22 September 2015

NSW Planning Assessment Commission

GPO BOX 3415

SYDNEY, NSW 2001

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Attention: JOHANNA LEE

Dear Johanna

AIRLY MINE EXTENSION PROJECT – Comments for PAC Meeting 23 September 2015

Please find the following submission by the undersigned regarding possible Impacts to Groundwater by the proposed Centennial Airly Mine Extension Project. Groundwater Solutions International **does not** support Centennial Airly Pty Ltd application for the Airly Mine Extension Project.

The letter report details my comments in response to Appendix E: GHD Pty Ltd 'Response to Submission from Groundwater Solutions International' (January 2015) as part of Centennial Airly's 'Response to Submissions'. GHD Pty Ltd did not provide a response to Groundwater Solutions International additional comments on the Peer Review of the Hydrogeological Model.

Two submissions were originally made by Groundwater Solutions as follows:

- Desktop Review of Airly Mine Extension Project: Groundwater Impact Assessment and Hydrogeological Model (30 October 2014) which formed part of Centennial Airly Pty Ltd Airly Mine Extension Project, Environmental Impact Statement.
- Additional Submission by Groundwater Solutions International (6 November 2014) on the Peer Review of the Hydrogeological Model (Dr Noel Merrick, HydroAlgorithmics). The Peer Review was exhibited by Centennial Airly after the public exhibition period had closed and permission to submit was made as a matter of procedural fairness.

Yours sincerely

Andrea Broughton

[redacted]

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[redacted].

1.0 Introduction

As requested by EDO NSW, on behalf of Capertee Valley Alliance, I have read the following documents and provided this letter report with my comments.

Airly MEP EIS Appendix E Ground Water

Airly MEP Lithgow City Council

Airly MEP NOW EIS Submission

Airly MEP OEH EIS Submission

Airly MEP CVA EIS Submission

Airly MEP CVEG EIS Submission

Airly MEP IESC advice

Airly MEP Response to Submissions (sections 5.2.1, 5.2.2, 5.3.1, 5.3.2, 5.4.1, 5.4.2 and Appendices A, E and G.

Airly MEP Supplementary Information to RTS

Airly MEP Preliminary Assessment Report

PAR App H Recommended Conditions of consent

This letter report is split into four sections:

1. Comments by Groundwater Solutions International (GSI) in response to GHD Pty Ltd Response to Submission from GSI.
2. GSI comments on the Peer Review by Dr Noel Merrick, HydroAlgorithmics.
3. GSI comments on GHD Airly Mine Extension Project – Fault Zone Hydrogeology.
4. GSI comments on NSW Department of Planning & Environment 'Secretary's Preliminary Environmental Assessment Report' and Draft Conditions of Consent (Appendix H)

2.0 Comments on GHD response to Submission from GSI

There were nine comments submitted by Groundwater Solutions International (30 October 2014) with regard to GHD Groundwater Impact Assessment and Hydrogeological Model. The concerns are summarised below with comments on GHDs responses:

1. **No Peer Review of the Hydrogeological Model had been published.**

After GSI made the submission and the exhibition period was closed, Centennial Airly added a Peer Review of the Hydrogeological Model by Dr Noel Merrick, HydroAlgorithmics. GHD did not provide a comment in their response to Submission from GSI, as the Peer Review was published before this occurred. However, GHD did not subsequently make a supplementary comment on GSIs supplementary submission (6 November 2014). Questions remain and will be discussed fully in Section 3.0 of this letter report.

2. **The Groundwater Monitoring Network did not represent the area of interest and the proposed new monitoring bores for Authorisation Area 232 should have been completed and data used as part of the EIS.**

GHD confirmed the number of boreholes: 23 VWPs and 5 standpipes (including the production bore). There is currently over two years of monitoring data for 15 VWPs and two monitoring bores. These monitoring bores represent the central zone of the Airly Mine Area only. The monitoring bore network does not represent the Proposed Mine Extension Area in the east, which the EIS and Numerical Groundwater Model were supposed to cover. GHD state that the IESC were satisfied that '….groundwater data has largely been collected to a satisfactory standard and over an appropriate timeframe'. I disagree, the groundwater data does not cover the eastern mine area where Emu and Dog Trap Creeks rise from and where there are many private bores downgradient in the same catchments which may be in hydraulic connection with the alluvial aquifers in these catchments. Subsidence and drawdown impacts on baseflow and seepage will affect the habitats of GDEs such as the endangered bird the *Regent Honey Eater,* which is found in the eastern areas of Genowlan Mountain. The IESC stated '….subsidence and drawdown impacts are likely to reduce flows in Gap and Genowlan creeks and potentially impact local groundwater dependent ecosystems'. This comment could be equally applied to the Emu and Dog Trap creek catchments.

I understand Airly Mine is located in a closed hydrogeological system and there is limited response to rainfall with the exception of the shallow alluvium. I understand the network of fractures and joints provide the predominant pathway for groundwater movement toward seepage areas and baseflow, rather than downward to the Lithgow Coal Seam and regional groundwater systems, except, what if subsidence leads to the lowering of the hydraulic conductivity of the fractures and joints to the point where fault zones gain more influence in vertical conducting groundwater flow. Given no studies have been done in the eastern area of Airly Mine GHD are not able to confirm this.

GHD state drilling of four additional monitoring bores is to commence in early 2015. Were the NSW Office of Water (NOW) consulted before drilling the additional standpipe monitoring bores and VWPs? GHD state 'NOW, in their submission on the EIS (dated 7 November 2014), has not raised concerns regarding the groundwater monitoring network and existing data'. However, NOW have asked on three occasions to be consulted by Centennial with regards to the Airly Mine Groundwater Monitoring and Modelling Plan of which the location of monitoring bores is important. The last communication was a letter on 9 March 2015 from Mitchell Issacs, Manager Strategic Stakeholder Liaison, NSW Office of Water (Dept of Primary Industries) to Thomas Watt, Planning Officer, Resource Assessments, (Department of Planning & Environment).

3. **The EIS was light on data supporting the conclusions made by GHD. The information required was discussed further on in the Submission by GSI, such as geological logs, standpipe screen intervals, details regarding the installation of the VWPs, reduced levels of standpipes, packer test data.**

No comment by GHD except their response to Point 2 above that the IESC were satisfied that '….groundwater data has largely been collected to a satisfactory standard and over an appropriate timeframe'.

Mine dewatering and subsidence may alter the hydraulic ability of the local groundwater system to transmit groundwater.

GHD state 'due to the extensive network of fractures and joints throughout the Triassic strata it is considered unlikely that fracturing and deformation of strata overlying the mine workings will be altered to such an extent that natural groundwater flow to seepages areas and waterways will reduce.' The subsidence assessment for the Project

cannot predict any impacts to the Triassic strata in the eastern area of A232. What monitoring systems are in place to measure whether this is the case for the whole Airly Mine area, not just the central area centred on Gap Creek?

4. **Reduced baseflow recharge to the Quaternary alluvium, and Creeks, may reduce recharge to the underlying shallow aquifers of the Shoalhaven and Devonian Formation.**

I understand this has been considered in the numerical hydrogeological model and a drawdown prediction of 0.1m in the Shoalhaven aquifer has been made within the Project Area. There is never a single value for drawdown predictions, only ranges. What is the upper and lower end of the drawdown predictions in the Shoalhaven formation? What range in streambed conductance values were used along all creek reaches directly overlying both the Shoalhaven and Devonian shallow aquifers?

I suspect this model is not able to represent drawdown effects on a local scale. I understand GHD have discussed this in the IESC submission saying running the model with a smaller 25 x 25m grid actually indicated groundwater levels will not be lowered to the extent as was predicted with the 50 x 50m grid. However, the actual data on the ground is not small scale enough to allow adequate predictions on a 25 x 25m grid.

What monitoring plan does Centennial have to ground truth the numerical groundwater model predictions of seepage and baseflow reductions, on Emu Swamp and Dog Trap creek?

5. **Centennial Airly have not included a study of cumulative effects of dewatering and subsidence on groundwater levels in the colluvium and alluvium under drought conditions.**

I understand the numerical hydrogeological model is being used to predict non-rainfall (mining) effects on local and regional groundwater. Given the site water balance model requires rainfall inputs into the model and averaged rainfall has been used for this numerical model, then I still don't understand why a drought scenario has not been run?

6. **Centennial Airly bought an 'Additional Entitlement' WAL 36565 for 120 ML/year from the Sydney North Basin. The source for this 'Additional Entitlement' has not been published.**

I understand the additional entitlement was obtained by Centennial Airly through a tender process under a Controlled Allocation Order. I understand the additional entitlement was obtained from a groundwater source that previously had unassigned water. The answer I want to know is which aquifer source is the additional entitlement coming from? A groundwater licence saying Centennial can abstract groundwater from the local Capertee Catchment based on the availability of groundwater from a source that is not in the local Capertee Catchment (whether by coal seam dewatering or extraction from the production bore) is wrong. Airly mine will be dewatering from a closed hydrogeological system where groundwater is often scarce. If Centennial has a licence to take groundwater because they have a number on paper saying they can, does not mean groundwater is available to be taken. This will affect the GDEs. This is a number shuffling exercise on paper and will affect the Water Balance Model.

7. **Once the mine reaches its peak requirements of 199 ML/year and is recycling 80% of this produced water there will be no need to have a 278 ML/year groundwater allocation for the life of the mine.**

GHD has explained NOW require them to hold a WAL for the life of the mine and after mining ceases (as groundwater take may still be occurring), whether Centennial take groundwater or not, in accordance with the Aquifer Interference Plan.

8. **Centennial Airly have no additional groundwater WAL licences to cover increased groundwater abstractions above those modelled, if they have underestimated groundwater storage in the Permian Lithgow coal measures.**

GHD explained this fully and monitoring will ensure the modelled aquifer storage estimates remain conservative.

3.0 GSI comments on Peer Review by Dr Noel Merrick, HydroAlgorithmics

As part of procedural fairness GSI submitted comments on the Peer Review on 6 November 2014. However to date GSI has not received a Response to Submission from GHD regarding the following submission by GSI.

The Peer Review of the Airly Mine Extension Project Hydrogeological Model carried out by Dr Noel Merrick, HydroAlgorithmics, is thorough and fair. Groundwater Solutions International is in agreement with most of his findings. However, the following important comments are made:

1. Dr Merrick stated 'the groundwater monitoring network enabled good mapping of groundwater level contours over the central part of the lease for the Narrabeen Group, Lithgow Seam and Marrangaroo Formation groundwater systems'. However, Groundwater Solutions finds the monitoring network only represent the central portion of the proposed Airly Mine Extension Area and does not represent the eastern areas of interest which form the catchment area for Emu Swamp and Dog Trap Creek where there are a number of private bores located downgradient. The proposed five new monitoring bores for Authorisation 232 should have been completed and used as part of this Environmental Impact Assessment, including two years of monitoring data. The monitoring bore network does not characterise the shallow groundwater and baseflow conditions adequately in the whole area of interest.

2. Dr Merrick concluded that adequate multiple scenarios had been run for climate variability. However, Dr Merrick did note that 'a single average climate has been used, although text says historical dataset has been used'. GSI does not consider using only **average** rainfall and from a climate station that is not considered representative of Mt Airly and Genowlan Mountain. GSI agrees with the Consent Condition, Appendix H in the Secretary's report, stating Centennial set up a climate station at the Airly Mine and effectively fine tune the numerical groundwater model with the new climatic data.

3. Dr Merrick stated the Conceptual Model was adequate. However, Groundwater Solutions finds the conceptual model for the local groundwater system does not allow for baseflow in the shallow colluvial deposits and highly weathered sandstone in the **upper reaches** of the Creeks, as seen at the Grotto. GHD **acknowledge it occurs** but it is not apparent in the building of their Conceptual Hydrogeological Model.

4. Centennial Airly have not included a study of cumulative effects during drought. Centennial did address this comment in GSIs earlier submission (refer to comments in Section 2.0).

5. The lack of groundwater and surface water modelling of mining effects on baseflow recharge to the Quaternary alluvium, and Creeks, was also noted by Dr Merrick. In light of points 2, 3 and 4 above there may well be reduced recharge to the underlying shallow aquifers of the Shoalhaven and Devonian Formation. Therefore groundwater users may be affected.

6. Dr Merrick noted there was a lack of groundwater modelling for the Devonian rock groundwater resource. Although he does conclude it is unlikely to be an impacted. He states that the majority of groundwater users

access the Devonian aquifer. He rightly said they will be concerned about the security of their water resource and this should have been addressed in the groundwater model. Given no monitoring data has been collected for the eastern Mine Extension area the numerical groundwater model cannot be calibrated for steady state flow in the eastern area. Again this is the catchment for Emu Swamp and Dog Trap Creeks along which there are many private groundwater bores.

To date GSI believed Dr Merrick was incorrect in his belief that the majority of bores are located in the Devonian aquifers. Anecdotal water quality evidence mentioned to GSI by the landholders suggested their bores are actually located in the Shoalhaven formation. This was based on poor water quality from their bores. It is possible that the bores are extracting groundwater from the Devonian aquifer but may have increased levels in pH over the years due to mixing from another groundwater source. I understand the chemical signature of the Devonian and Shoalhaven formation aquifers are distinctly different. However, GSI is not aware of any chemical analysis studies from private bores conducted by Centennial in the Emu Swamp and Dog Trap creek catchments. There is a possibly there may be a proportion of groundwater recharge to the Devonian aquifer from the overlying poorer quality Shoalhaven groundwater systems. The alluvial aquifers in the **lower** Emu Swamp and Dog Trap creek catchments may be contaminated by poor quality water from Airly Creek and recharging the underlying Devonian aquifers if there is a hydraulic connection with the creek bed. GHD need to gather more data in these catchments and check their conceptual groundwater model in the eastern area of the Proposed Mine Extension Area.

As it stands mining project impacts on the Shoalhaven and Devonian formation groundwater users has not been adequately modelled and discussed in the Environmental Impact Statement. This is mentioned in Dr Merrick's Peer Review.

7. Potential changes in baseflow were assessed from 11 locations throughout the model domain to determine whether any baseflow reductions occurred at the model boundary and at the confluence of Gap and Genowlan Creeks. No assessment locations were used in the upper tributaries of the model domain. Predicted changes in baseflow and groundwater drawdown as a result of proposed mining operations is sensitive to hydraulic conductivity values assigned to both the alluvium and Permian strata. However, there is little real data used to calibrate the transient model and to check on the model predictions. **Dr Merrick also stated the transient model is not sufficiently calibrated against temporal observations**.

8. Dr Merrick concludes 'although more work could have been done to make the groundwater model more robust, the model is considered sufficiently *fit for purpose*, as required by the Aquifer Interference Policy'. GSI understands the calibrated transient model is required to make predictions spanning 60-70 years. The model is not calibrated for transient modelling (it has been roughly verified) and therefore any conclusions regarding aquifer recovery and long term effects are not sound.

The remaining comments made by Dr Merrick regarding the groundwater model are supported by GSI.

4.0 GSI comments on Fault Zone Hydrogeology (GHD, 16 January 2015).

GHD's letter report to Centennial Airly Pty Ltd titled 'Airly Mine Extension Project – Response to Submissions Fault Zone Hydrogeology (GHD, 16 January 2015) outlined a Fault Zone Hydrogeological study in response to IESC request for supplementary information.

GHD state the following observations from 23 packer tests from the 23 VWPs, installed across seven borehole locations and with four borehole sites (ARP01, ARP04, ARP07 and ARP08) within the mapped fault zones:

1. Faults are not transmitting horizontal groundwater flow.
2. Given the low hydraulic gradient across the eastern Airly Mountain and western Genowlan Mountain area the faults are also not the main vertical transmitters of groundwater flow. GHD state the four borehole sites located on fault zones do not indicate a great loss of water.
3. There is a negative piezometric pressure in most of the boreholes indicating there is a downward flow of groundwater and represented as an unsaturated zone. GHD indicated there was a high loss of groundwater, so much so that it made it impossible to undertake a meaningful packer tests.
4. Positive piezometric pressure is generally low (<10m) which GHD say reflects the extensive groundwater seepage areas across the slops of Mt Airly and Genowlan Mountain.
5. The Triassic Narrabeen Sandstone and Permian strata of Mt Airly and Genowlan Mountain are characterized by a regular pattern of joints and fractures, with spacing in the order of 10-20m, based on analysis of aerial imagery and from the exploration drilling program.
6. GHD conclude the faults are not the main transmitters of groundwater flow, but fractures and joints in the Narrabeen Sandstone are. The fractures and joints direct groundwater to seepage areas across the slopes of Mt Airly and Genowlan Mountain. This is supported by the water loss during drilling and packer testing and the unsaturated conditions found in the Lithgow Coal Seam.

GHD state there is no hydraulic connection between the Triassic and Permian formations, and the underlying Shoalhaven and Devonian aquifers. GSI are not convinced of this given no chemical analysis studies have been carried out in private bores to east of A232 (refer to comments in Section 3.0). I understand seepage and baseflow seem to be the main groundwater outputs in the central Airly Mine area based on the VWPs, however, the eastern area (Eastern Genowlan Mountain) of the Proposed Mine Extension has not been studied. Once the proposed 2015 drilling program has been completed, and the baseline data collected (including packer tests), the conceptual groundwater model will need to be reassessed.

Not a lot of work has been done in the EIS regarding impacts of subsidence in the **eastern extension area** on the fractures and joints in the overlying Triassic and Permian strata. If subsidence compact the strata fractures and joints then the hydraulic conductivity will be reduced. Is it therefore not possible that the fault zones may become the predominant conduits to vertical groundwater flow in subsidence affected areas? I would expect compaction from subsidence would have an impact on fractures and joints more readily than fault zones. This in turn will have an impact on the ability of the strata to transmit groundwater to seepage areas and as baseflow to creeks. If the faults could become the predominant conduit to groundwater flow in areas of Airly Mine then that could allow for deep migration of groundwater into the underlying Lithgow Coal Seam and/or the underlying Shoalhaven formations. Although the Devonian regional aquifer is recharged from the northern and eastern areas, local influence from Airly Mine could occur if a hydraulic connection was established with the overlying Shoalhaven formation. This could possibly occur if fault zones predominate over compacted fractures and joints in the overlying Triassic and Permian formations.

The reduction of baseflow and seepage to the Quaternary alluvium along Gap, Genowlan, Airly, Emu Swamp and Trap Dog Creeks Creek will impact on recharge to the **shallow** Shoalhaven and Devonian aquifers where they are in hydraulic connection with the overlying alluvial aquifers. This will ultimately impact on the private bores in the area.

Centennial said they will be carrying out a bore drilling program to increase their groundwater/seepage monitoring network in early 2015. Has this happened and if so were NOW consulted as to the siting of the monitoring bores and tests to be undertaken? This data should have been used in the Centennial EIS to calibrate their numerical model for

steady state conditions, and ultimately for transient conditions to enable more credible predictions of impacts to baseflow, groundwater and GDEs.

5.0 Comment on NSW Department of Planning & Environment 'Secretary's Preliminary Environmental Assessment Report' (August 2015)

5.1 Groundwater System and Model

In the NSW Department of Planning & Environment 'Secretary's Preliminary Environmental Assessment Report' (August 2015) the Department consider there is sufficient data available for the assessment. GSI continues to disagree since there is no monitoring data (2 years) to calibrate the groundwater model for steady state flow in the eastern portion of A232. This is a basic requirement to meet the need for constructing a working groundwater model which forms the basis for determining whether subsidence will affect the groundwater flow regime and GDEs. The Department agrees that data from the additional monitoring bores in the proposed eastern portion of the A232 should inform the development of the mine plan, via adaptive management (pg. 45). GSI recommend at least two years of data from the additional bores be gathered before any mine operations commence in the eastern portion of A232. Adaptive management has its place but to not have essential data at the outset is negligent.

The Department recommended conditions requiring the mine to calibrate the groundwater model as part of the Water Management Plan and to use this data to inform adaptive management practices in Extraction Plans as mining moves from the west to east on the site (pg. 45).

5.2 Drawdown within the shallow alluvial groundwater source

The Department considers there will be no change in water quality to Gap or Genowlan Creek, or to the beneficial use categories of these creeks as a result of predicted levels of groundwater drawdown (2.5-3.5m beneath Gap Creek and up to 1.1m beneath Genowlan Creek). The Department concludes no high priority GDEs or groundwater users would be affected and baseflow losses would be minor. The Department considers impacts to the alluvial groundwater sources are less than the Level 1 minimal impact consideration under the Aquifer Interference Plan (AIP).

As stated in the Secretary's report on page 46 Centennial has previously monitored drawdown of 3.5m in the Gap Creek alluvium due to climatic conditions (I presume drought conditions) between August 2012 and April 2013, with no change in groundwater quality. GSI consider if there is a predicted drawdown of 2.5-3.5m within a period of drought then the cumulative drawdown effect from mining activities will be up to 7m (depending on the alluvial aquifer thickness), which is similar to that predicted by GSI in its submission in October 2014. GSI would expect the water quality would be compromised if this was to occur and GDE's or groundwater users would be affected. GSI consider impacts will be more than the Level 1 minimal impact consideration under the AIP during drought periods and licence conditions need to be made to manage these impacts.

5.3 Drawdown within the less productive porous and fractured rock groundwater sources.

The Department believes that fracturing due to coal mining will be limited to the Permian formation. The overlying Narrabeen Sandstone is not expected to experience additional fracturing and groundwater flow will continue to flow horizontally through fractures and joints to seepage areas and as baseflow to creeks where the strata outcrops, rather than to the mine workings and the regional groundwater sources below. The Department is also satisfied that there will be no inter-aquifer connectivity between the local and regional groundwater sources as a result of mining-

induced subsidence or sub-surface fracturing. The Department concludes that the proposed depressurisation and drawdown would be within the Level 1 minimal impact consideration under the Aquifer Interference Plan.

GSI do not believe the Department has sufficient data from the proposed mine extension area to form this conclusion at this point in time for reasons already discussed above.

5.4 Drawdown within the highly productive porous and fractured rock groundwater sources.

GSI received anecdotal reports of poor water quality from private bores located in the Devonian regional groundwater resource in the Dog Trap-Coco Creek and Emu Swamp Creek areas. GSI consider that maybe these bores were actually either located within the Shoalhaven groundwater resource, or their bores are inducing local drawdown flows from the overlying Shoalhaven source. Even if this was so, the Department considers that as there is minimal drawdown of 0.1m in the Shoalhaven Group that there is unlikely to be any impact to groundwater users who may extract from this groundwater source.

There is a possibility that these bores could be at shallow levels within the Devonian aquifer and are in hydraulic connection with the overlying alluvial aquifer associated with Airly/Coco Creek, which has poor water quality. The Department has been given one value of drawdown which is unrealistic in the field of hydrogeology. Centennial should provide a range in drawdown values.

5.5 Monitoring and Management

The Department believes the additional monitoring bores proposed for the eastern area of A232 would improve the coverage of groundwater monitoring across the site and enable greater calibration of the groundwater model and predicted impacts as part of the mine's Water Management Plan. This information would be incorporated into the Extraction Plan process and inform adaptive management practices as mining progresses from west to east across the site.

GSI recommend the Department not state how many additional bores will be required for the eastern A232 area, but to state that the monitoring bores requirements are at NOW's discretion when Centennial consult them on the Groundwater Monitoring and Management Plan. GSI also confirm that this additional data should be collected for at least two years and the groundwater model updated before any mining commences in the eastern portion of A232.

5.6 Draft Conditions of Consent (Appendix H)

5.6.1 Extraction Plan

Section 5 (g) (iii) *Water Management Plan*

The Secretary stated the 'Department believes the additional monitoring bores proposed for the eastern area of A232 would improve the coverage of groundwater monitoring across the site and enable greater calibration of the groundwater model and predicted impacts as part of the mine's Water Management Plan. **This information would be incorporated into the Extraction Plan process and inform adaptive management practices as mining progresses from west to east across the site.**'

This has not been clearly stipulated in the Extraction Plan. GSI would also recommend that NOW decide whether four monitoring boreholes with loggers is sufficient to represent the eastern portion of A232.

GSI requests that Emu Swamp and Dog Trap Creeks are included in the baseline monitoring. The creeks and associated alluvial aquifer systems have been largely ignored, along with the eastern portion of the A232, even though there are GDEs (endangered bird *Regent Honey Eater*) and groundwater users in the catchment.

With regard to the 'Notes'…Condition 5 Extraction Plan does not apply to first or second workings which are covered by an Extraction Plan or Subsidence Management Plan which has been already approved, or is under assessment as at the date of this development consent'…It is hard to comment whether this condition is reasonable when the existing Extraction Plan has not been exhibited.

GSI would expect the water quality in the Gap Creek Alluvium would be compromised if cumulative effects of drought and mining activities caused the water table to drawdown up to 7m (depending on the alluvial aquifer thickness). If this was to occur, then GDE's and/or groundwater users would be affected. GSI consider impacts will be more than the Level 1 minimal impact consideration under the AIP during drought periods and licence conditions need to be made to manage these impacts.

5.6.2 Water Management Plan

Section 13 (d) (iii) *Groundwater Management Plan*

GSI strongly recommends Centennial consult NOW for the location of any monitoring bores to be drilled in the eastern portion of the Proposed Mine Extension Area. The Central area of the site is well monitored. However, the proposed four additional boreholes for the Eastern A232 area may not be located in the optimum sites and may not be sufficient in numbers to represent site coverage.

GSI is in agreement with all remaining parts of the Water Management Plan. Adaptive management is not the best approach but is the most realistic, as data and interpretation of that data comes to hand. GSI recommend that Centennial does not proceed with mining in the Eastern A232 area until at least 2 years of monitoring data is compiled, processed and the updated numerical groundwater model run for all scenarios including using climatic data from the new station that is to be installed at Airly Mine.

6.0 Conclusion

Groundwater Solutions International (GSI) has read the appropriate documents and is submitting the above comments relating to groundwater impacts from Centennial's Proposed Mine Extension to the Planning Assessment Committee for consideration. Groundwater Solutions International **does not** support Centennial Airly Pty Ltd application for the Airly Mine Extension Project.