PIA Queensland State Conference ‘Planning with altitude’

Proposal for paper addressing the themes:
Changing attitudes to risk and best practice

Title: Railways with Altitude
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Description:

‘Railways with Altitude’ presents a case where a desktop study did not identify all potential problems for a major infrastructure project. The proposed alignment resulting from this study for the Briaba duplication, part of QR National’s Goonyella to Abbot Point (GAP) Expansion Project in central Queensland, was initially positioned to minimise vertical and horizontal grade impacts on rolling stock. The practicalities of construction and operation and the potential for derailment due to rock falls became evident and necessitated identification of an alternative location.

AV Requirements: Computer with Microsoft PowerPoint capability to present a slideshow
Presenter: John O’Dwyer

Abstract:

CoalConnect is an alliance delivering part of QR National’s Goonyella to Abbot Point (GAP) Expansion Project. On the existing Newlands coal rail line, part of the CoalConnect works involved duplicating the existing line over a ridge known as the Briaba Bank. The original alignment was chosen in a desktop study for QR National using topographic maps, and was considered sufficient at the time to progress the project to subsequent phases of project development.

When CoalConnect undertook a walk of the alignment, it became apparent that the hillsides above sections of the proposed line contained large numbers of unstable boulders which could dislodge and fall onto the proposed alignment. The proposed alignment also involved crossing seven perennial creeks and had the potential to impact habitat of at least two Commonwealth-listed species which would require a controlled action referral under the Environmental Protection and Biodiversity Conservation Act 1999 (Cwlth) (EPBC Act).
An investigation into options was undertaken and resulted in the selection of a more suitable alignment that avoided the boulder strewn hillsides, crossing of perennial creeks and impacts on a state-controlled road, and that minimised impacts on potential habitat for protected and listed species—a win for the environment, construction and the road network.

A key lesson to be learned is that desktop studies are a preliminary phase tool and should not be used to finalise the alignment of major infrastructure work. Specific inspections and survey (groundtruthing) of potential sites are essential. Appropriate time, budget and resources for groundtruthing and an assessment of hazards and risk are needed during early project development phases before the design is finalised to ensure appropriate development occurs.
Railways with altitude
John O’Dwyer MPIA, Ross Edmonds MPIA and Jake Harrison.

Introduction

As planners, we often have clients who wish to do feasibility studies to justify a project and to settle on a location or route, and at the same time minimise costs until they have an approval in hand, a financial approval or both. In such cases, the client may want to do piecemeal studies to address a limited scope of potential issues.

The role of the planner involves strategic oversight and consideration of risk. This places us in a position where often we have to do desktop studies and limited field investigations as part of the project and to develop feasibility studies. These investigations may be done in house or be based on a combination of in-house and subconsultant reports.

Generally, we provide our clients with reports that sufficiently identify the issues and identify reasonably practicable sites or routes.

However, the time and cost constraints placed on these studies and at times their broad assessment scope can result in outcomes where critical issues are not identified. Sometimes those issues cannot be identified at the time of the preliminary study. However, in many cases we, as planners, can identify those issues if we take a wider view in our reporting for our clients and include risk assessment as part of our approach.

If we do not take this broader approach, detailed design and investigations may commence, only to find the site/route is unsuitable for the intended purpose and the cost of remediation or avoidance of the issues could make the project unviable.

We must as planners recognise that these preliminary studies need to identify flaws as early as possible to minimise the wasted costs and resources that are likely to occur when a site or route is impractical to develop or unusable because of external constraints.

This paper looks at a case study that had such a flaw that was not recognised at the preliminary investigation stage and the delays it caused for the project. It also looks at the lessons to be learned from such a study.

In this case, the flaw resulted in some extra costs at the start of the detailed design stage, but in addressing the issue, ultimately there were significant savings for the project.

Case study

This case study focuses on the history of a proposed duplication of the Newlands coal rail line as part of QR National’s Goonyella to Abbot Point (GAP) Expansion Project in central Queensland. This duplication was located over the Briaba Bank, a ridge across the rail line about 18 km north of Collinsville and 60 km south of Bowen (see Figure 1 Locality Plan). The current alignment comprises a single track with passing loops at the bottom and top of the ridge, tight horizontal curves and steep vertical curves that can be difficult for laden trains to climb over. The Briaba duplication alignment was initially positioned to minimise those vertical and horizontal grades.
However, on further review at the detailed design stage, the following factors were identified:

- Several slopes above the proposed route contained thousands of large, unstable boulders.
- There was a significant potential for rock falls which could hamper construction, damage the rail formation and cause derailments that would stop the operation of the railway.
- These boulders would need to be stabilised.
- The environmental impacts of stabilisation were unknown as preliminary studies had not investigated the environmental values of the boulder fields or the areas where access would be needed to get to the top of the boulder fields.
- The route and boulder fields were in a state forest and, while the client had negotiated an in-principle agreement with the Environmental Protection Agency (EPA) to recommend the excision of approximately 60 ha from the state forest for the route, the impact of stabilisation works on at least a further 30 ha of state forest had not been discussed with the EPA.
- It was going to be difficult, dangerous and time consuming to carry out the field environmental studies needed to justify and obtain approvals for the stabilisation works and to provide the survey and geotechnical information needed to enable the design of the stabilisation works on a rock-by-rock basis.
- There was no guarantee that the EPA (or subsequently Department of Environment and Resource Management—DERM) would agree to the stabilisation works.

**Overall issues**

This paper considers the issues arising from piecemeal studies used to underpin development.

Some agencies have exemptions that mean they need to do limited investigations to obtain approvals only for the aspects of the project not covered by the exemptions. This means there is no legal requirement for a comprehensive assessment. Accordingly, these agencies may constrain their preliminary investigations to focus on those assessable aspects of the proposed development.

Fortunately, these agencies tend to have other systems in place that ensure that at some point in the process of developing a project (normally in the lead-up to detailed design), there is a comprehensive assessment undertaken. A good example of this is the QR Environmental Planning and Processes Manual that involves a preliminary assessment of issues and risks, followed by a comprehensive environmental planning study (or formal EIS if required) leading to environmental management plans for the planning, construction and operational phases of the project. This was used by CoalConnect in developing the applications for approvals for the project.

Limited feasibility studies where individual reports focus on specific issues (for example: approvals plans, fauna and flora studies, or engineering feasibility studies) mean that the client has to do the integration of issues and risk assessment often without the involvement of the consultants who prepared the technical reports.

Where the scope of preliminary studies is limited, critical issues may be overlooked or deferred to the detailed design stage (as they are ‘too hard’ or ‘too complicated’ to resolve or not appreciated at the preliminary feasibility stage). This can put projects at risk, as the lack of integration across disciplines means flaws can be overlooked and project planning can proceed, often wasting time and resources.
Is it the role of planners as professionals to encourage our clients to include an integrated review and risk assessment of the preliminary studies as part of the initial risk assessment for the project?

**Briaba duplication**

In 2005, Queensland Rail (QR) (now known as QR National) commissioned an initial report on a possible route for a duplication to reduce the grades on the track through Briaba, and a flora and fauna assessment of the proposed route. The preliminary engineering report proposed an 11 km duplication from 58 km to 68.5 km over the Briaba Bank that would achieve a minimum acceptable speed for laden coal trains passing through the duplication. The duplication alignment was initially positioned to minimise vertical grades and horizontal curves.

The flora and fauna report indicated that the areas to be cleared involved a small area of ‘Of concern’ and ‘Not of concern’ remnant vegetation that was well represented locally. Two bird species protected under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) were found, along with habitat suitable for nine other species protected under that Act. Two bird species protected under the Queensland *Nature Conservation Act 1992* (NC Act) were found along with habitat suitable for 11 other species protected under that Act. No flora species scheduled under the EPBC Act or the NC Act were found during the investigations. The Environmental Protection Agency (EPA) had found a new species of *Grevillea* in the vicinity of the duplication, but none were found on the alignment in the field investigation. The study estimated 66 ha of remnant vegetation would need to be cleared for the project. The report did not identify any significant issues with the proposed alignment.

No land survey was undertaken as part of these original studies, so limited topographical information was available (20 m contours on the 1:100,000 topographical map).

Following the preliminary environmental and engineering field investigations, this duplication was repositioned slightly westwards to avoid ‘steep rock strewn slopes’ and repositioned elsewhere to ‘avoid impacts on Pelican Creek’. The study was a preliminary investigation and so was not expected to assess the risks associated with the construction and operation of the rail line adjacent to those rock strewn slopes.

Following these studies, QR began negotiations with the then EPA to have the rail corridor excised from Sonoma State Forest. This involved an area of 60 ha from state forest and additional areas from a stock route. This excision from the state forest would ultimately require the agreement of state parliament and Governor in Council approval before the duplication could be constructed. There is a pastoral lease over the state forest and the corridor would also need to be acquired out of that lease.

No formal acquisition action was started on the Briaba duplication corridor. This proved beneficial in one respect, as it meant no acquisition needed to be rescinded. However, the time taken to obtain the parliamentary approval and the regulation to excise the land meant that construction on that part of the duplication was delayed. Further south, QR National identified and acquired the land for the Northern Missing Link corridor to provide the link between the Newlands and Goonyella coal rail systems as part of the GAP Project before the start of construction.

**CoalConnect consideration of the proposed duplication**
Before commencing fieldwork and detailed design, the CoalConnect Approvals Group and Design Team undertook a preliminary walkover of the proposed duplication. This walkover revealed the extent and the steepness of the boulder fields and significant evidence of boulder instability with large numbers of boulders scattered across the slopes and valley floor of Pelican Creek.

The concern of the CoalConnect staff was that the construction of the rail line and subsequent operation of trains on the proposed duplication route could result in destabilisation of many of the boulders. This could lead to potential dangers for construction and train crews and future destruction of the railway and derailment of coal trains.

It became apparent that:

- detailed survey and detailed environmental and geotechnical investigations would be needed to underpin any stabilisation of the boulder fields
- preliminary approvals would be needed to justify the conduct of those investigations
- the boulder field and large areas surrounding the boulder field (at least 30 ha) would be affected by the investigations and by the subsequent stabilisation works.

When combined with the potential impact on listed fauna species and the need to clear at least 90 ha within Sonoma State Forest, it was considered that the application for the fieldwork and ultimate construction works would probably have been refused on environmental grounds.

From a planning, environmental and approvals viewpoint, the preliminary works for the field investigations would have been difficult to justify to the EPA (now DERM), let alone justifying the impacts associated with the works involved in actually stabilising the slopes due to the significant increase in destruction of vegetation, damage to habitat and the extent of areas affected.

**Options investigation**

Accordingly, an options investigation was carried out to seek an alternative route. Three routes were investigated (see Figure 2):

- Option 1—the original duplication route
- Option 2—a route on the west side of the existing rail line that switched to the western side of Bowen Developmental Road for the northern part of the duplication
- Option 3—a route totally located between Bowen Developmental Road and the existing rail line.

**Comparison of options**

**Option 1** would have the highest construction and environmental costs due to the boulder slope stabilisation, and would have two rail bridges over Pelican Creek and Pine Creek respectively. It would have the greatest extent of clearing and potential impacts on protected wildlife and aquatic wildlife in the creek systems.
Option 2 would have two road-over-rail bridges; however, the cost of the bridges and high embankments on the western side of Bowen Developmental Road would be less than the cost of rock stabilisation of the boulder slopes and the bridges over the creeks. The new track would cross the same creeks and drainage lines as the existing rail line and Bowen Developmental Road. These crossings are upstream of the existing track in areas where there are no natural rock pools, thereby avoiding potential impacts on aquatic values.

The clearing associated with this option would be significantly less than Option 1, but would involve clearing up to 15 ha of the western part and approximately 8 ha of the central part of Sonoma State Forest, with potential impacts on protected species such as the Yakka skink, bats and northern native quoll. It would have no impact on the Pelican Creek system or aquatic ecology as there are no permanent streams or waterholes in Sonoma State Forest upstream of the existing rail line.

Option 3 would have no bridges and no impacts on Bowen Developmental Road and so would have the lowest construction costs. It would cross the same creeks and drainage lines as the existing rail line and Bowen Developmental Road, being between the rail line and the road.

It would also have the least impact on Sonoma State Forest, involving clearing of less than 8 ha of forest. Most of this clearing would occur in areas already affected by access tracks and in an area cut off from the rest of the state forest by the current location of Bowen Developmental Road.

Option 3 had the benefit of being the cheapest of the three options. It avoided impacts on Bowen Developmental Road and additional impacts on the aquatic environment as it would cross a number of non-perennial creeks between existing road and rail culverts.

For these reasons, Option 3 was adopted as the preferred option and was approved by QR National for construction with some modifications related to track operations.

**Outcomes**

The key outcomes of the relocation were:
- a significantly lower environmental impact with construction largely within an existing disturbed area
- a reduction from 60 ha (estimated land take for Option 1 without the boulder stabilisation) to 7.6 ha of land taken for rail purposes from Sonoma State Forest
- a less complicated and lower environmental impact that DERM officers could recommend to the Minister for the Environment, as the land take from the state forest was significantly reduced from the take being planned as a result of the original duplication proposal and the construction impacts were being minimised and focused on an already significantly disturbed area
- an easier option for the Minister in recommending the excision to parliament as it could be shown that the land take from Sonoma State Forest was the minimum needed, was selected to minimise environmental impacts and was necessary for significant infrastructure
- no additional creeks affected by the project
- no adverse impacts on aquatic fauna or habitat
- no additional bridges
• a more sustainable outcome for railway operations in reduced construction and maintenance materials and costs
• the provision of permanent intersections for railway access points to provide safer access to and egress from Bowen Developmental Road for QR National and adjoining landowners and infrastructure operators.

These outcomes represented a win for the environment, sustainability, rail construction and operation, and safety of the rail and state-controlled road networks.

Considerations

In this case, the effects of relocating the duplication were:

• better environmental outcomes
• a cheaper project that would be quicker to build
• safer construction and operation of the railway.

This good outcome was achieved because the alliance reconnoitered the duplication route before committing to the route or undertaking survey and detailed design.

Nevertheless, there was a cost to CoalConnect in undertaking the options analysis, in additional environmental studies over the selected option route and then having the new route approved by QR National. Further costs arose from the delays in undertaking the detailed design and costing of the Briaba duplication as initial alliance cost estimates had to be prepared quickly without the opportunity for full value assessment. Fortunately for the project, the cost estimate was revisited after the Global Financial Crisis and that value assessment was able to be undertaken and resulted in a final design that was significantly lower in earthworks and cost than the initial formal estimate.

Lessons learned

This paper argues that piecemeal investigations used to justify projects are often likely to result in poor decision-making that will be costly for the developer and the community.

As planners, we should be encouraging clients to take a comprehensive view of options and the risks facing their projects at the earliest possible stage, rather than deferring hard decisions to later stages.

At the preliminary feasibility stage, this should include asking ‘Where is the best place for the project?’ before land is acquired or the owner commits to a site. If a site is fixed, the question might be ‘What is the best use of this site?’ to avoid having an owner decide they want to do a specific development that does not answer that question.

Once a decision is made on the site, the feasibility study should include a broad assessment of the issues and potential risks facing the project. The following questions should be considered and, where appropriate, incorporated into preliminary studies:

• What are the risks that face your client’s project?
• Can investigations be done safely?
  o assess potential safety issues before sending teams into the field
  o ensure staff have appropriate physical competencies to undertake surveys
o staff should not be sent into dangerous situations to do surveys for projects

- When undertaking a site inspection, consider: Will the construction and operation (including construction and maintenance access) be practical? Either seek the advice of relevant design and geotechnical specialists on the practicalities or recommend your client seek such advice
- Are there possible flaws for a project that will potentially result in resources being wasted on studies that need to be duplicated later for an entirely different site?

When coming into a project after the preliminary studies are completed, challenge the outcomes of preliminary studies by asking:

- Are the circumstances still the same?
- Is the site/route suitable for the project?
- Is there a better site or route, or section of a route?
- Do you have sufficient information to justify proceeding with a project?

If you find that insufficient information is available from studies that have been completed, be prepared to argue strongly for additional studies to demonstrate the project is viable from a sustainable planning, social and economic basis. These studies could include geotechnical, environmental and other risk investigations. It is easier to change a design than to modify a constructed development.

In applying these lessons, you will seek and achieve greater value for your client and the environment.

Our aim must be to discover the flaws early rather than late.

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References


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