11 GAS FIELD CONSTRUCTION

11.1 INTRODUCTION

The Project description for the Queensland Curtis LNG (QCLNG) Project Gas Field Component, as described in the draft environmental impact statement (EIS), was based on best available, conceptual information prior to detailed Front End Engineering and Design (FEED). At the time of preparation of the supplementary EIS, the Project description had been further refined as a result of the progression of engineering design and option selection processes.

This chapter describes the changes in Project description for the Gas Field construction between the draft EIS and the sEIS. The impact of these changes and measures to mitigate impacts are described in *Volume 3* of this sEIS. Where the Project description provided in the draft EIS has not changed, that aspect of the Project is not discussed in the sEIS.

In addition, any submissions received that relate to the description of Gas Field Construction are addressed in this chapter.

11.2 SUBMISSIONS RECEIVED

Table 2.11.1 provides a summary of the submissions received on the construction of the Gas Field Component and a response to those submissions.

Table 2.11.1 Responses to Submissions on the Draft EIS

Issue Raised	QCLNG Response	Relevant Submissions(s)
A synthetic liner should be used if the integrity of a compacted clay layer cannot be demonstrated over the life of the ponds.	Refer to *Section 11.4.2.*	32
Impacts of ramp gas management are not addressed	Refer to *Section 11.4.1.* Impacts from the management of ramp gas, including impacts from gas injection to aquifers, will be addressed through a separate approvals process to the Queensland Curtis LNG (QCLNG) Project EIS process.	32
Project water requirements should be supplied from Associated Water. Municipal water supplies will not be available.	Refer to *Section 11.4.9*.	36

11.3 OVERVIEW OF CHANGES TO PROJECT DESCRIPTION

Changes to the Project description are described in *Volume 2, Table 2.7.1*. Any changes that relate specifically to the Gas Field construction phase, are described in *Table 2.11.2*, which provides a summary of the changes to the Project description for construction, identifies the environmental factors affected by the changes and the section of this sEIS in which the impacts of those changes are assessed.

11.3.1 Changes to Project Footprint

Based on changes to the Project description as described in *Volume 2, Chapter 7*, *Table 2.11.3* summarises the changes to the direct construction footprint of the Gas Field before progressive rehabilitation. This represents the approximate total disturbance, although activities creating disturbances will occur throughout the life of the Project. *Volume 2, Chapter 15* describes the expected construction footprint, before and after progressive rehabilitation and *Volume 3, Chapter 19* the expected activities required to develop the Gas Field to 2014 and over the life of the Project.

Table 2.11.2 Summary of Project Description Changes to Gas Field Construction

Project Element	Draft EIS description	Section of Draft EIS	Supplementary EIS description	Environmental Factors Affected by Change	Section Describing Impact Assessment of Change
Personnel	• 2,100 personnel for construction period	*Vol 2, 11.6.4*	• Construction workforce peaking at approximately 3,800 personnel for the first half of 2012 • 2,000 personnel required in 2018/2019 • Greater than 1,000 personnel required between May 2011 and June 2013	• Social • Ecology • Transport	• *Volume 8* • *Vol 3, Ch 7, 8* • *Vol 3, Ch 14*
Accommodation Camps	• During construction and operations small, mobile camps for well drilling, well establishment and gathering lines • During construction six to seven large temporary camps with 250 - 300 personnel per camp • Approximately 7 ha per large temporary camp • Camp locations not determined	*Vol 2, 11.6.4*	• Between five and 10 camps with between 250 and 1,500 personnel per camp	• Social • Ecology • Transport	• *Volume 8* • *Vol 3, Ch 7, 8* • *Vol 3, Ch 14*
Borrow Pits	• Quarry material to be sourced from licensed third party quarries	*Vol 2, 11.6.5*	• Quarry material sourced from supplies on petroleum tenements • On average one borrow pit per block • Each borrow pit approximately 8.0 ha for the supply of approximately 155,000 m^3 of material for hardstands and access tracks • Total footprint of approximately 420 ha	• Ecology • Transport • Land Use	• *Vol 3, Ch 7, 8* • *Vol 3, Ch 14* • *Vol 3, Ch 5*
Electrification	• Option analysed for cost/benefit to economic model	*Vol 2, 7.10.6*	• 1,600 km of underground or above ground 33 kV lines located in 600 km of easement with trunklines connecting central processing plants (CPPs) to field compression stations (FCSs) • 40 km of above ground 132 kV lines connecting the grid to CPPs • Substations at each FCS and CPP connected to the grid	• Visual • Ecology • Transport	• *Vol 3, Ch 15* • *Vol 3, Ch 7, 8* • *Vol 3, Ch 14*

Table 2.11.3 Changes to Project Footprint

Proposed Infrastructure	Infrastructure footprint used in the draft EIS			Infrastructure footprint used in the supplementary EIS		
	Number/Length	**Clearing Pad/Corridor**	**Total Area**	**Number/Length**	**Clearing Pad/Corridor**	**Total Area (Ha)**
Gas wells	6,000	1 ha	6,000 ha	6,000	1 ha	6,000 ha
Borrow pits	Sourced from independent supplier			53	8 ha	420 ha
Gas/water gathering line easements	2,500 km	10 - 25 m width	3,750 ha	Total 13,431 km of which 9,235 km easement required	15 – 30 m easement width	15,600 ha
Gas and water trunklines (including power transmission)	1,200 km	30 m	3,600 ha	Total 1,615 km gas + 555 km water + 1,615 km underground transmission line which requires 600 km easement	20 – 46 m easement width	1,600 ha
Gas collection laterals	100 km	40 m	400 ha	No longer differentiated from the Gas Collection Header		
Field compressors	27	5 ha	135 ha	53	7 ha + 1 ha laydown area	424 ha
Central processing pants	9	7 ha	65 ha	4	19 ha + 1 ha laydown area	80 ha
Water treatment plants	3	8 ha	24 ha	3	25 ha	75 ha
Ponds, including brine ponds and brine evaporation basins		Various from 4 to 11 ha	250 ha	175 (excluding existing ponds)	Various from 0.3 ha to 140 ha	665 ha
Salt landfill			Salt landfill area not specified	3	16 ha	50 ha
Access tracks	2,000 km (*Vol 2, Ch 11, Section 11.6.5.2*)	4 m width (*Vol 2, Ch 11, Section 11.6.5.2*)	800 ha	4,500 km	3.6 m width	1,600 ha
Construction camps	5	10 - 15 ha	65 ha	10	25 ha	250 ha
Total Area			**15,089 ha**			**26,764 ha**

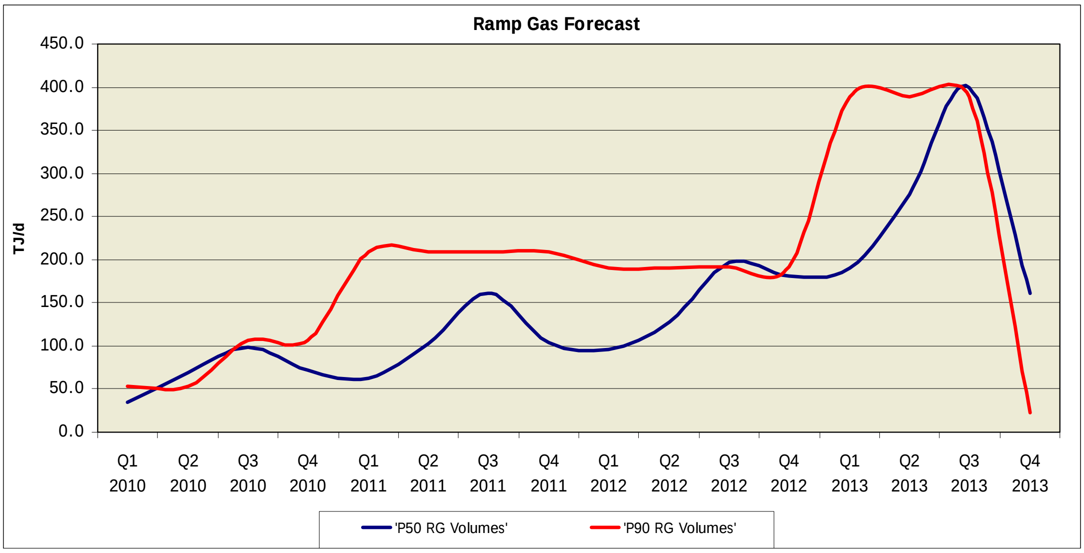
11.4 DETAILS OF CHANGES TO PROJECT DESCRIPTION

This section describes the changes summarised in *Table 2.11.2,* provides supplementary information on construction activities of certain Project infrastructure and identifies the changes to materials, water, energy and transport requirements.

11.4.1 Ramp Gas

QGC has estimated between 200 and 300 petajoules (PJ) (5.5 and 8.2 billion m^3) of coal seam gas (CSG) will be produced prior to the commissioning of the LNG Plant in late 2013 or early 2014. This is referred to as ramp gas. The rate of ramp gas production will increase in late 2012 as shown in *Figure 2.11.1*.

Figure 2.11.1 Ramp Gas Forecast



QGC is investigating a number of options for management of ramp gas such that there is no venting or flaring of ramp gas. These options include:

- reduced ramp gas volumes through improved Gas Field modelling and the application of field development and well management improvements
- gas sales to the South-east Queensland and other markets
- bringing forward the commissioning of the LNG Plant
- short-term gas supply to existing gas-fired peaking power stations through tolling agreements during off-peak periods
- in-seam storage through injection of gas into depleted CSG seams or depleted third-party conventional gas reservoirs
- construction of an open-cycle gas-fired power station supplying base load power during the ramp gas period and operating as an off-peak power supplier after the ramp gas period

- gas swaps and purchases with other gas providers
- conversion of coal-fired power stations to co-fired power stations and supply of gas.

In the event that none of these options is realised, wells will not be opened, resulting in a lower-than-expected throughput of gas to the LNG Plant.

The potential infrastructure required for the fulfilment of these options may include gas pipelines (constructed by QGC and third parties), injection wells and an open-cycle gas-fired power station constructed, owned and operated outside of the QCLNG Project asset structure. Approval for any of these options will be sought through separate licensing processes to the QCLNG Project.

11.4.2 Associated Water Storage Ponds

Associated Water storage ponds include infield buffer storages (tanks or ponds), regional storage ponds, collection header ponds, raw water ponds, treated water ponds and blending ponds. QGC has developed extensive experience in the planning, investigation, environmental assessment, design, construction and operation of Associated Water storage ponds.

11.4.2.1 Design Principles

Ponds will be engineered structures, lined to control seepage through the floor and walls. Ponds constructed with greater than 10 ML capacity and which will store Associated Water with a salinity measured as electrical conductivity greater than 4,000 µS/cm. will be regulated storages and will be constructed in accordance with Environmental Authority requirements and with guidelines set out in the "The Manual for Assessing Hazard Categories and Hydraulic Performance of Dams" (2009). In particular these guidelines set out spillway and diversion channel sizing requirements for various hazard ratings. Similar design guidelines will be used for smaller non-regulated water storages. Operation of all storages will take into account the specific requirements of the Environmental Authority, *Environment Protection Act 2004* and the *Associated Water Policy 2008* where appropriate.

All Associated Water storage ponds classified as being of significant to high risk will be designed using the following criteria:

- The base of the storage pond will be more than 1 m above highest seasonal groundwater level. In general QGC ponds have been and will be constructed well above regional sedimentary aquifers. In many locations, a shallow water table (less than 10 m below ground surface) does not exist beneath existing or proposed storage sites.
- At the start of the wet season (1 November) all pond water levels will be below the maximum operating level (MOL). This level provides sufficient pond capacity to contain the design storage allowance (DSA) which is the volume of rainfall calculated in accordance with the applicable

Environmental Authority (EA) from historical rainfall sequences representative of the site sourced from either the Bureau of Meteorology daily rainfall stations or the Silo Data Drill, using a continuous water balance simulation covering at least 100 years.

- Ponds will have a mandatory reporting level (MRL) being the level below the pond overflow spillway sill level when the responsible authorities will be advised.
- The MRL is calculated as the lower of:
  - the level on the pond wall above which the runoff volume from the 100-year annual exceedance probability (AEP) 72-hour storm cannot be contained below the spillway sill level
  - the level on the pond wall that allows sufficient freeboard below the spillway sill level to prevent discharge due to wave action under the influence of the 100-year AEP storm.
- Ponds will be located above the 1:100 year flood level as far as practicable.
- Ponds will, as far as practicable, not be located on Quaternary Alluvials that might expose alluvial groundwater to seepage from ponds.

Pond design will consider potential climate changes that may result in a 30 per cent increase in rainfall intensity during peak tropical cyclone precipitation events and a 10 per cent increase in runoff.

In general, geosynthetic lined ponds will include a seepage collection or depressurisation system beneath the geomembrane liner. Potential seepage will report to a seepage collection sump located adjacent to the pond, equipped with a return pump system. Ponds larger than 200 ML capacity may be constructed as two or more cells.

The design of water storage facilities will take into account:

- landholder requirements
- cultural heritage requirements
- meteorological events, including allowance for increased storm intensity by predicted climate change data
- environmental compliance
- seismic loads
- wind allowances (wave action within the pond)
- humidity ranges
- temperature fluctuations
- site-specific hydrogeological data.

11.4.2.2 *Construction*

Associated Water ponds will typically be designed and constructed as a balanced cut-to-fill exercise with suitable excavated material from the pond floor being used to construct a four-sided compacted earthfill embankment. Ponds are designed as enclosed structures with no external catchment. Construction of the embankments will be in accordance with the construction and quality assurance testing specification provided by design engineers, in order to meet EA as-constructed certification requirements.

QGC will line all in-field buffer storages (where these are ponds), regional storage and exploration and appraisal (E&A) ponds with geosynthetic liner such as high density polyethylene (HDPE). They will be designed by a suitably qualified engineer and have a design life of at least 20 years. However the use of HDPE lining may not be a practical solution for larger ponds, such as collection header and raw water ponds, and in these instances QGC proposes to use a compacted clay layer where there is suitable clay material available and the risk of permeation into the substrate can be managed to avoid adverse impact on the environment. These larger ponds will be built using a clay embankment with a low permeability clay core.

QGC has undertaken extensive research trials into clay liner technology and is currently constructing a pond (under the existing EA) with a two layer 300 mm thick smooth drum-rolled compacted clay liner. This method may be employed at future ponds. Clay borrow material for lining is generally sourced from borrow pits within and adjacent to the pond footprint.

QGC has invested in wide-ranging studies and has developed extensive experience in the design and construction of ponds which have been developed in accordance with Department of Environment and Resources Management (DERM) requirements.

All ponds will be provided with an overflow spillway and outlet channel. Spillways and diversion channels will be sized in accordance with the requirements of the applicable EA and the relevant criteria depending on the hazard rating for each storage as appropriate. Spillways will typically be rock-lined for protection against scour and erosion. Spillways will discharge to a drainage channel in which flows will be directed to natural drainage downslope of the pond. Similarly, grass-lined diversion channels, drains or bunds will divert surface runoff from upslope sides of the pond around the pond to natural drainage points downslope of the pond. The MOL and MRL will be clearly marked on pond walls adjacent to the spillway.

The inner slopes of clay-lined pond embankments will be protected from wave erosion by means of a compacted gravel pavement installed over a geotextile membrane or similar system. The outer slopes of pond embankments will be grassed for protection against erosion. Pond crests will be provided with a capping layer of compacted gravel or durable rock pavement for traffic ability and protection against erosion.

Geosynthetic lined ponds will typically be enclosed with a minimum 1.8 m height chain mesh security fence installed around the crest of the pond to guard against human, stock and wildlife access to the pond.

Pond operations and monitoring is described in *Volume 2, Chapter 7*. The prevention of contamination of soils and water through release of saline water from ponds is described in *Volume 3, Chapter 6.*

11.4.3 Brine Ponds and Brine Evaporation Basins

The design principles described in *Section 11.4.2.* also apply to brine ponds and brine evaporation basins.

Concentrated brine will be transferred to brine evaporation basins to remove remaining water. The solar evaporation process will require construction of multi-cell evaporation basins. These will be open-top earth ring dams which are double-lined with clay and geosynthetic liner to prevent seepage. The upper liner will be provided with a trafficable protective gravel pavement to facilitate removal of crystallised brine, while protecting the integrity of the liner. Brine storages will include under-liner drainage systems.

Because the evaporation basins are open, they will collect rainwater. The design of the basins will account for this by providing capacity within each cell for rainwater to be stored and evaporated over time.

Design and construction techniques designed to prevent contamination of soils and water from seepage from brine storages are described in *Volume 3, Chapter 6*.

11.4.4 Salt Disposal Landfill

QGC has not finalised the number or location of salt landfills, but there is potentially one salt landfill near each of the three WTPs. The design of a salt disposal landfill will result from a risk assessment to systematically analyse the selected sites conditions, exposure pathways and receptor characteristics to estimate the risks to the environment and potential receptors. The benchmark techniques to be used in the design include:

- balanced earthworks design to minimise site footprint and requirements for haulage of non-local cover material
- stormwater management system
- leachate barrier system
- leachate management, including collection and conveyance systems development of a site-specific leakage rate trigger and action plan
- groundwater monitoring
- site capping with a composite liner and drainage system that provides a barrier to the migration of water into the salt
- definition of a suitable post-closure management period.

Construction activities associated with a salt disposal landfill are outlined in the draft EIS.

In addition to the factors considered in the draft EIS, the following factors will be considered in locating and designing a landfill:

- The potential use of an existing pit, such as a former quarry will be investigated.
- The landfill will not be located near sensitive areas. For example, buffer distances such as 100 m from surface waters and the 100-year flood plain and 200 m from a noise or dust sensitive place may be applied.
- The landfill will not be located in areas of potable groundwater, groundwater recharge areas or in proclaimed sub-artesian districts under the *Water Act 2000*, below the regional watertable. The most preferred site for a landfill is a site that is underlaid by low-permeability soils or weathered rock with a deep underlying sub-artesian aquifer overlaid by thick, low permeability strata.
- The landfill will not be developed in areas identified under conservation plans and critical habitats, where landfills may have a significant impact on threatened species and ecological communities.
- A capping system will be required to restrict water entry to the waste material. The design of the capping layer and liner for a landfill will be based on a risk assessment.
- A range of geo-membranes, such as high density polyethylene, geosynthetic clay liners (GCL) and linear low density polyethylene (LLDPE); will be incorporated with clay in the landfill liner design to reduce landfill seepage.
- Sump systems to remove saline water under the liner, at leak locations, and above the liner for ponding liquids, will be incorporated into the landfill design to manage landfill liquids.

Design and construction techniques designed to prevent contamination of soils and water from seepage from salt disposal landfills are described in *Volume 3, Chapter 6*.

11.4.5 Material Requirements and Borrow Pits

The draft EIS proposed that quarry material would be sourced from appropriately licensed quarries. Analysis of logistical implications for using third party quarries resulted in long haulage to meet Project needs and the option of sourcing locally has been investigated. QGC considers that borrow pits are an incidental activity under the *Petroleum and Gas (Production and Safety) (P&G) Act* necessary for the construction of infrastructure and will seek approval to locate borrow pits on its tenements. It is estimated that approximately 420 ha of borrow pits will be required to meet the needs of the Project. Over the life of the Project, approximately 8,500,000 m^3 of quarry material may be required for hardstand areas and access tracks. The exact number and location of borrow pits has not been determined and is dependent on geotechnical investigations identifying suitable material. It is anticipated that each block will have a borrow pit of approximately 8 ha and 155,000 m^3 to meet the localised quarry material requirements of the Project. Should suitable material not be available within QGC's tenements, material will be supplied from appropriately licensed quarries.

Table 2.11.4 details the material requirements for the Project as described in the draft EIS and sEIS. Further refinement of Project design has resulted in an increase in expected material requirements over the life of the Project. The estimated area of the hardstand required for each well has increased from 2,500 m^2 to 5,000 m^2. The estimate of access tracks required has increased from 2,000 km to 4,500 km.

Table 2.11.4 Material Requirements

Material	Use	Volume / area / length per Draft EIS	Volume / area / length per sEIS	Source
Gravel/soil/fill	Hardstand areas – CPP, FCS, camps and WTP	148,500 m^3	925,000 m^3	Borrow pits or local quarries
Gravel/soil/fill	Hardstand areas – wells	2,250,000 m^3	4,876,000 m^3	Borrow pits or local quarries
Road base	Access track construction	983,000 m^3	2,500,000 m^3	Borrow pits or local quarries
Sand	Gathering pipelines	700,000 m^3	185,000 m^3	Local quarries
Cement/slurry	Well construction	60,000 m^3 to 96,000 m^3	60,000 m^3 to 96,000 m^3	Local manufacturer with sufficient capability
Clay	Lining for ponds	1,200,000 m^3	1,200,000 m^3	Existing tenements using suitable materials in site selection criteria
HDPE	Lining for ponds	1,000,000 m^2	4,287,000 m^2	Local / overseas manufacturer with sufficient capability
Fencing	Maintenance/replacement of rural fencing. Site infrastructure security	511,000 m	1,015,000 m	Local manufacturer with sufficient capability

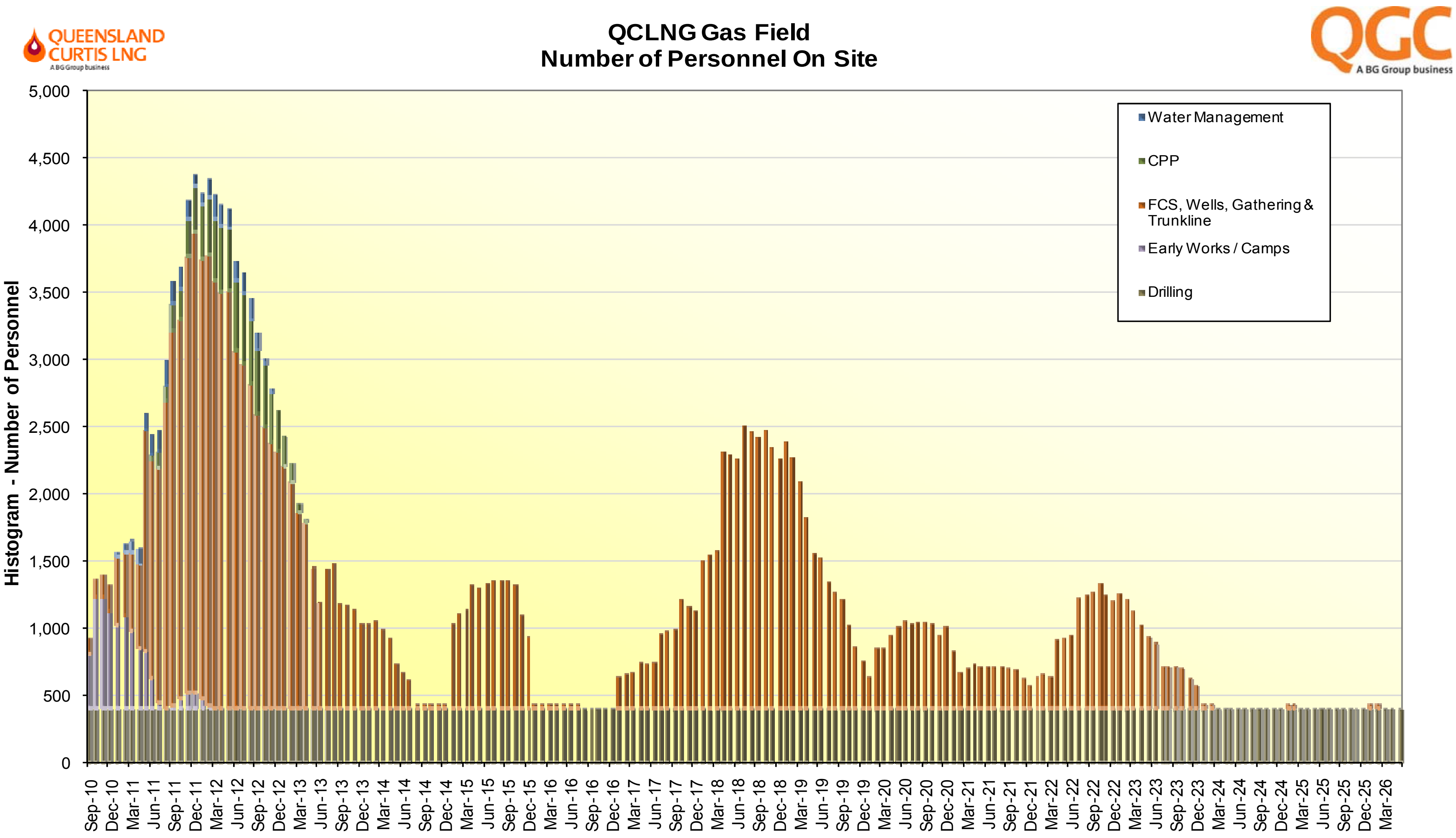
11.4.6 Accommodation Camps

11.4.6.1 Construction Workforce

A construction workforce histogram for the Gas Fields (excluding the Collection Header) is provided in *Figure 2.11.2.* Construction will occur in 2 peaks, between April 2011 and September 2013 and between January 2018 to July 2019. The first peak will see the construction of CPPs, FCSs, water treatment plants (WTPs), ponds, initial wells, trunklines and gathering lines and require approximately 4,400 construction personnel. The second peak will see the construction of additional FCSs, wells, trunklines and gathering lines and require approximately 2,500 construction personnel.

For the draft EIS it was estimated that approximately 2,100 construction personnel would be required. Detailed analysis of required construction activities based on selected technologies, revised forecasts of infrastructure requirements and condensed timeframes for construction has resulted in the peak workforce numbers increasing to meet the Project first gas to LNG delivery obligation.

Figure 2.11.2 Construction Workforce Histogram



11.4.6.2 *Accommodating the Construction Workforce*

It is estimated that there will be between five and 10 construction camps with between 250 and 1,000 personnel per camp.

11.4.7 Transport Requirements

Table 2.11.5 describes the changes in transport requirements between the draft EIS and sEIS. Transport requirements have increased in proportion to the increase in expected infrastructure, such as gathering lines, trunklines and compressors, and resulting increase in personnel and quarry material requirements.

Table 2.11.5 Transport Requirements

Transported Item[1]	Approximate Vehicle movements per draft EIS	Approximate Vehicle movements per sEIS
Personnel – work-based and non work-based	1.6 million to 2.3 million vehicle movements per annum	2.4 million vehicle movements per annum
Drilling machinery, bore casings, wellhead equipment	25,000 truck movements over the life of the Project	14,200 truck movements over the life of the Project
Gathering pipelines and trunklines (gas and water)	10,100 truck movements over the life of the Project	21,300 truck movements over the life of the Project
CPPs, including either reciprocating or centrifugal compressor and all components	405 semi-trailer movements over the construction period	20 truck movements over the life of the Project
FCSs	650 low-loader movements over the construction period	320 truck movements over the life of the Project
Fuel supply	10,920 truck movements over the life of the Project	10,400 truck movements to 2014
Water treatment infrastructure	Not estimated	300 truck movements to 2014
Campsite components	1,285 truck movements over the construction period	2,800 truck movements to 2014
Heavy equipment	84 vehicle movements over the construction period	900 vehicle movements over the construction period
Other – general supplies	365 truck movements per annum	365 truck movements per annum
Quarry materials	294,000 truck movements over the life of the Project	639,000 truck movements over the life of the Project

11.4.8 Electricity and Energy Requirements

FCSs and CPPs will be powered by a connection to the grid. Where a connection to the grid is proposed, a substation will be constructed at each FCS connected through a combination of underground and above-ground 33 kV power lines to a substation at the nearest CPP. Substations form part of the construction footprint of a CPP and FCS.

Underground power lines are the preferred option, but where practicable, above-ground power lines will be used. The total length of power lines is approximately 1,600 km. Multiple underground power lines will be located in the same easement as gas trunklines where power lines from multiple FCSs converge at a CPP. The total easement length is approximately 600 km. Where power lines are above ground these will be supported by wooden poles approximately 15 m high. Above ground power 33 kV power lines will require a minimum separation distance of 20 m from a steel trunkline and a 20 m wide easement.

A substation will be constructed at each CPP connected by above ground 132 kV power lines to a third party substation. The total length of above-ground 132 kV power lines is approximately 40 km. Above ground 132 kV power lines will be supported by a concrete or steel poles approximately 24 m high. They will require a minimum separation distance of 50 m from a steel pipeline and a 60 m wide easement.

11.4.9 Water Requirements

Water requirements for construction purposes have been reforecast for the sEIS and are presented in *Table 2.11.6*. Based on revised estimates of construction activity and water required for each activity, the estimated volume of construction water required has increased from 470,000 m^3 in the draft EIS to 9,325,000 m^3 in the sEIS. The revised volume is a conservative estimate based on peak construction requirements.

All water requirements for construction will sourced from raw or treated Associated Water, depending on the water quality required. Where treated water is available prior to the commencement of camp activities, this will be used as the camp water supply. In other circumstances water will be sourced from groundwater bores until such time as treated Associated Water is available. Small, mobile water treatment plants may be used to treat Associated Water where the main water treatment plant (WTP) is not constructed. It is not expected that groundwater sources will be utilised for more than 18 months at any camp. Municipal water supplies will not be used for QGC's construction activities.

Table 2.11.6 Indicative Water Requirements for the Gas Field during Construction

Activities, processes and facilities requiring water	Water quantity requirement (m^3)	Water quality requirement	Preferred source of water	Additional treatment requirements	Onsite water storage facilities (type and volume)
Construction Phase					
Drill rigs including slurry and concreting	Mean daily: 1,875 kL/day Annual total: 684,000	TDS < 2000	Associated Water	Treatment by RO[3] or other methods	Ponds
Dust control	Mean daily: 1,650 kL/day Annual total: 602,000	TDS < 2000	Associated Water	Treatment by RO or other methods	Ponds
Trunk lines and gathering lines pressure testing	Mean daily: 700 kL/day Annual total: 256,000	TDS < 2000	Associated Water	Treatment by RO or other methods	Ponds
Road construction[1]	Mean daily: 5250 kL/day Annual total: 1,916,000	TDS < 2000	Associated Water	Treatment by RO or other methods	Ponds
Well lease area and infrastructure hardstand areas[1]	Mean daily: 6,750 kL/day Annual total: 2,464,000	TDS < 4000	Associated Water	Treatment by RO or other methods	Ponds
Pond construction[2]	Mean daily: 8,000 kL/day Annual total: 2,928,000	TDS < 4000	Associated Water	Treatment by RO or other methods	Ponds
Wash down	Mean daily: 300kL/day Annual total: 110,000	TDS < 2000			
Temporary construction camps	Mean daily: 0.2 kL/person/day Annual total: 365,000	Australia and New Zealand Environment and Conservation Council (ANZECC) water guidelines for potable water	Groundwater / Associated Water	Treatment by RO or other methods	Ponds
Fire-fighting and other emergency services	Annual total: as required	TDS < 2000	Associated Water	Treatment by RO or other methods	Ponds
Construction Phase Total	*Annual total: 9,325,000*				

1 Based on 3 per cent of total volume of material required
2 Based on 3 per cent of embankment volumes
3 Reverse osmosis