



Community Information Paper

Flood and Surface Water Modelling



Introduction

The Caroona Exploration Licence (EL) Area covers approximately 350 square kilometres.

The terrain within the EL Area varies from the near flat Liverpool Plains floodplain to elevated grazed and timbered ridge country.

The floodplain sustains highly productive agriculture including irrigated and dryland cropping and livestock production. During large and/or prolonged rainfall events, flooding has the potential to affect large areas of the alluvial floodplains.

Flooding also has the potential to affect public and private infrastructure such as roads and buildings including dwellings.

BHP Billiton is undertaking extensive work to identify possible impacts of mining on flooding, including developing a flood model.

August 2010

Facts On This Sheet

P.1 Key Points

P.1 Introduction

P.2 BHP Billiton regulatory restrictions and commitments restrict likely flooding impacts

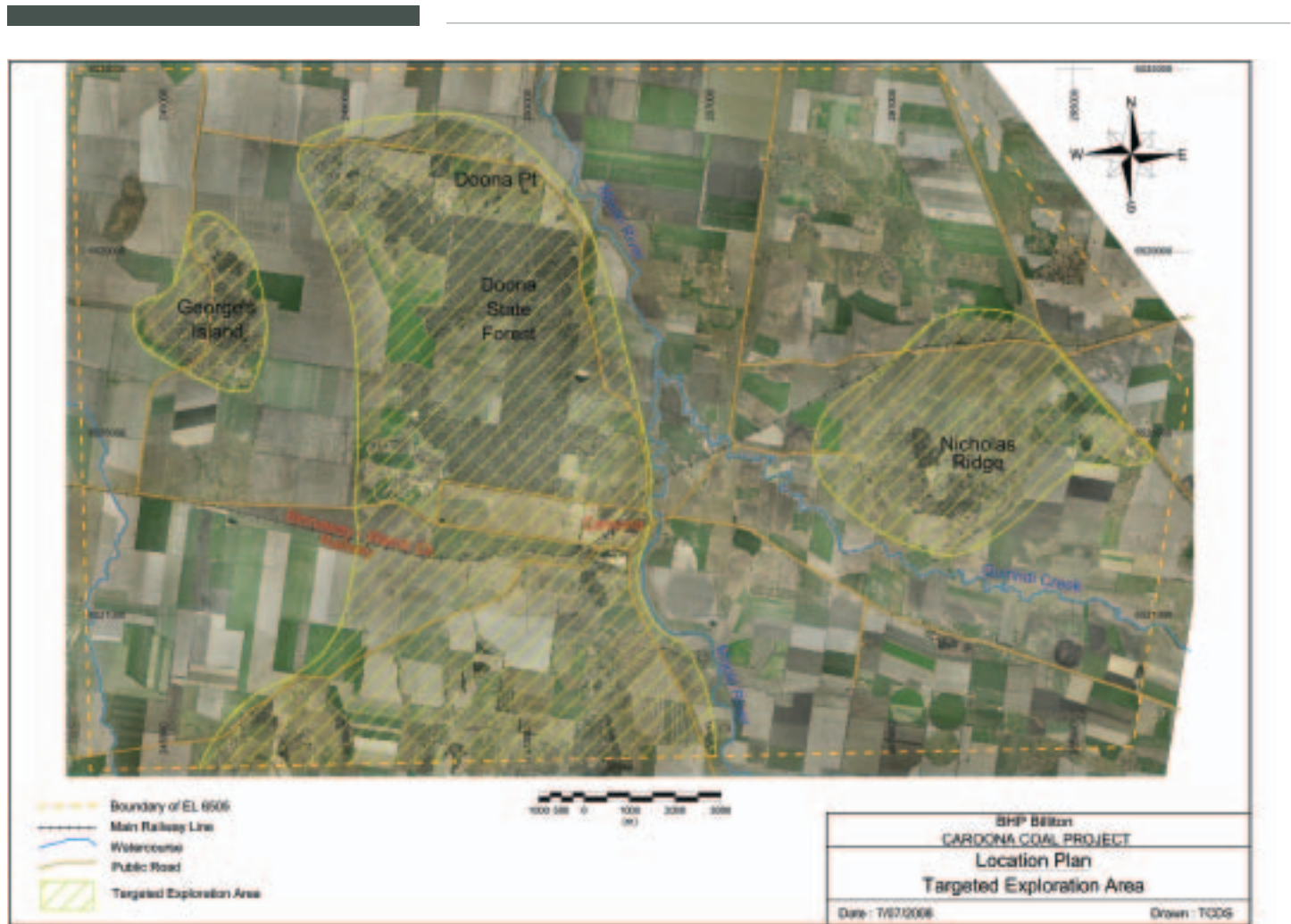
P.3 Development of a flood model

P.3 Assessing the impact of mining on flooding

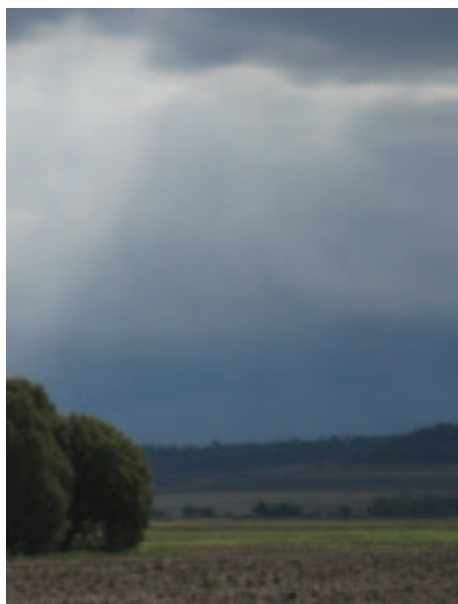
P.4 Next steps to address flood and surface water issues

Key Points

- BHP Billiton is undertaking extensive work to identify possible impacts of mining on flooding, including developing a flood model.
- Following the development of a detailed flood model, impacts from different mine designs, layout and the location and scale of mining and its related infrastructure can be predicted by inputting terrain and localised surface runoff changes into the flood model.
- The likely impacts of any potential mine in the EL Area on flooding have been minimised due to the commitments made by BHP Billiton and restrictions included in the EL.



BHP Billiton regulatory restrictions and commitments restrict likely flooding impacts



The likely impacts of any potential mine in the EL Area have been minimised due to the commitments made by BHP Billiton and restrictions included in the EL.

BHP Billiton has committed that there will be no open cut mining anywhere in the EL Area. These commitments are captured by NSW Government amendments to the Special Conditions of the Caroona Exploration Licence. The amendments prevent BHP Billiton from applying for a mining lease that includes any of the following activities:

- longwall mining underneath the deep alluvial irrigation aquifers;
- longwall mining underneath the floodplain; and
- open cut mining on the floodplain.

These restrictions are consistent with BHP Billiton's commitments.

These commitments and EL restrictions mean that any flooding impacts from mining activities would be minimised for the following reasons:

- Avoiding subsidence on the floodplains will mean that flood flow patterns across the floodplains remain unaffected. The potential for damming and increased water logging in subsided ground on the black soil plains is eliminated.
- Underground mining involves less surface disturbance than open cut mining. For the Caroona EL this means that the likely implications for surface are significantly less than they may be in relation to an equivalent open cut operation.

Development of a flood model

Understanding the existing surface flow regime is critical to understand what impacts underground mining and its related infrastructure might have on flooding in the Caroona area.

BHP Billiton has commissioned Umwelt (Australia) Pty Limited (Umwelt) to develop a detailed two-dimensional flood model of the Caroona region and to investigate flood behaviours within the Caroona EL and surrounding areas. The flood model will be developed using a series of processes, including:

- In 2006, the EL and surrounding areas was extensively surveyed using Light Detection and Ranging (LIDAR) and Falcon™ airborne sensing equipment. This survey data, in combination with NSW Government Land and Property Information (LPI) survey data, has provided detailed terrain data of the EL and surrounding area.
- Data collected from stream gauging stations located in and around the EL Area provide information on historical flood levels and durations at these locations following various rainfall events in the region.
- Detailed information on rainfall events including rainfall depth and intensity is obtained from Bureau of Meteorology rainfall gauges and stream gauges in the catchment.

- Historical rainfall and stream gauging data are reviewed to gain an understanding of rainfall patterns and historical flood responses.
- Hydrology models of the catchment areas upslope of the EL are developed based on historical data.
- A flood model of the floodplain in and around the Caroona EL Area is then developed using the historical flooding and rainfall data, the detailed topography data and information collected during site inspections.
- The flood model will also consider information that is relevant to flood behaviour including various terrain and soil types and factors such as vegetation type, crops and coverage.
- The accuracy of the flood model is then considered by reviewing the sensitivity of the flood model to various parameters and reviewing the flood model outputs against past known rainfall events, flood levels and flood pathways.

Assessing the impact of mining on flooding

Mining and its related infrastructure has the potential to affect surface water flows in the following ways:

- exposed soils areas associated with mining activities may increase run-off;
- site water management controls may intercept water that may otherwise have contributed to surface water flows;

- subsidence from longwall mining can affect surface flow patterns; and
- works on floodplains can affect surface flow patterns which can cause scouring and/or affect the extent and duration of flooding in surrounding areas.

Following the development of a detailed flood model, impacts from different mine designs, layout and the location and scale of mining and its related infrastructure can be predicted by inputting terrain and localised surface runoff changes into the flood model.

The key aspects of any potential mining operation in the Caroona EL Area that may have an impact on flooding in the area are:

- the location and layout of surface mine infrastructure;
- terrain changes due to subsidence from longwall mining;
- road upgrades;
- rail upgrades; and
- additional utility and support infrastructure such as power lines and gas drainage.

Managing potential flood impacts caused by mine infrastructure

The location and scale of surface works, particularly the size of disturbed areas, will affect the amount of infiltration and runoff from the site. While this may have significant localised impacts, this is unlikely to have a significant effect on flood levels and flow patterns on the plains as the main surface



infrastructure will need to be located above historical flood levels to avoid damage and disruption to operations.

Managing potential flood impacts caused by subsidence

Subsidence induced terrain changes can cause localised flooding impacts and alter flood flow patterns if the subsidence occurs within a floodplain. As longwall mining will be limited to the ridge country there will be no subsidence of the floodplains.

The design of longwall layout can reduce the magnitude of any adverse impacts associated with subsidence on the slopes and ridges.

Subsidence on the slopes and ridges is likely to affect localised surface water runoff patterns. The extent of any impacts will be identified by the flood model being developed. The flood model will assist in understanding where adverse impacts may arise from particular mine designs and allow the mine plan to be designed to minimise these impacts. Individual property subsidence management plans will be prepared as part of the subsidence management process to ensure that any subsidence impacts are appropriately managed to address the specific land management requirements of each property owner.

The flood model will also assess whether localised changes to surface water runoff on the slopes will have any impact on flood patterns on the plains, however any such impact is expected to be negligible.

Managing potential flood impacts caused by road, rail and infrastructure upgrades

There are a number of roads and railway lines that cross the plains in and around the Caroona EL Area. These roads and railway lines already act as flood barriers, having a damming effect on floodwaters moving downstream. Should BHP Billiton seek and gain approval for an underground mine in the

Caroona EL Area or other mines be approved in the region, both rail and road infrastructure will require upgrading. Any increases in the height of roads that are currently inundated during large rainfall events will potentially have impacts on flood flow patterns. Changes in the dimensions of bridges and the length of culverts, causeways and floodways can also affect flood heights and flood flow patterns. The detailed flood model being developed by Umwelt will enable any infrastructure upgrades associated with an underground mine in the Caroona EL Area to be designed to minimise any adverse impacts on flooding flow and behaviour.

Utility infrastructure such as pipelines and powerlines can also alter flood flows where they are located within a floodplain. As with road and rail infrastructure upgrades, the detailed flood model being developed by Umwelt can be utilised to assess the impact, if any, that such infrastructure can have on flood flows and behaviours. Where necessary, design options can be assessed to minimise any adverse impacts.

Next steps to address flood and surface water issues

- Complete the detailed model of the existing surface water and flooding regime.
- Conduct detailed sensitivity analyses and ground truth the model to ensure appropriate accuracy. This process will include consultation with key stakeholders (including landowners and relevant agencies).
- When BHP Billiton commences detailed consideration of project design options, model various scenarios to assist in designing the project in a manner which minimises impacts on surface water flow and flooding regimes.
- If BHP Billiton decides to proceed with seeking project approval, use the detailed modelling as part of a comprehensive water resources assessment to be included in the Environmental Assessment. Such assessment will consider local and regional considerations, including any outcomes of the regional water study and any cumulative effects.

BHP Billiton
Caroona Coal Project
Corner Hawker and Nowland Sts
Quirindi NSW 2343

Phone +61 2 6746 4600
Fax +61 2 6746 4601
Email CaroonaCoalProject@BHPBilliton.com
Web www.caroonacoal.bhpbilliton.com

HOTLINE: 1800 216 266
