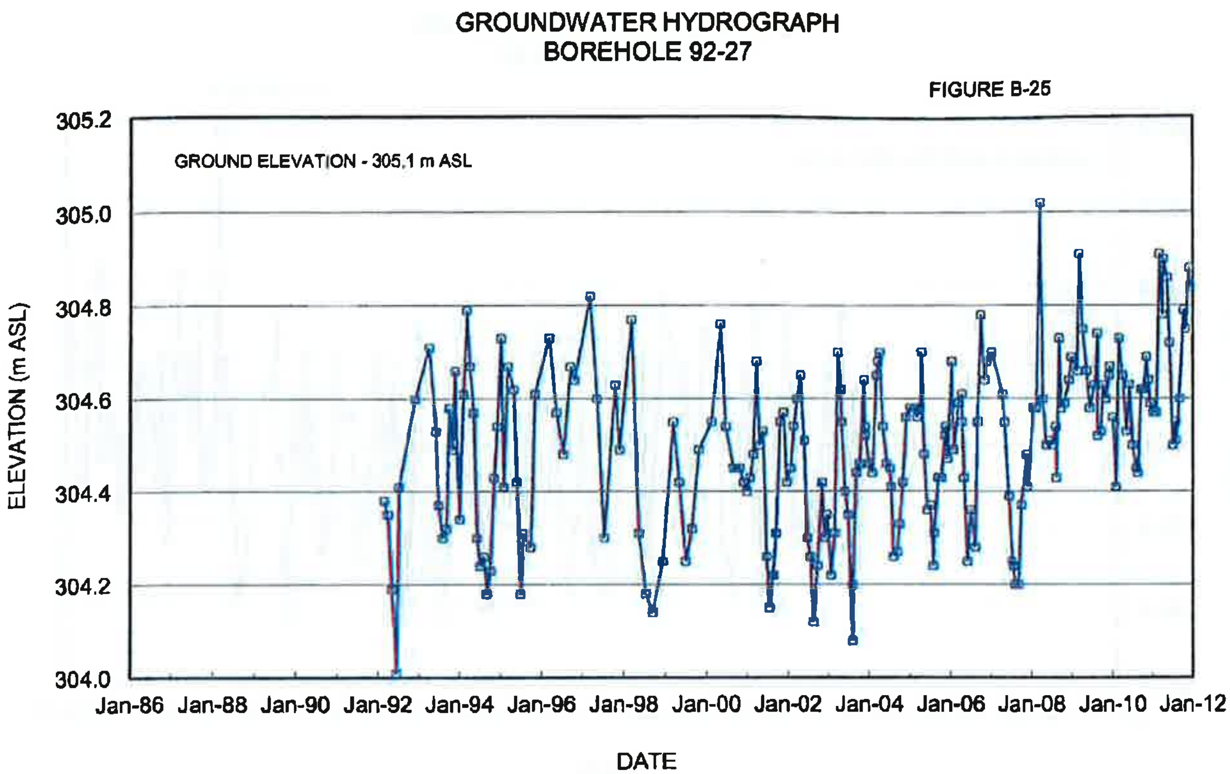
FIGURE B-23

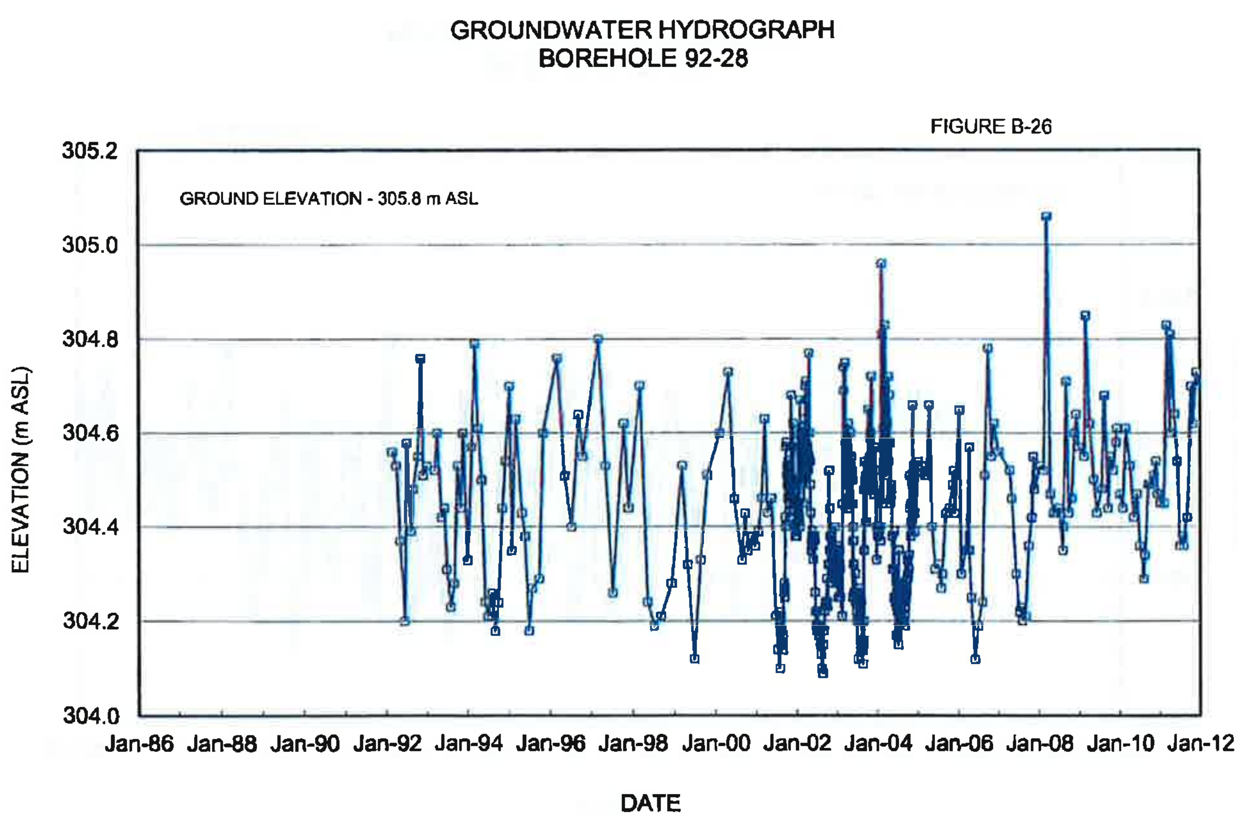


GROUNDWATER HYDROGRAPH
BOREHOLE 92-26

FIGURE B-24

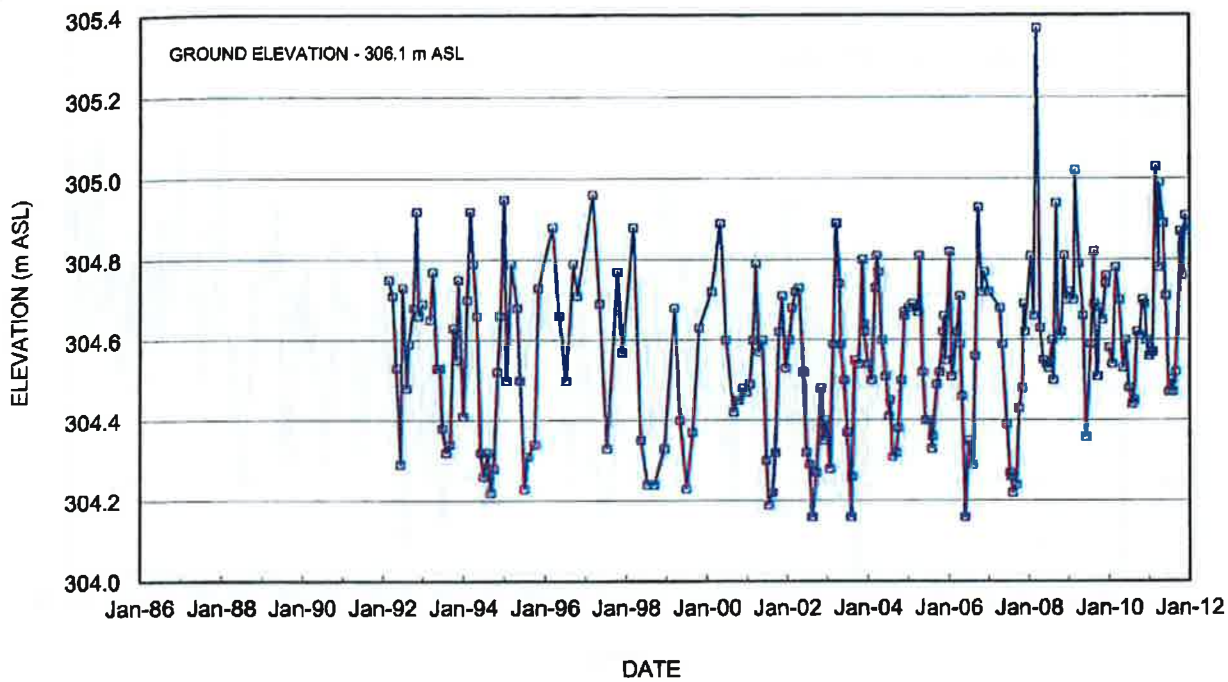



GROUNDWATER HYDROGRAPH
BOREHOLE 92-27
FIGURE B-25
GROUND ELEVATION - 305.1 m ASL
ELEVATION (m ASL)
305.2
305.0
304.8
304.6
304.4
304.2
304.0
Jan-86 Jan-88 Jan-90 Jan-92 Jan-94 Jan-96 Jan-98 Jan-00 Jan-02 Jan-04 Jan-06 Jan-08 Jan-10 Jan-12
DATE


GROUNDWATER HYDROGRAPH
BOREHOLE 92-28
FIGURE B-26
GROUND ELEVATION - 305.8 m ASL
ELEVATION (m ASL)
305.2
305.0
304.8
304.6
304.4
304.2
304.0
Jan-86 Jan-88 Jan-90 Jan-92 Jan-94 Jan-96 Jan-98 Jan-00 Jan-02 Jan-04 Jan-06 Jan-08 Jan-10 Jan-12
DATE

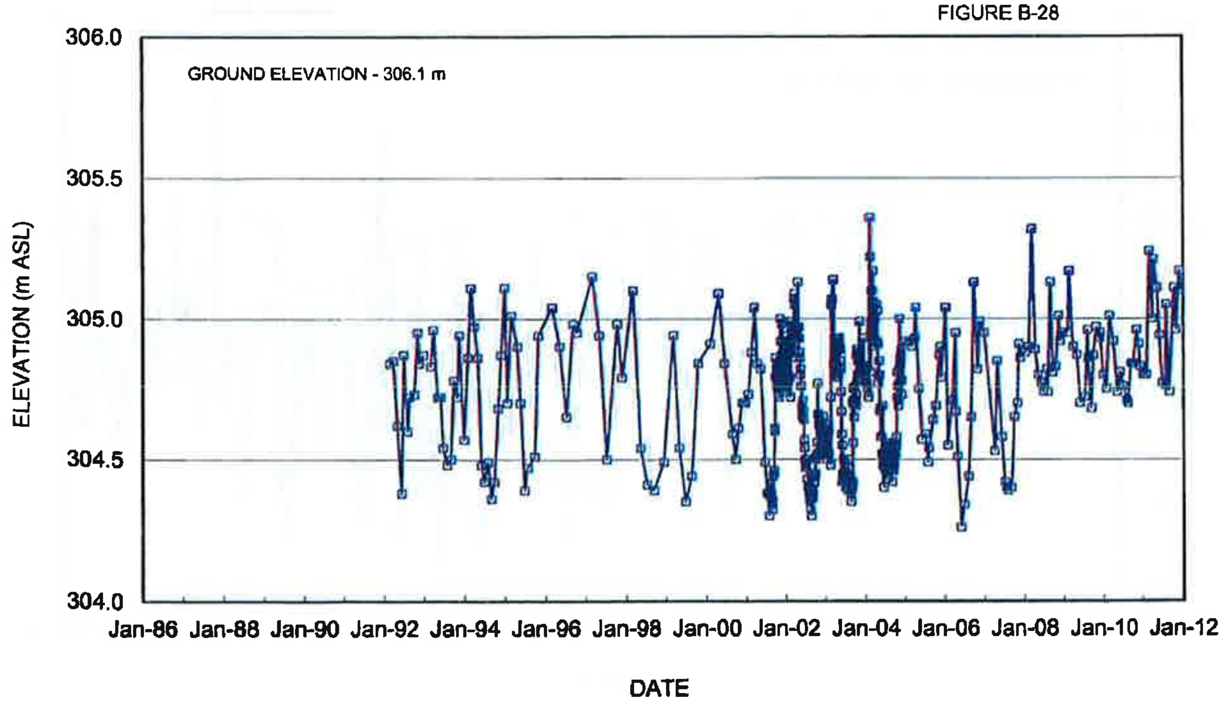
GROUNDWATER HYDROGRAPH
BOREHOLE 92-29

FIGURE B-27



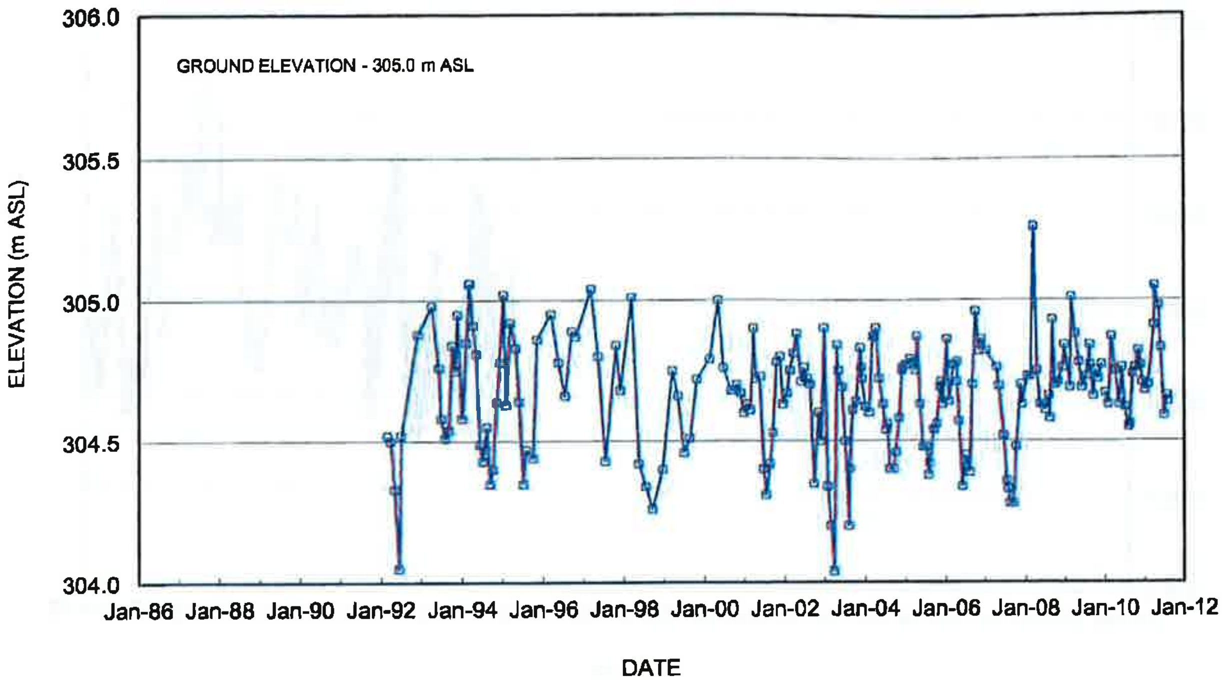
GROUNDWATER HYDROGRAPH
BOREHOLE 92-30

FIGURE B-28



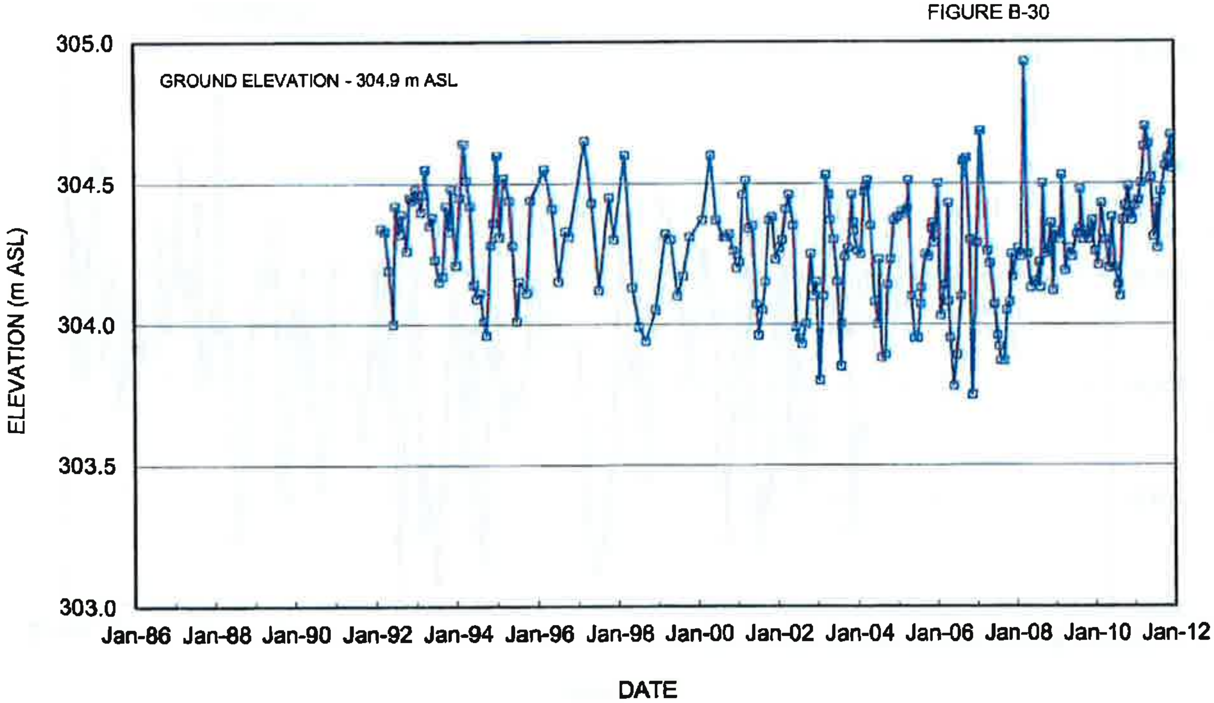
GROUNDWATER HYDROGRAPH
BOREHOLE 92-31

FIGURE B-29



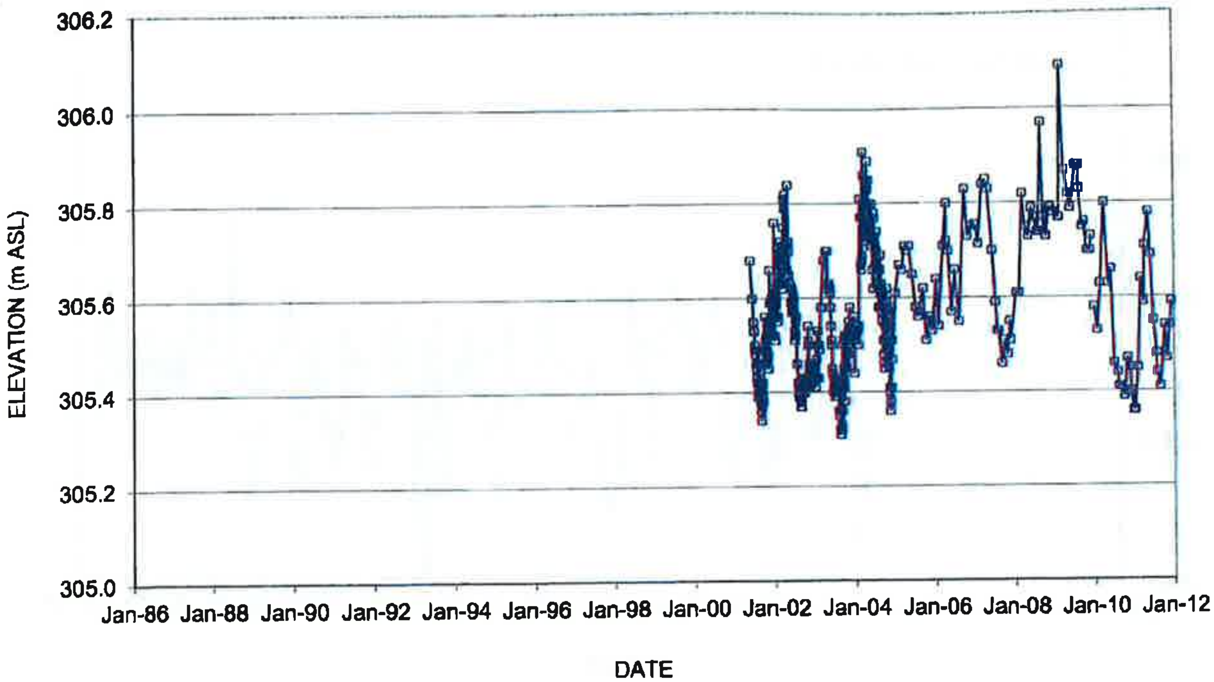
GROUNDWATER HYDROGRAPH
BOREHOLE 92-32

FIGURE B-30



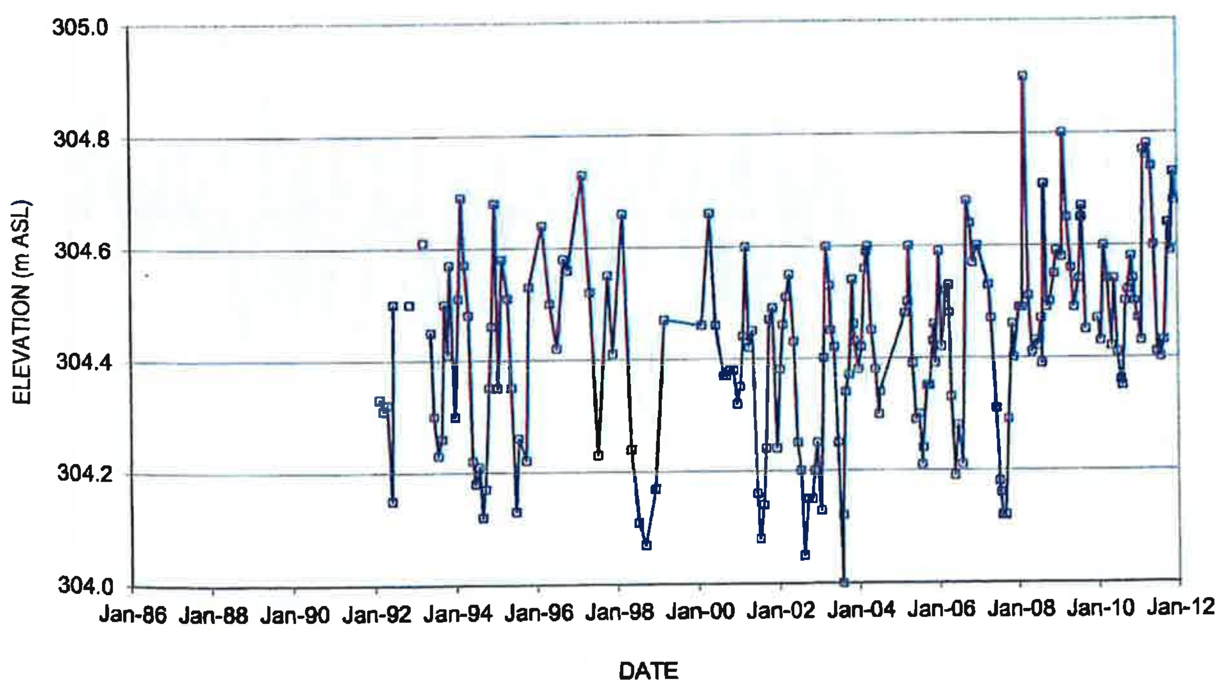
GROUNDWATER HYDROGRAPH
BOREHOLE 92-12

FIGURE B-31



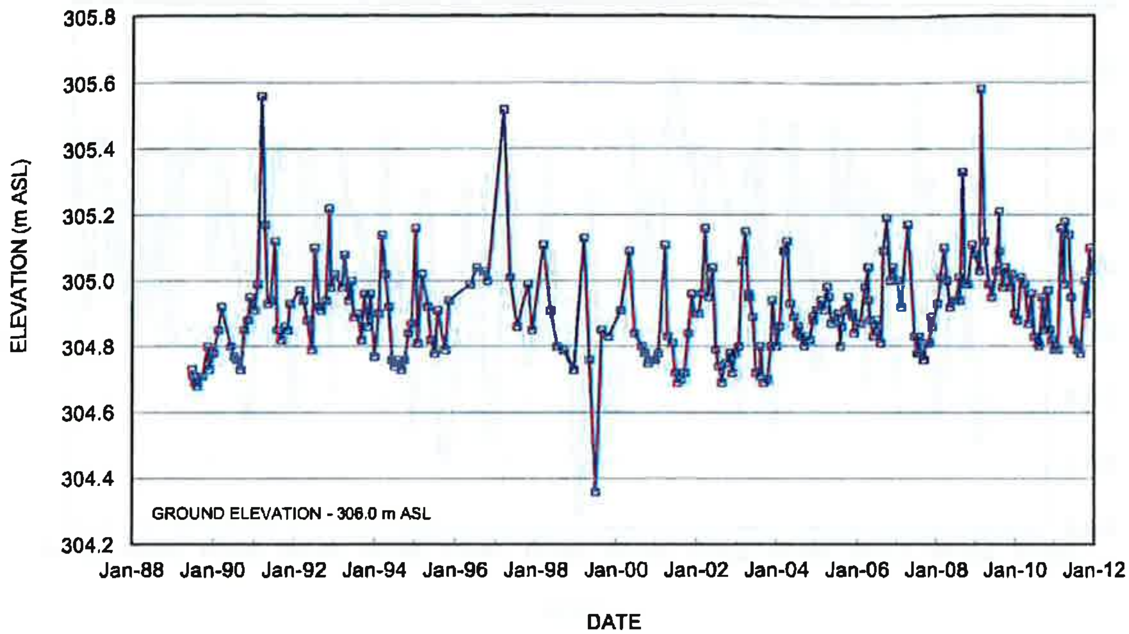
GROUNDWATER HYDROGRAPH
BOREHOLE 92-33

FIGURE B-32



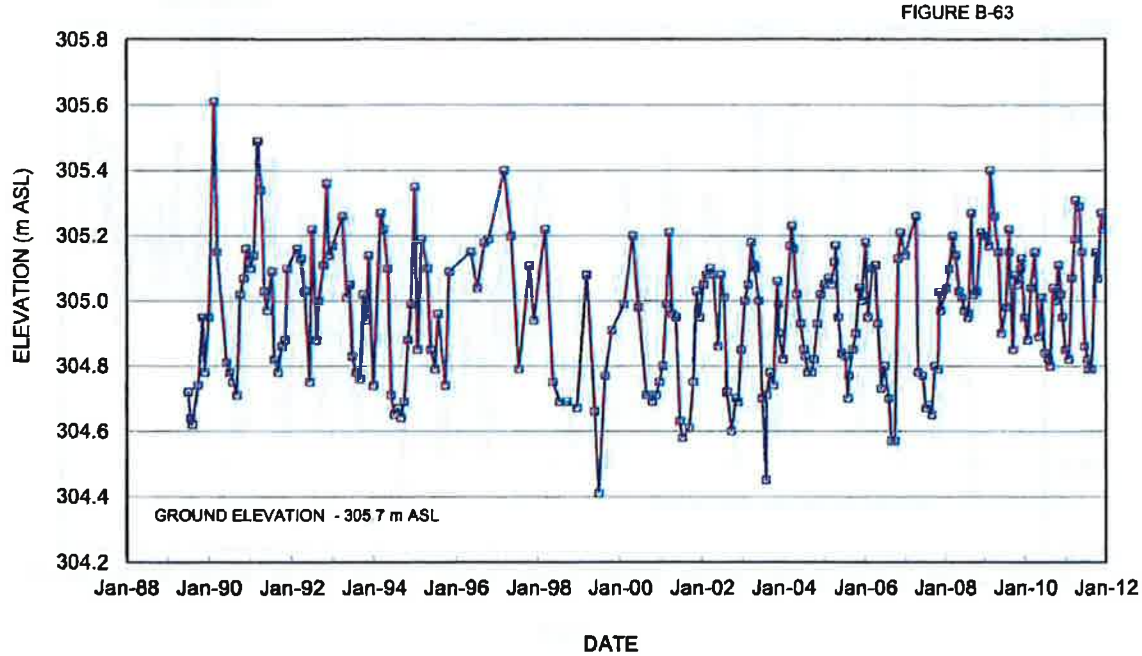
GROUNDWATER HYDROGRAPH
DP10

FIGURE B-62



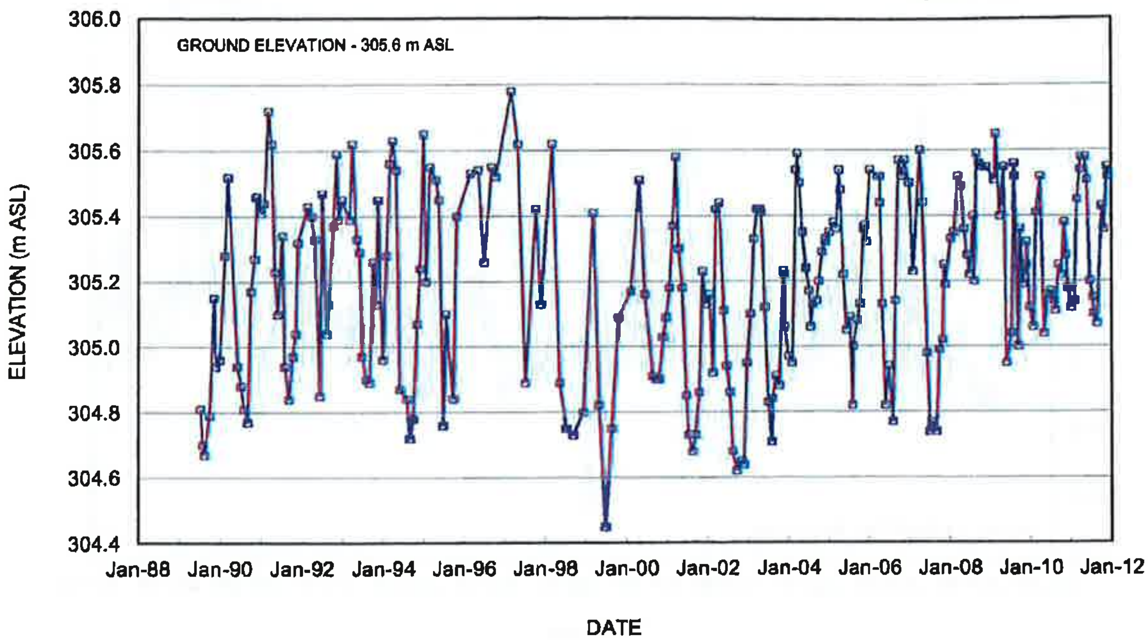
GROUNDWATER HYDROGRAPH
DP11

FIGURE B-63



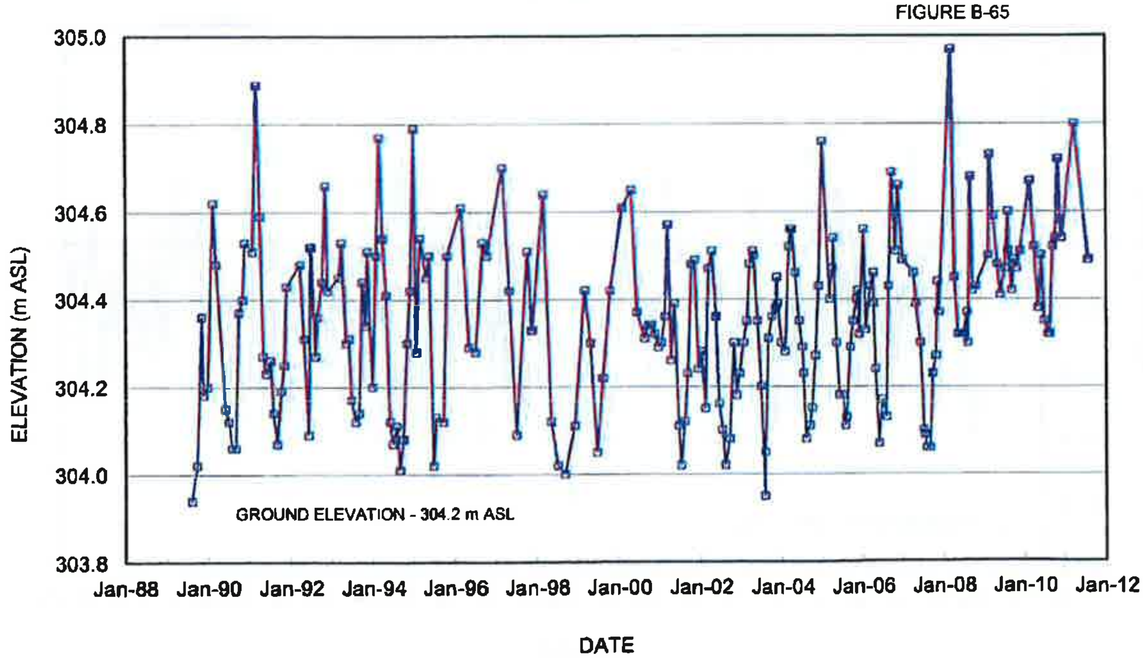
GROUNDWATER HYDROGRAPH
DP12

FIGURE B-64



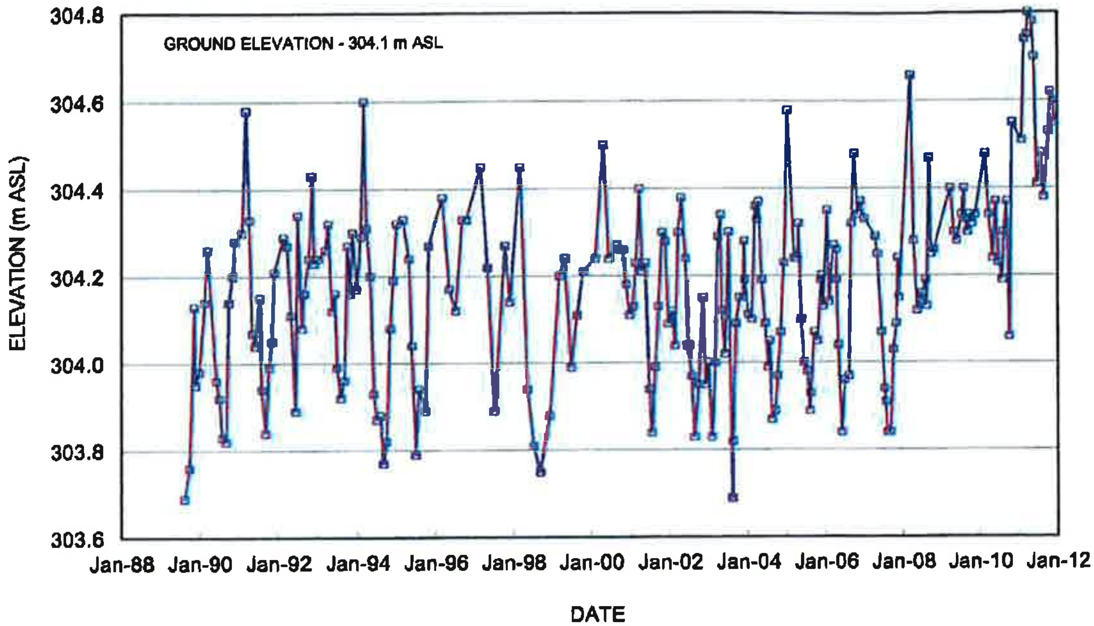
GROUNDWATER HYDROGRAPH
DP15

FIGURE B-65



GROUNDWATER HYDROGRAPH
DP16

FIGURE B-66



Memo

Paul F. J. Eagles Planning Ltd

To: Ron Vanooteghem, Holcim

From: Paul F. J. Eagles, Paul F. J. Eagles Planning Ltd.

CC: File

Date: 12/17/2012

Re: Short summary of the findings from the 2012 wetland vegetation monitoring program

---

The year 2012 was the twenty-first season of biological monitoring conducted by Paul F.J. Eagles Planning Ltd. on the Mill Creek Aggregates property. Monitoring activities were carried out between May and August, 2012, followed by data analysis and preparation of a monitoring report.

Vegetation monitoring was conducted according to standard methodology established by Eagles Planning in 1991. In 2012, a report summarized the results of vegetation monitoring on the site and examined each monitoring plot in detail. The objective of permanent plot monitoring is to document changes in vegetation composition in the wetlands of the property. The technique deemed appropriate for measuring the composition of the vegetation cover in the wetlands is known as the Quadrat-Charting Method. This method has been used consistently throughout the monitoring program over many years.

This memo provides a short summary of the larger 2012 biological monitoring report than concentrates on wetland vegetation monitoring.

Memo

Biological monitoring of the Mill Creek Aggregates property in 2012 indicated that wetland habitat is being maintained. In none of the 14 monitoring plots did dryland vegetation cover exceed wetland vegetation cover. This confirms the conclusions of the original environmental impact assessment by Paul F.J. Eagles Planning Ltd. in 1989, which stated that extraction could proceed without the loss of provincially significant wetland vegetation or wildlife. Monitoring methods continued to be effective during the 2012 field season and it is recommended that these methods continue to be used. Paul F.J. Eagles Planning Ltd. will continue more intensive monitoring in plots that have experienced vegetation anomalies in the past.

The 2012 report confirms that wetland habitat has been maintained on the forested sections of the property throughout the extraction period. The biological monitoring team concludes that the 2012 report satisfies condition 20 of the Class A extraction license issued for the property under the Aggregate Resources Act. Aggregate extraction activities have not negatively impacted the provincially significant Mill Creek Wetland Complex which is beyond the limits of extraction.