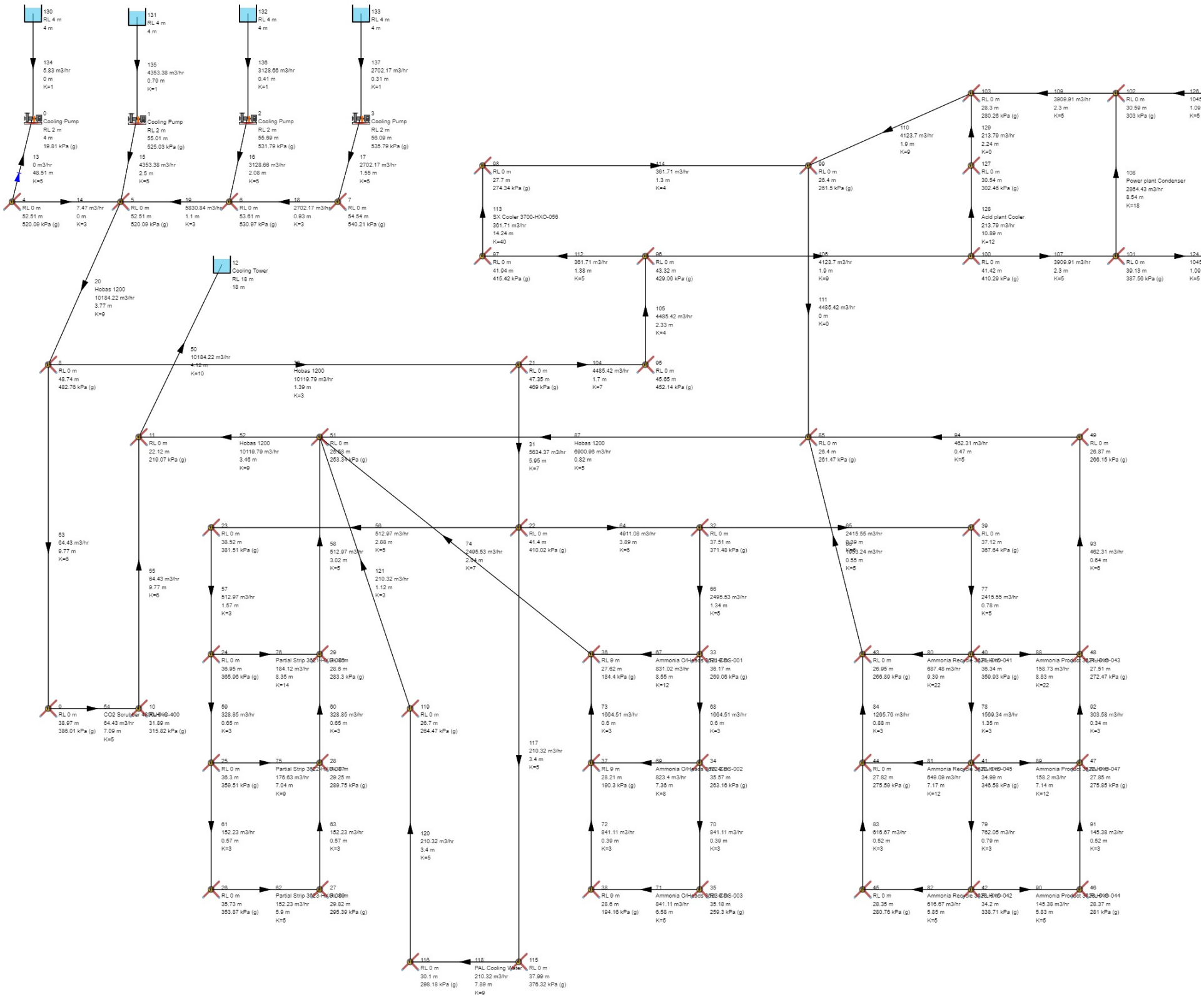
Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Network Type	Liquid	Calc. Method	Darcy
Description	A - Cooling Water Pump network		

Nickel Process Plant Cooling Water Network.
Complex Nickel processing plant colling water network with 137 pipes and nodes.
4 Cooling pumps, 1 on standby. Note NRV in line from pump to prevent backflow.

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		



A - Cooling Water Pump network

Helix deltaQ Pipe Details

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	13	From node to node	0 - 4
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	710 mm	Inside Diameter	625 mm
Outside Diameter	710 mm	Pipe Length	5 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	Yes
Total Fittings k	5	Total Fittings kf	0
Flow Rate	0 m3/hr	Velocity	0 m/s
Friction Loss	48.51 m	Fitting Losses	0 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	48.51 m	Total Pressure Drop	480.47 kPa
Entry Total Head	52.51 m	Exit Total Head	4 m
Entry Gauge Head	2 m	Exit Gauge Head	-44.51 m
Reynolds No.	0	Friction Factor	30386.13641 (Darcy f)

Helix deltaQ Pipe Details

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	14	From node to node	4 - 5
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	710 mm	Inside Diameter	625 mm
Outside Diameter	710 mm	Pipe Length	3 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	7.47 m3/hr	Velocity	0.01 m/s
Friction Loss	0 m	Fitting Losses	0 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0 m	Total Pressure Drop	0 kPa
Entry Total Head	52.51 m	Exit Total Head	52.51 m
Entry Gauge Head	52.51 m	Exit Gauge Head	52.51 m
Reynolds No.	3555.79	Friction Factor	0.04134 (Darcy f)

Helix deltaQ Pipe Details

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	15	From node to node	1 - 5
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	800 mm	Inside Diameter	704 mm
Outside Diameter	800 mm	Pipe Length	5 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	4353.38 m3/hr	Velocity	3.11 m/s
Friction Loss	0.04 m	Fitting Losses	2.46 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	2.5 m	Total Pressure Drop	24.75 kPa
Entry Total Head	55.01 m	Exit Total Head	52.51 m
Entry Gauge Head	53.01 m	Exit Gauge Head	52.51 m
Reynolds No.	1840777.63	Friction Factor	0.01084 (Darcy f)

Helix deltaQ Pipe Details

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	16	From node to node	2 - 6
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	710 mm	Inside Diameter	625 mm
Outside Diameter	710 mm	Pipe Length	5 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	3128.66 m3/hr	Velocity	2.83 m/s
Friction Loss	0.04 m	Fitting Losses	2.05 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	2.08 m	Total Pressure Drop	20.63 kPa
Entry Total Head	55.69 m	Exit Total Head	53.61 m
Entry Gauge Head	53.69 m	Exit Gauge Head	53.61 m
Reynolds No.	1490139.01	Friction Factor	0.01121 (Darcy f)

Helix deltaQ Pipe Details

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	17	From node to node	3 - 7
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	710 mm	Inside Diameter	625 mm
Outside Diameter	710 mm	Pipe Length	5 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	2702.17 m3/hr	Velocity	2.45 m/s
Friction Loss	0.03 m	Fitting Losses	1.53 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	1.55 m	Total Pressure Drop	15.39 kPa
Entry Total Head	56.09 m	Exit Total Head	54.54 m
Entry Gauge Head	54.09 m	Exit Gauge Head	54.54 m
Reynolds No.	1287007.59	Friction Factor	0.01145 (Darcy f)

Helix deltaQ Pipe Details

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	18	From node to node	7 - 6
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	710 mm	Inside Diameter	625 mm
Outside Diameter	710 mm	Pipe Length	3 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	2702.17 m3/hr	Velocity	2.45 m/s
Friction Loss	0.02 m	Fitting Losses	0.92 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.93 m	Total Pressure Drop	9.24 kPa
Entry Total Head	54.54 m	Exit Total Head	53.61 m
Entry Gauge Head	54.54 m	Exit Gauge Head	53.61 m
Reynolds No.	1287007.59	Friction Factor	0.01145 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	19	From node to node	6 - 5
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	1000 mm	Inside Diameter	879.8 mm
Outside Diameter	1000 mm	Pipe Length	3 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	5830.84 m3/hr	Velocity	2.66 m/s
Friction Loss	0.01 m	Fitting Losses	1.09 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	1.1 m	Total Pressure Drop	10.89 kPa
Entry Total Head	53.61 m	Exit Total Head	52.51 m
Entry Gauge Head	53.61 m	Exit Gauge Head	52.51 m
Reynolds No.	1972853.63	Friction Factor	0.01067 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	20	From node to node	5 - 8
Description	Hobas 1200	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Hobas 06 1200 SN 10000	Pipe Class	06
Nominal Diameter	1200 mm	Inside Diameter	1173 mm
Outside Diameter	1229 mm	Pipe Length	200 m
Pipe Roughness	0.015 mm	Allowable Press.	600 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	9	Total Fittings kf	0
Flow Rate	10184.22 m3/hr	Velocity	2.62 m/s
Friction Loss	0.62 m	Fitting Losses	3.14 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	3.77 m	Total Pressure Drop	37.33 kPa
Entry Total Head	52.51 m	Exit Total Head	48.74 m
Entry Gauge Head	52.51 m	Exit Gauge Head	48.74 m
Reynolds No.	2584504.75	Friction Factor	0.01046 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	30	From node to node	8 - 21
Description	Hobas 1200	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Hobas 06 1200 SN 10000	Pipe Class	06
Nominal Diameter	1200 mm	Inside Diameter	1173 mm
Outside Diameter	1229 mm	Pipe Length	115 m
Pipe Roughness	0.015 mm	Allowable Press.	600 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	10119.79 m3/hr	Velocity	2.6 m/s
Friction Loss	0.35 m	Fitting Losses	1.03 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	1.39 m	Total Pressure Drop	13.76 kPa
Entry Total Head	48.74 m	Exit Total Head	47.35 m
Entry Gauge Head	48.74 m	Exit Gauge Head	47.35 m
Reynolds No.	2568154.67	Friction Factor	0.01047 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	31	From node to node	21 - 22
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	800 mm	Inside Diameter	704 mm
Outside Diameter	800 mm	Pipe Length	15 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	7	Total Fittings kf	0
Flow Rate	5634.37 m3/hr	Velocity	4.02 m/s
Friction Loss	0.18 m	Fitting Losses	5.77 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	5.95 m	Total Pressure Drop	58.98 kPa
Entry Total Head	47.35 m	Exit Total Head	41.4 m
Entry Gauge Head	47.35 m	Exit Gauge Head	41.4 m
Reynolds No.	2382433	Friction Factor	0.01047 (Darcy f)

Helix deltaQ Pipe Details

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	50	From node to node	11 - 12
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Hobas 06 1200 SN 10000	Pipe Class	06
Nominal Diameter	1200 mm	Inside Diameter	1173 mm
Outside Diameter	1229 mm	Pipe Length	200 m
Pipe Roughness	0.015 mm	Allowable Press.	600 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	10	Total Fittings kf	0
Flow Rate	10184.22 m3/hr	Velocity	2.62 m/s
Friction Loss	0.62 m	Fitting Losses	3.49 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	4.12 m	Total Pressure Drop	40.79 kPa
Entry Total Head	22.12 m	Exit Total Head	18 m
Entry Gauge Head	22.12 m	Exit Gauge Head	0 m
Reynolds No.	2584504.75	Friction Factor	0.01046 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	52	From node to node	51 - 11
Description	Hobas 1200	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Hobas 06 1200 SN 10000	Pipe Class	06
Nominal Diameter	1200 mm	Inside Diameter	1173 mm
Outside Diameter	1229 mm	Pipe Length	115 m
Pipe Roughness	0.015 mm	Allowable Press.	600 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	9	Total Fittings kf	0
Flow Rate	10119.79 m3/hr	Velocity	2.6 m/s
Friction Loss	0.35 m	Fitting Losses	3.1 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	3.46 m	Total Pressure Drop	34.27 kPa
Entry Total Head	25.58 m	Exit Total Head	22.12 m
Entry Gauge Head	25.58 m	Exit Gauge Head	22.12 m
Reynolds No.	2568154.67	Friction Factor	0.01047 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	53	From node to node	8 - 9
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	110 mm	Inside Diameter	96 mm
Outside Diameter	110 mm	Pipe Length	150 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	6	Total Fittings kf	0
Flow Rate	64.43 m3/hr	Velocity	2.47 m/s
Friction Loss	7.9 m	Fitting Losses	1.87 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	9.77 m	Total Pressure Drop	96.75 kPa
Entry Total Head	48.74 m	Exit Total Head	38.97 m
Entry Gauge Head	48.74 m	Exit Gauge Head	38.97 m
Reynolds No.	199777.54	Friction Factor	0.01621 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	54	From node to node	9 - 10
Description	CO2 Scrubber 4800-HXO-400	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	110 mm	Inside Diameter	96 mm
Outside Diameter	110 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	64.43 m3/hr	Velocity	2.47 m/s
Friction Loss	0.53 m	Fitting Losses	1.56 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	7.09 m	Total Pressure Drop	70.19 kPa
Entry Total Head	38.97 m	Exit Total Head	31.89 m
Entry Gauge Head	38.97 m	Exit Gauge Head	31.89 m
Reynolds No.	199777.54	Friction Factor	0.01621 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	55	From node to node	10 - 11
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	110 mm	Inside Diameter	96 mm
Outside Diameter	110 mm	Pipe Length	150 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	6	Total Fittings kf	0
Flow Rate	64.43 m3/hr	Velocity	2.47 m/s
Friction Loss	7.9 m	Fitting Losses	1.87 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	9.77 m	Total Pressure Drop	96.75 kPa
Entry Total Head	31.89 m	Exit Total Head	22.12 m
Entry Gauge Head	31.89 m	Exit Gauge Head	22.12 m
Reynolds No.	199777.54	Friction Factor	0.01621 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	56	From node to node	22 - 23
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	280 mm	Inside Diameter	246 mm
Outside Diameter	280 mm	Pipe Length	24 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	512.97 m3/hr	Velocity	3 m/s
Friction Loss	0.59 m	Fitting Losses	2.29 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	2.88 m	Total Pressure Drop	28.51 kPa
Entry Total Head	41.4 m	Exit Total Head	38.52 m
Entry Gauge Head	41.4 m	Exit Gauge Head	38.52 m
Reynolds No.	620738.12	Friction Factor	0.01311 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	57	From node to node	23 - 24
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	280 mm	Inside Diameter	246 mm
Outside Diameter	280 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	512.97 m3/hr	Velocity	3 m/s
Friction Loss	0.2 m	Fitting Losses	1.37 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	1.57 m	Total Pressure Drop	15.55 kPa
Entry Total Head	38.52 m	Exit Total Head	36.95 m
Entry Gauge Head	38.52 m	Exit Gauge Head	36.95 m
Reynolds No.	620738.12	Friction Factor	0.01311 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	58	From node to node	29 - 51
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	280 mm	Inside Diameter	246 mm
Outside Diameter	280 mm	Pipe Length	30 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	512.97 m3/hr	Velocity	3 m/s
Friction Loss	0.73 m	Fitting Losses	2.29 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	3.02 m	Total Pressure Drop	29.96 kPa
Entry Total Head	28.6 m	Exit Total Head	25.58 m
Entry Gauge Head	28.6 m	Exit Gauge Head	25.58 m
Reynolds No.	620738.12	Friction Factor	0.01311 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	59	From node to node	24 - 25
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	280 mm	Inside Diameter	246 mm
Outside Diameter	280 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	328.85 m3/hr	Velocity	1.92 m/s
Friction Loss	0.09 m	Fitting Losses	0.57 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.65 m	Total Pressure Drop	6.45 kPa
Entry Total Head	36.95 m	Exit Total Head	36.3 m
Entry Gauge Head	36.95 m	Exit Gauge Head	36.3 m
Reynolds No.	397937.36	Friction Factor	0.01407 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	60	From node to node	29 - 28
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	280 mm	Inside Diameter	246 mm
Outside Diameter	280 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	328.85 m3/hr	Velocity	1.92 m/s
Friction Loss	0.09 m	Fitting Losses	0.57 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.65 m	Total Pressure Drop	6.45 kPa
Entry Total Head	29.25 m	Exit Total Head	28.6 m
Entry Gauge Head	28.6 m	Exit Gauge Head	27.95 m
Reynolds No.	397937.36	Friction Factor	0.01407 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	61	From node to node	25 - 26
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	200 mm	Inside Diameter	176 mm
Outside Diameter	200 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	152.23 m3/hr	Velocity	1.74 m/s
Friction Loss	0.11 m	Fitting Losses	0.46 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.57 m	Total Pressure Drop	5.64 kPa
Entry Total Head	36.3 m	Exit Total Head	35.73 m
Entry Gauge Head	36.3 m	Exit Gauge Head	35.73 m
Reynolds No.	257471.25	Friction Factor	0.01526 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	62	From node to node	26 - 27
Description	Partial Strip 3623-HXO-089	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	200 mm	Inside Diameter	176 mm
Outside Diameter	200 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	152.23 m3/hr	Velocity	1.74 m/s
Friction Loss	0.13 m	Fitting Losses	0.77 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	5.9 m	Total Pressure Drop	58.48 kPa
Entry Total Head	35.73 m	Exit Total Head	29.82 m
Entry Gauge Head	35.73 m	Exit Gauge Head	29.82 m
Reynolds No.	257471.25	Friction Factor	0.01526 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	63	From node to node	27 - 28
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	200 mm	Inside Diameter	176 mm
Outside Diameter	200 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	152.23 m3/hr	Velocity	1.74 m/s
Friction Loss	0.11 m	Fitting Losses	0.46 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.57 m	Total Pressure Drop	5.64 kPa
Entry Total Head	29.82 m	Exit Total Head	29.25 m
Entry Gauge Head	29.82 m	Exit Gauge Head	29.25 m
Reynolds No.	257471.25	Friction Factor	0.01526 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	64	From node to node	22 - 32
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	800 mm	Inside Diameter	704 mm
Outside Diameter	800 mm	Pipe Length	14 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	6	Total Fittings kf	0
Flow Rate	4911.08 m3/hr	Velocity	3.5 m/s
Friction Loss	0.13 m	Fitting Losses	3.76 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	3.89 m	Total Pressure Drop	38.54 kPa
Entry Total Head	41.4 m	Exit Total Head	37.51 m
Entry Gauge Head	41.4 m	Exit Gauge Head	37.51 m
Reynolds No.	2076595.8	Friction Factor	0.01066 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	65	From node to node	32 - 39
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	1000 mm	Inside Diameter	879.8 mm
Outside Diameter	1000 mm	Pipe Length	18 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	6	Total Fittings kf	0
Flow Rate	2415.55 m3/hr	Velocity	1.1 m/s
Friction Loss	0.02 m	Fitting Losses	0.37 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.39 m	Total Pressure Drop	3.85 kPa
Entry Total Head	37.51 m	Exit Total Head	37.12 m
Entry Gauge Head	37.51 m	Exit Gauge Head	37.12 m
Reynolds No.	817295.87	Friction Factor	0.01222 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	66	From node to node	32 - 33
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	710 mm	Inside Diameter	625 mm
Outside Diameter	710 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	2495.53 m3/hr	Velocity	2.26 m/s
Friction Loss	0.04 m	Fitting Losses	1.3 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	1.34 m	Total Pressure Drop	13.28 kPa
Entry Total Head	37.51 m	Exit Total Head	36.17 m
Entry Gauge Head	37.51 m	Exit Gauge Head	27.17 m
Reynolds No.	1188586.46	Friction Factor	0.01159 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	67	From node to node	33 - 36
Description	Ammonia O/Heads 3621-CDS-001	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	400 mm	Inside Diameter	352 mm
Outside Diameter	400 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	12	Total Fittings kf	0
Flow Rate	831.02 m3/hr	Velocity	2.37 m/s
Friction Loss	0.11 m	Fitting Losses	3.44 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	8.55 m	Total Pressure Drop	84.66 kPa
Entry Total Head	36.17 m	Exit Total Head	27.62 m
Entry Gauge Head	27.17 m	Exit Gauge Head	18.62 m
Reynolds No.	702776.11	Friction Factor	0.01273 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	68	From node to node	33 - 34
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	630 mm	Inside Diameter	554 mm
Outside Diameter	630 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	1664.51 m3/hr	Velocity	1.92 m/s
Friction Loss	0.03 m	Fitting Losses	0.56 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.6 m	Total Pressure Drop	5.9 kPa
Entry Total Head	36.17 m	Exit Total Head	35.57 m
Entry Gauge Head	27.17 m	Exit Gauge Head	26.57 m
Reynolds No.	894385.11	Friction Factor	0.01213 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	69	From node to node	34 - 37
Description	Ammonia O/Heads 3622-CDS-002	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	400 mm	Inside Diameter	352 mm
Outside Diameter	400 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	8	Total Fittings kf	0
Flow Rate	823.4 m3/hr	Velocity	2.35 m/s
Friction Loss	0.1 m	Fitting Losses	2.25 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	7.36 m	Total Pressure Drop	72.86 kPa
Entry Total Head	35.57 m	Exit Total Head	28.21 m
Entry Gauge Head	26.57 m	Exit Gauge Head	19.21 m
Reynolds No.	696330.63	Friction Factor	0.01275 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	70	From node to node	34 - 35
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	500 mm	Inside Diameter	440 mm
Outside Diameter	500 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	841.11 m3/hr	Velocity	1.54 m/s
Friction Loss	0.03 m	Fitting Losses	0.36 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.39 m	Total Pressure Drop	3.86 kPa
Entry Total Head	35.57 m	Exit Total Head	35.18 m
Entry Gauge Head	26.57 m	Exit Gauge Head	26.18 m
Reynolds No.	569047.65	Friction Factor	0.0131 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	71	From node to node	35 - 38
Description	Ammonia O/Heads 3623-CDS-003	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	400 mm	Inside Diameter	352 mm
Outside Diameter	400 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	841.11 m3/hr	Velocity	2.4 m/s
Friction Loss	0.11 m	Fitting Losses	1.47 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	6.58 m	Total Pressure Drop	65.14 kPa
Entry Total Head	35.18 m	Exit Total Head	28.6 m
Entry Gauge Head	26.18 m	Exit Gauge Head	19.6 m
Reynolds No.	711309.57	Friction Factor	0.01271 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	72	From node to node	38 - 37
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	500 mm	Inside Diameter	440 mm
Outside Diameter	500 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	841.11 m3/hr	Velocity	1.54 m/s
Friction Loss	0.03 m	Fitting Losses	0.36 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.39 m	Total Pressure Drop	3.86 kPa
Entry Total Head	28.6 m	Exit Total Head	28.21 m
Entry Gauge Head	19.6 m	Exit Gauge Head	19.21 m
Reynolds No.	569047.65	Friction Factor	0.0131 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	73	From node to node	37 - 36
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	630 mm	Inside Diameter	554 mm
Outside Diameter	630 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	1664.51 m3/hr	Velocity	1.92 m/s
Friction Loss	0.03 m	Fitting Losses	0.56 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.6 m	Total Pressure Drop	5.9 kPa
Entry Total Head	28.21 m	Exit Total Head	27.62 m
Entry Gauge Head	19.21 m	Exit Gauge Head	18.62 m
Reynolds No.	894385.11	Friction Factor	0.01213 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	74	From node to node	36 - 51
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	710 mm	Inside Diameter	625 mm
Outside Diameter	710 mm	Pipe Length	45 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	7	Total Fittings kf	0
Flow Rate	2495.53 m3/hr	Velocity	2.26 m/s
Friction Loss	0.22 m	Fitting Losses	1.82 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	2.04 m	Total Pressure Drop	20.2 kPa
Entry Total Head	27.62 m	Exit Total Head	25.58 m
Entry Gauge Head	18.62 m	Exit Gauge Head	25.58 m
Reynolds No.	1188586.46	Friction Factor	0.01159 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	75	From node to node	25 - 28
Description	Partial Strip 3622-HXO-087	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	200 mm	Inside Diameter	176 mm
Outside Diameter	200 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	9	Total Fittings kf	0
Flow Rate	176.63 m3/hr	Velocity	2.02 m/s
Friction Loss	0.18 m	Fitting Losses	1.87 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	7.04 m	Total Pressure Drop	69.76 kPa
Entry Total Head	36.3 m	Exit Total Head	29.25 m
Entry Gauge Head	36.3 m	Exit Gauge Head	29.25 m
Reynolds No.	298736.66	Friction Factor	0.01488 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	76	From node to node	24 - 29
Description	Partial Strip 3621-HXO-085	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	200 mm	Inside Diameter	176 mm
Outside Diameter	200 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	14	Total Fittings kf	0
Flow Rate	184.12 m3/hr	Velocity	2.1 m/s
Friction Loss	0.19 m	Fitting Losses	3.15 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	8.35 m	Total Pressure Drop	82.66 kPa
Entry Total Head	36.95 m	Exit Total Head	28.6 m
Entry Gauge Head	36.95 m	Exit Gauge Head	28.6 m
Reynolds No.	311414.69	Friction Factor	0.01478 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	77	From node to node	39 - 40
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	800 mm	Inside Diameter	704 mm
Outside Diameter	800 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	2415.55 m3/hr	Velocity	1.72 m/s
Friction Loss	0.02 m	Fitting Losses	0.76 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.78 m	Total Pressure Drop	7.71 kPa
Entry Total Head	37.12 m	Exit Total Head	36.34 m
Entry Gauge Head	37.12 m	Exit Gauge Head	36.34 m
Reynolds No.	1021387.65	Friction Factor	0.01183 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	78	From node to node	40 - 41
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	500 mm	Inside Diameter	440 mm
Outside Diameter	500 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	1569.34 m3/hr	Velocity	2.87 m/s
Friction Loss	0.09 m	Fitting Losses	1.26 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	1.35 m	Total Pressure Drop	13.35 kPa
Entry Total Head	36.34 m	Exit Total Head	34.99 m
Entry Gauge Head	36.34 m	Exit Gauge Head	34.99 m
Reynolds No.	1061723.27	Friction Factor	0.01189 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	79	From node to node	41 - 42
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	400 mm	Inside Diameter	352 mm
Outside Diameter	400 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	762.05 m3/hr	Velocity	2.18 m/s
Friction Loss	0.07 m	Fitting Losses	0.72 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.79 m	Total Pressure Drop	7.87 kPa
Entry Total Head	34.99 m	Exit Total Head	34.2 m
Entry Gauge Head	34.99 m	Exit Gauge Head	34.2 m
Reynolds No.	644449.82	Friction Factor	0.0129 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	80	From node to node	40 - 43
Description	Ammonia Recycle 3621-HXO-041	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	400 mm	Inside Diameter	352 mm
Outside Diameter	400 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	22	Total Fittings kf	0
Flow Rate	687.48 m3/hr	Velocity	1.96 m/s
Friction Loss	0.07 m	Fitting Losses	4.32 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	9.39 m	Total Pressure Drop	93.05 kPa
Entry Total Head	36.34 m	Exit Total Head	26.95 m
Entry Gauge Head	36.34 m	Exit Gauge Head	26.95 m
Reynolds No.	581385.42	Friction Factor	0.01312 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	81	From node to node	41 - 44
Description	Ammonia Recycle 3622-HXO-045	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	400 mm	Inside Diameter	352 mm
Outside Diameter	400 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	12	Total Fittings kf	0
Flow Rate	649.09 m3/hr	Velocity	1.85 m/s
Friction Loss	0.07 m	Fitting Losses	2.1 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	7.17 m	Total Pressure Drop	70.99 kPa
Entry Total Head	34.99 m	Exit Total Head	27.82 m
Entry Gauge Head	34.99 m	Exit Gauge Head	27.82 m
Reynolds No.	548921.61	Friction Factor	0.01324 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	82	From node to node	42 - 45
Description	Ammonia Recycle 3623-HXO-042	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	400 mm	Inside Diameter	352 mm
Outside Diameter	400 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	616.67 m3/hr	Velocity	1.76 m/s
Friction Loss	0.06 m	Fitting Losses	0.79 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	5.85 m	Total Pressure Drop	57.95 kPa
Entry Total Head	34.2 m	Exit Total Head	28.35 m
Entry Gauge Head	34.2 m	Exit Gauge Head	28.35 m
Reynolds No.	521502.83	Friction Factor	0.01335 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	83	From node to node	45 - 44
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	400 mm	Inside Diameter	352 mm
Outside Diameter	400 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	616.67 m3/hr	Velocity	1.76 m/s
Friction Loss	0.05 m	Fitting Losses	0.47 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.52 m	Total Pressure Drop	5.17 kPa
Entry Total Head	28.35 m	Exit Total Head	27.82 m
Entry Gauge Head	28.35 m	Exit Gauge Head	27.82 m
Reynolds No.	521502.83	Friction Factor	0.01335 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	84	From node to node	44 - 43
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	500 mm	Inside Diameter	440 mm
Outside Diameter	500 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	1265.76 m3/hr	Velocity	2.31 m/s
Friction Loss	0.06 m	Fitting Losses	0.82 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.88 m	Total Pressure Drop	8.7 kPa
Entry Total Head	27.82 m	Exit Total Head	26.95 m
Entry Gauge Head	27.82 m	Exit Gauge Head	26.95 m
Reynolds No.	856339.55	Friction Factor	0.01228 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	86	From node to node	43 - 85
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	800 mm	Inside Diameter	704 mm
Outside Diameter	800 mm	Pipe Length	30 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	1953.24 m3/hr	Velocity	1.39 m/s
Friction Loss	0.05 m	Fitting Losses	0.5 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.55 m	Total Pressure Drop	5.42 kPa
Entry Total Head	26.95 m	Exit Total Head	26.4 m
Entry Gauge Head	26.95 m	Exit Gauge Head	26.4 m
Reynolds No.	825904.93	Friction Factor	0.01223 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	87	From node to node	85 - 51
Description	Hobas 1200	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Hobas 06 1200 SN 10000	Pipe Class	06
Nominal Diameter	1200 mm	Inside Diameter	1173 mm
Outside Diameter	1229 mm	Pipe Length	12 m
Pipe Roughness	0.015 mm	Allowable Press.	600 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	6900.96 m3/hr	Velocity	1.77 m/s
Friction Loss	0.02 m	Fitting Losses	0.8 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.82 m	Total Pressure Drop	8.13 kPa
Entry Total Head	26.4 m	Exit Total Head	25.58 m
Entry Gauge Head	26.4 m	Exit Gauge Head	25.58 m
Reynolds No.	1751295.4	Friction Factor	0.011 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	88	From node to node	40 - 48
Description	Ammonia Product 3621-HXO-043	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	200 mm	Inside Diameter	176 mm
Outside Diameter	200 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	22	Total Fittings kf	0
Flow Rate	158.73 m3/hr	Velocity	1.81 m/s
Friction Loss	0.15 m	Fitting Losses	3.68 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	8.83 m	Total Pressure Drop	87.46 kPa
Entry Total Head	36.34 m	Exit Total Head	27.51 m
Entry Gauge Head	36.34 m	Exit Gauge Head	27.51 m
Reynolds No.	268471.57	Friction Factor	0.01515 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	89	From node to node	41 - 47
Description	Ammonia Product 3622-HXO-047	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	200 mm	Inside Diameter	176 mm
Outside Diameter	200 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	12	Total Fittings kf	0
Flow Rate	158.2 m3/hr	Velocity	1.81 m/s
Friction Loss	0.14 m	Fitting Losses	2 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	7.14 m	Total Pressure Drop	70.72 kPa
Entry Total Head	34.99 m	Exit Total Head	27.85 m
Entry Gauge Head	34.99 m	Exit Gauge Head	27.85 m
Reynolds No.	267565.33	Friction Factor	0.01516 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	90	From node to node	42 - 46
Description	Ammonia Product 3623-HXO-044	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	200 mm	Inside Diameter	176 mm
Outside Diameter	200 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	145.38 m3/hr	Velocity	1.66 m/s
Friction Loss	0.12 m	Fitting Losses	0.7 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	5.83 m	Total Pressure Drop	57.71 kPa
Entry Total Head	34.2 m	Exit Total Head	28.37 m
Entry Gauge Head	34.2 m	Exit Gauge Head	28.37 m
Reynolds No.	245893.98	Friction Factor	0.01538 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	91	From node to node	46 - 47
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	200 mm	Inside Diameter	176 mm
Outside Diameter	200 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	145.38 m3/hr	Velocity	1.66 m/s
Friction Loss	0.1 m	Fitting Losses	0.42 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.52 m	Total Pressure Drop	5.15 kPa
Entry Total Head	28.37 m	Exit Total Head	27.85 m
Entry Gauge Head	28.37 m	Exit Gauge Head	27.85 m
Reynolds No.	245893.98	Friction Factor	0.01538 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	92	From node to node	47 - 48
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	315 mm	Inside Diameter	277 mm
Outside Diameter	315 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	303.58 m3/hr	Velocity	1.4 m/s
Friction Loss	0.04 m	Fitting Losses	0.3 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.34 m	Total Pressure Drop	3.38 kPa
Entry Total Head	27.85 m	Exit Total Head	27.51 m
Entry Gauge Head	27.85 m	Exit Gauge Head	27.51 m
Reynolds No.	326241.29	Friction Factor	0.01451 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	93	From node to node	48 - 49
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	400 mm	Inside Diameter	352 mm
Outside Diameter	400 mm	Pipe Length	30 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	6	Total Fittings kf	0
Flow Rate	462.31 m3/hr	Velocity	1.32 m/s
Friction Loss	0.11 m	Fitting Losses	0.53 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.64 m	Total Pressure Drop	6.33 kPa
Entry Total Head	27.51 m	Exit Total Head	26.87 m
Entry Gauge Head	27.51 m	Exit Gauge Head	26.87 m
Reynolds No.	390965.44	Friction Factor	0.01401 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	94	From node to node	49 - 85
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	400 mm	Inside Diameter	352 mm
Outside Diameter	400 mm	Pipe Length	8 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	462.31 m3/hr	Velocity	1.32 m/s
Friction Loss	0.03 m	Fitting Losses	0.44 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.47 m	Total Pressure Drop	4.68 kPa
Entry Total Head	26.87 m	Exit Total Head	26.4 m
Entry Gauge Head	26.87 m	Exit Gauge Head	26.4 m
Reynolds No.	390965.44	Friction Factor	0.01401 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	104	From node to node	21 - 95
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	1000 mm	Inside Diameter	879.8 mm
Outside Diameter	1000 mm	Pipe Length	75 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	7	Total Fittings kf	0
Flow Rate	4485.42 m3/hr	Velocity	2.05 m/s
Friction Loss	0.2 m	Fitting Losses	1.5 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	1.7 m	Total Pressure Drop	16.86 kPa
Entry Total Head	47.35 m	Exit Total Head	45.65 m
Entry Gauge Head	47.35 m	Exit Gauge Head	45.65 m
Reynolds No.	1517631.96	Friction Factor	0.01109 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	105	From node to node	95 - 96
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	800 mm	Inside Diameter	704 mm
Outside Diameter	800 mm	Pipe Length	30 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	4	Total Fittings kf	0
Flow Rate	4485.42 m3/hr	Velocity	3.2 m/s
Friction Loss	0.24 m	Fitting Losses	2.09 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	2.33 m	Total Pressure Drop	23.08 kPa
Entry Total Head	45.65 m	Exit Total Head	43.32 m
Entry Gauge Head	45.65 m	Exit Gauge Head	43.32 m
Reynolds No.	1896608.81	Friction Factor	0.0108 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	106	From node to node	96 - 100
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	1000 mm	Inside Diameter	879.8 mm
Outside Diameter	1000 mm	Pipe Length	115 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	9	Total Fittings kf	0
Flow Rate	4123.7 m3/hr	Velocity	1.88 m/s
Friction Loss	0.27 m	Fitting Losses	1.63 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	1.9 m	Total Pressure Drop	18.77 kPa
Entry Total Head	43.32 m	Exit Total Head	41.42 m
Entry Gauge Head	43.32 m	Exit Gauge Head	41.42 m
Reynolds No.	1395247.83	Friction Factor	0.01123 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	107	From node to node	100 - 101
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	800 mm	Inside Diameter	704 mm
Outside Diameter	800 mm	Pipe Length	50 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	3909.91 m3/hr	Velocity	2.79 m/s
Friction Loss	0.31 m	Fitting Losses	1.98 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	2.3 m	Total Pressure Drop	22.73 kPa
Entry Total Head	41.42 m	Exit Total Head	39.13 m
Entry Gauge Head	41.42 m	Exit Gauge Head	39.13 m
Reynolds No.	1653263.91	Friction Factor	0.01101 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	108	From node to node	101 - 102
Description	Power plant Condenser	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE100 AS4130	Pipe Class	PN8
Nominal Diameter	800 mm	Inside Diameter	720 mm
Outside Diameter	800 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	18	Total Fittings kf	0
Flow Rate	2864.43 m3/hr	Velocity	1.95 m/s
Friction Loss	0.03 m	Fitting Losses	3.5 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	8.54 m	Total Pressure Drop	84.56 kPa
Entry Total Head	39.13 m	Exit Total Head	30.59 m
Entry Gauge Head	39.13 m	Exit Gauge Head	30.59 m
Reynolds No.	1184276.22	Friction Factor	0.01156 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	109	From node to node	102 - 103
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	800 mm	Inside Diameter	704 mm
Outside Diameter	800 mm	Pipe Length	50 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	3909.91 m3/hr	Velocity	2.79 m/s
Friction Loss	0.31 m	Fitting Losses	1.98 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	2.3 m	Total Pressure Drop	22.73 kPa
Entry Total Head	30.59 m	Exit Total Head	28.3 m
Entry Gauge Head	30.59 m	Exit Gauge Head	28.3 m
Reynolds No.	1653263.91	Friction Factor	0.01101 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	110	From node to node	103 - 99
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	1000 mm	Inside Diameter	879.8 mm
Outside Diameter	1000 mm	Pipe Length	115 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	9	Total Fittings kf	0
Flow Rate	4123.7 m3/hr	Velocity	1.88 m/s
Friction Loss	0.27 m	Fitting Losses	1.63 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	1.9 m	Total Pressure Drop	18.77 kPa
Entry Total Head	28.3 m	Exit Total Head	26.4 m
Entry Gauge Head	28.3 m	Exit Gauge Head	26.4 m
Reynolds No.	1395247.83	Friction Factor	0.01123 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	111	From node to node	99 - 85
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	1000 mm	Inside Diameter	879.8 mm
Outside Diameter	1000 mm	Pipe Length	1 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	4485.42 m3/hr	Velocity	2.05 m/s
Friction Loss	0 m	Fitting Losses	0 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0 m	Total Pressure Drop	0.03 kPa
Entry Total Head	26.4 m	Exit Total Head	26.4 m
Entry Gauge Head	26.4 m	Exit Gauge Head	26.4 m
Reynolds No.	1517635.13	Friction Factor	0.01109 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	112	From node to node	96 - 97
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE100 AS4130	Pipe Class	PN8
Nominal Diameter	280 mm	Inside Diameter	252 mm
Outside Diameter	280 mm	Pipe Length	30 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	361.71 m3/hr	Velocity	2.01 m/s
Friction Loss	0.34 m	Fitting Losses	1.03 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	1.38 m	Total Pressure Drop	13.64 kPa
Entry Total Head	43.32 m	Exit Total Head	41.94 m
Entry Gauge Head	43.32 m	Exit Gauge Head	41.94 m
Reynolds No.	427276.02	Friction Factor	0.0139 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	113	From node to node	97 - 98
Description	SX Cooler 3700-HXO-056	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	280 mm	Inside Diameter	246 mm
Outside Diameter	280 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	40	Total Fittings kf	0
Flow Rate	361.71 m3/hr	Velocity	2.11 m/s
Friction Loss	0.13 m	Fitting Losses	9.11 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	14.24 m	Total Pressure Drop	141.09 kPa
Entry Total Head	41.94 m	Exit Total Head	27.7 m
Entry Gauge Head	41.94 m	Exit Gauge Head	27.7 m
Reynolds No.	437697.39	Friction Factor	0.01385 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	114	From node to node	98 - 99
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	280 mm	Inside Diameter	246 mm
Outside Diameter	280 mm	Pipe Length	30 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	4	Total Fittings kf	0
Flow Rate	361.71 m3/hr	Velocity	2.11 m/s
Friction Loss	0.39 m	Fitting Losses	0.91 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	1.3 m	Total Pressure Drop	12.84 kPa
Entry Total Head	27.7 m	Exit Total Head	26.4 m
Entry Gauge Head	27.7 m	Exit Gauge Head	26.4 m
Reynolds No.	437697.39	Friction Factor	0.01385 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	117	From node to node	22 - 115
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	200 mm	Inside Diameter	176 mm
Outside Diameter	200 mm	Pipe Length	80 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	210.32 m3/hr	Velocity	2.4 m/s
Friction Loss	1.93 m	Fitting Losses	1.47 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	3.4 m	Total Pressure Drop	33.7 kPa
Entry Total Head	41.4 m	Exit Total Head	37.99 m
Entry Gauge Head	41.4 m	Exit Gauge Head	37.99 m
Reynolds No.	355726.19	Friction Factor	0.01446 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	118	From node to node	115 - 116
Description	PAL Cooling Water	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	200 mm	Inside Diameter	176 mm
Outside Diameter	200 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	9	Total Fittings kf	0
Flow Rate	210.32 m3/hr	Velocity	2.4 m/s
Friction Loss	0.24 m	Fitting Losses	2.65 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	7.89 m	Total Pressure Drop	78.14 kPa
Entry Total Head	37.99 m	Exit Total Head	30.1 m
Entry Gauge Head	37.99 m	Exit Gauge Head	30.1 m
Reynolds No.	355726.19	Friction Factor	0.01446 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	120	From node to node	116 - 119
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	200 mm	Inside Diameter	176 mm
Outside Diameter	200 mm	Pipe Length	80 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	210.32 m3/hr	Velocity	2.4 m/s
Friction Loss	1.93 m	Fitting Losses	1.47 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	3.4 m	Total Pressure Drop	33.7 kPa
Entry Total Head	30.1 m	Exit Total Head	26.7 m
Entry Gauge Head	30.1 m	Exit Gauge Head	26.7 m
Reynolds No.	355726.19	Friction Factor	0.01446 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	121	From node to node	119 - 51
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	200 mm	Inside Diameter	176 mm
Outside Diameter	200 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	210.32 m3/hr	Velocity	2.4 m/s
Friction Loss	0.24 m	Fitting Losses	0.88 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	1.12 m	Total Pressure Drop	11.13 kPa
Entry Total Head	26.7 m	Exit Total Head	25.58 m
Entry Gauge Head	26.7 m	Exit Gauge Head	25.58 m
Reynolds No.	355726.19	Friction Factor	0.01446 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	124	From node to node	101 - 122
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	500 mm	Inside Diameter	440 mm
Outside Diameter	500 mm	Pipe Length	30 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	1045.49 m3/hr	Velocity	1.91 m/s
Friction Loss	0.16 m	Fitting Losses	0.93 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	1.09 m	Total Pressure Drop	10.8 kPa
Entry Total Head	39.13 m	Exit Total Head	38.04 m
Entry Gauge Head	39.13 m	Exit Gauge Head	38.04 m
Reynolds No.	707315.71	Friction Factor	0.01265 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	125	From node to node	122 - 123
Description	Gen Set Cooling	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	500 mm	Inside Diameter	440 mm
Outside Diameter	500 mm	Pipe Length	10 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	7	Total Fittings kf	0
Flow Rate	1045.49 m3/hr	Velocity	1.91 m/s
Friction Loss	0.05 m	Fitting Losses	1.3 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	6.36 m	Total Pressure Drop	62.96 kPa
Entry Total Head	38.04 m	Exit Total Head	31.68 m
Entry Gauge Head	38.04 m	Exit Gauge Head	31.68 m
Reynolds No.	707315.71	Friction Factor	0.01265 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	126	From node to node	123 - 102
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	500 mm	Inside Diameter	440 mm
Outside Diameter	500 mm	Pipe Length	30 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	5	Total Fittings kf	0
Flow Rate	1045.49 m3/hr	Velocity	1.91 m/s
Friction Loss	0.16 m	Fitting Losses	0.93 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	1.09 m	Total Pressure Drop	10.8 kPa
Entry Total Head	31.68 m	Exit Total Head	30.59 m
Entry Gauge Head	31.68 m	Exit Gauge Head	30.59 m
Reynolds No.	707315.71	Friction Factor	0.01265 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	128	From node to node	100 - 127
Description	Acid plant Cooler	Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	200 mm	Inside Diameter	176 mm
Outside Diameter	200 mm	Pipe Length	90 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	12	Total Fittings kf	0
Flow Rate	213.79 m3/hr	Velocity	2.44 m/s
Friction Loss	2.24 m	Fitting Losses	3.65 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	5 m	Booster Pump Head	0 m
Total Head Loss	10.89 m	Total Pressure Drop	107.84 kPa
Entry Total Head	41.42 m	Exit Total Head	30.54 m
Entry Gauge Head	41.42 m	Exit Gauge Head	30.54 m
Reynolds No.	361598.03	Friction Factor	0.01442 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	129	From node to node	127 - 103
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	200 mm	Inside Diameter	176 mm
Outside Diameter	200 mm	Pipe Length	90 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	0	Total Fittings kf	0
Flow Rate	213.79 m3/hr	Velocity	2.44 m/s
Friction Loss	2.24 m	Fitting Losses	0 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	2.24 m	Total Pressure Drop	22.19 kPa
Entry Total Head	30.54 m	Exit Total Head	28.3 m
Entry Gauge Head	30.54 m	Exit Gauge Head	28.3 m
Reynolds No.	361598.03	Friction Factor	0.01442 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	134	From node to node	130 - 0
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	710 mm	Inside Diameter	625 mm
Outside Diameter	710 mm	Pipe Length	0 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	1	Total Fittings kf	0
Flow Rate	5.83 m3/hr	Velocity	0.01 m/s
Friction Loss	0 m	Fitting Losses	0 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0 m	Total Pressure Drop	0 kPa
Entry Total Head	4 m	Exit Total Head	4 m
Entry Gauge Head	0 m	Exit Gauge Head	2 m
Reynolds No.	2775.68	Friction Factor	0.04458 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	135	From node to node	131 - 1
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	710 mm	Inside Diameter	625 mm
Outside Diameter	710 mm	Pipe Length	0 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	1	Total Fittings kf	0
Flow Rate	4353.38 m3/hr	Velocity	3.94 m/s
Friction Loss	0 m	Fitting Losses	0.79 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.79 m	Total Pressure Drop	7.85 kPa
Entry Total Head	4 m	Exit Total Head	3.21 m
Entry Gauge Head	0 m	Exit Gauge Head	1.21 m
Reynolds No.	2073451.93	Friction Factor	0.01071 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	136	From node to node	132 - 2
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	710 mm	Inside Diameter	625 mm
Outside Diameter	710 mm	Pipe Length	0 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	1	Total Fittings kf	0
Flow Rate	3128.66 m3/hr	Velocity	2.83 m/s
Friction Loss	0 m	Fitting Losses	0.41 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.41 m	Total Pressure Drop	4.05 kPa
Entry Total Head	4 m	Exit Total Head	3.59 m
Entry Gauge Head	0 m	Exit Gauge Head	1.59 m
Reynolds No.	1490139.01	Friction Factor	0.01121 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Pipe No	137	From node to node	133 - 3
Description		Equipment No	
Liquid	Cooling Water	Viscosity	1.2 cp
Temperature	28 C	Density	1010 kg/m3
Vapour Pressure	4 kPa		
Pipe Description	Polyethylene PE80 AS4130	Pipe Class	PN8
Nominal Diameter	710 mm	Inside Diameter	625 mm
Outside Diameter	710 mm	Pipe Length	0 m
Pipe Roughness	0.007 mm	Allowable Press.	800 kPa
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	1	Total Fittings kf	0
Flow Rate	2702.17 m3/hr	Velocity	2.45 m/s
Friction Loss	0 m	Fitting Losses	0.31 m
Slurry Losses	0 m	Orifice Losses	0 m
Fixed Head Loss	0 m	Booster Pump Head	0 m
Total Head Loss	0.31 m	Total Pressure Drop	3.02 kPa
Entry Total Head	4 m	Exit Total Head	3.69 m
Entry Gauge Head	0 m	Exit Gauge Head	1.69 m
Reynolds No.	1287007.59	Friction Factor	0.01145 (Darcy f)

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	0	Node Type	Pump
Description	Cooling Pump	Equipment No	5290-PPC-037
Rel. Level (RL)	2 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	4 m		
Pump Head	0 m	Pump Flow Rate	5.72 m3/hr
Pump / Fan Efficiency	3.4214315547414484e+214 %	Pump Absorbed Power	0 kW
Casing Pressure	19.81 kPa		
Pump NPSH required	0 m	Pump NPSH available	1.6 m

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	1	Node Type	Pump
Description	Cooling Pump	Equipment No	5290-PPC-038
Rel. Level (RL)	2 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	55.01 m		
Pump Head	51.8 m	Pump Flow Rate	4353.38 m3/hr
Pump / Fan Efficiency	70 %	Pump Absorbed Power	886.33 kW
Casing Pressure	525.03 kPa		
Pump NPSH required	0 m	Pump NPSH available	0.8 m

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	2	Node Type	Pump
Description	Cooling Pump	Equipment No	5290-PPC-039
Rel. Level (RL)	2 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	55.69 m		
Pump Head	52.1 m	Pump Flow Rate	3128.66 m3/hr
Pump / Fan Efficiency	70 %	Pump Absorbed Power	640.68 kW
Casing Pressure	531.79 kPa		
Pump NPSH required	0 m	Pump NPSH available	1.19 m

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	3	Node Type	Pump
Description	Cooling Pump	Equipment No	5290-PPC-040
Rel. Level (RL)	2 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	56.09 m		
Pump Head	52.4 m	Pump Flow Rate	2702.17 m3/hr
Pump / Fan Efficiency	70 %	Pump Absorbed Power	556.53 kW
Casing Pressure	535.79 kPa		
Pump NPSH required	0 m	Pump NPSH available	1.29 m

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	4	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	52.51 m	Int.(Gauge) Pressure	520.09 kPa
Total Node Head	52.51 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	5	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	52.51 m	Int.(Gauge) Pressure	520.09 kPa
Total Node Head	52.51 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	6	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	53.61 m	Int.(Gauge) Pressure	530.97 kPa
Total Node Head	53.61 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	7	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	54.54 m	Int.(Gauge) Pressure	540.21 kPa
Total Node Head	54.54 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	8	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	48.74 m	Int.(Gauge) Pressure	482.76 kPa
Total Node Head	48.74 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	9	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	38.97 m	Int.(Gauge) Pressure	386.01 kPa
Total Node Head	38.97 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	10	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	31.89 m	Int.(Gauge) Pressure	315.82 kPa
Total Node Head	31.89 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	11	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	22.12 m	Int.(Gauge) Pressure	219.07 kPa
Total Node Head	22.12 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	12	Node Type	Tank
Description	Cooling Tower	Equipment No	5290-CZZ-002
Rel. Level (RL)	18 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	18 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	21	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	47.35 m	Int.(Gauge) Pressure	469 kPa
Total Node Head	47.35 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	22	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	41.4 m	Int.(Gauge) Pressure	410.02 kPa
Total Node Head	41.4 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	23	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	38.52 m	Int.(Gauge) Pressure	381.51 kPa
Total Node Head	38.52 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	24	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	36.95 m	Int.(Gauge) Pressure	365.96 kPa
Total Node Head	36.95 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	25	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	36.3 m	Int.(Gauge) Pressure	359.51 kPa
Total Node Head	36.3 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	26	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	35.73 m	Int.(Gauge) Pressure	353.87 kPa
Total Node Head	35.73 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	27	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	29.82 m	Int.(Gauge) Pressure	295.39 kPa
Total Node Head	29.82 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	28	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	29.25 m	Int.(Gauge) Pressure	289.75 kPa
Total Node Head	29.25 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	29	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	28.6 m	Int.(Gauge) Pressure	283.3 kPa
Total Node Head	28.6 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	32	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	37.51 m	Int.(Gauge) Pressure	371.48 kPa
Total Node Head	37.51 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	33	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	9 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	27.17 m	Int.(Gauge) Pressure	269.06 kPa
Total Node Head	36.17 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	34	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	9 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	26.57 m	Int.(Gauge) Pressure	263.16 kPa
Total Node Head	35.57 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	35	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	9 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	26.18 m	Int.(Gauge) Pressure	259.3 kPa
Total Node Head	35.18 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	36	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	9 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	18.62 m	Int.(Gauge) Pressure	184.4 kPa
Total Node Head	27.62 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	37	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	9 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	19.21 m	Int.(Gauge) Pressure	190.3 kPa
Total Node Head	28.21 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	38	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	9 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	19.6 m	Int.(Gauge) Pressure	194.16 kPa
Total Node Head	28.6 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	39	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	37.12 m	Int.(Gauge) Pressure	367.64 kPa
Total Node Head	37.12 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	40	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	36.34 m	Int.(Gauge) Pressure	359.93 kPa
Total Node Head	36.34 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	41	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	34.99 m	Int.(Gauge) Pressure	346.58 kPa
Total Node Head	34.99 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	42	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	34.2 m	Int.(Gauge) Pressure	338.71 kPa
Total Node Head	34.2 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	43	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	26.95 m	Int.(Gauge) Pressure	266.89 kPa
Total Node Head	26.95 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	44	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	27.82 m	Int.(Gauge) Pressure	275.59 kPa
Total Node Head	27.82 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	45	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	28.35 m	Int.(Gauge) Pressure	280.76 kPa
Total Node Head	28.35 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	46	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	28.37 m	Int.(Gauge) Pressure	281 kPa
Total Node Head	28.37 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	47	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	27.85 m	Int.(Gauge) Pressure	275.85 kPa
Total Node Head	27.85 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	48	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	27.51 m	Int.(Gauge) Pressure	272.47 kPa
Total Node Head	27.51 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	49	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	26.87 m	Int.(Gauge) Pressure	266.15 kPa
Total Node Head	26.87 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	51	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	25.58 m	Int.(Gauge) Pressure	253.34 kPa
Total Node Head	25.58 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	85	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	26.4 m	Int.(Gauge) Pressure	261.47 kPa
Total Node Head	26.4 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	95	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	45.65 m	Int.(Gauge) Pressure	452.14 kPa
Total Node Head	45.65 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	96	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	43.32 m	Int.(Gauge) Pressure	429.06 kPa
Total Node Head	43.32 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	97	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	41.94 m	Int.(Gauge) Pressure	415.42 kPa
Total Node Head	41.94 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	98	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	27.7 m	Int.(Gauge) Pressure	274.34 kPa
Total Node Head	27.7 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	99	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	26.4 m	Int.(Gauge) Pressure	261.5 kPa
Total Node Head	26.4 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	100	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	41.42 m	Int.(Gauge) Pressure	410.29 kPa
Total Node Head	41.42 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	101	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	39.13 m	Int.(Gauge) Pressure	387.56 kPa
Total Node Head	39.13 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	102	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	30.59 m	Int.(Gauge) Pressure	303 kPa
Total Node Head	30.59 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	103	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	28.3 m	Int.(Gauge) Pressure	280.26 kPa
Total Node Head	28.3 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	115	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	37.99 m	Int.(Gauge) Pressure	376.32 kPa
Total Node Head	37.99 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	116	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	30.1 m	Int.(Gauge) Pressure	298.18 kPa
Total Node Head	30.1 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	119	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	26.7 m	Int.(Gauge) Pressure	264.47 kPa
Total Node Head	26.7 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	122	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	38.04 m	Int.(Gauge) Pressure	376.76 kPa
Total Node Head	38.04 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	123	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	31.68 m	Int.(Gauge) Pressure	313.8 kPa
Total Node Head	31.68 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	127	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	0 m3/hr
Int.(Gauge) Head	30.54 m	Int.(Gauge) Pressure	302.46 kPa
Total Node Head	30.54 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	130	Node Type	Tank
Description		Equipment No	
Rel. Level (RL)	4 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	4 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	131	Node Type	Tank
Description		Equipment No	
Rel. Level (RL)	4 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	4 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	132	Node Type	Tank
Description		Equipment No	
Rel. Level (RL)	4 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	4 m		

Helix Technologies Pty Ltd

Project	Nickel Project	Client	ABC Mining
Project No.	4567	Design Date	23/01/2016
Category	Demo Liquid	Atmos. Press	0 kPa
Description	A - Cooling Water Pump network		

Node No	133	Node Type	Tank
Description		Equipment No	
Rel. Level (RL)	4 m	Pressure Input	0 kPa
Nozzle K value	-	Ext Flow (+In/-Out)	-
Int.(Gauge) Head	-	Int.(Gauge) Pressure	-
Total Node Head	4 m		