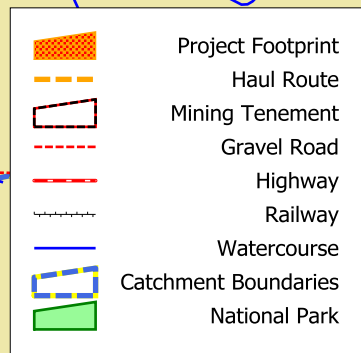
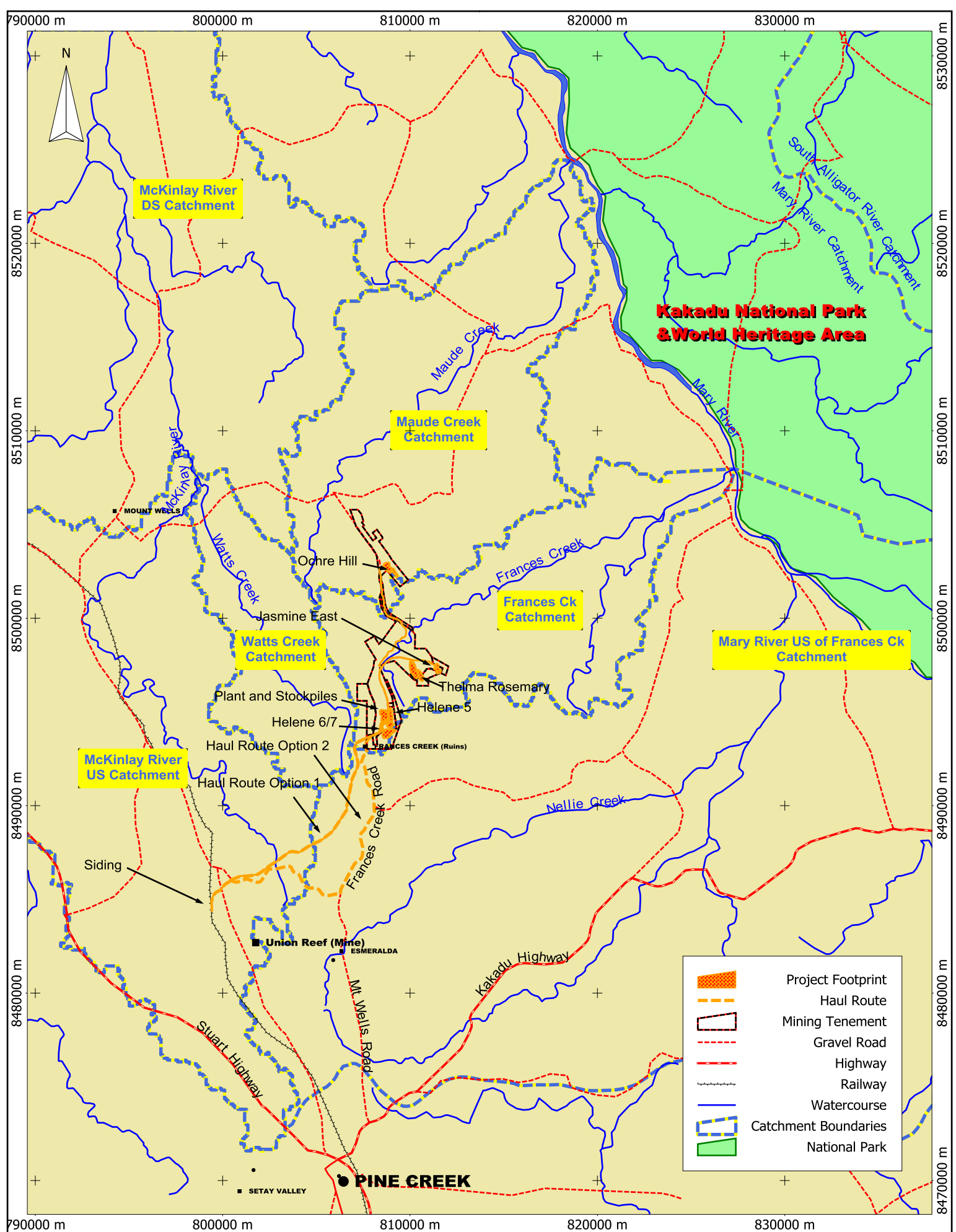
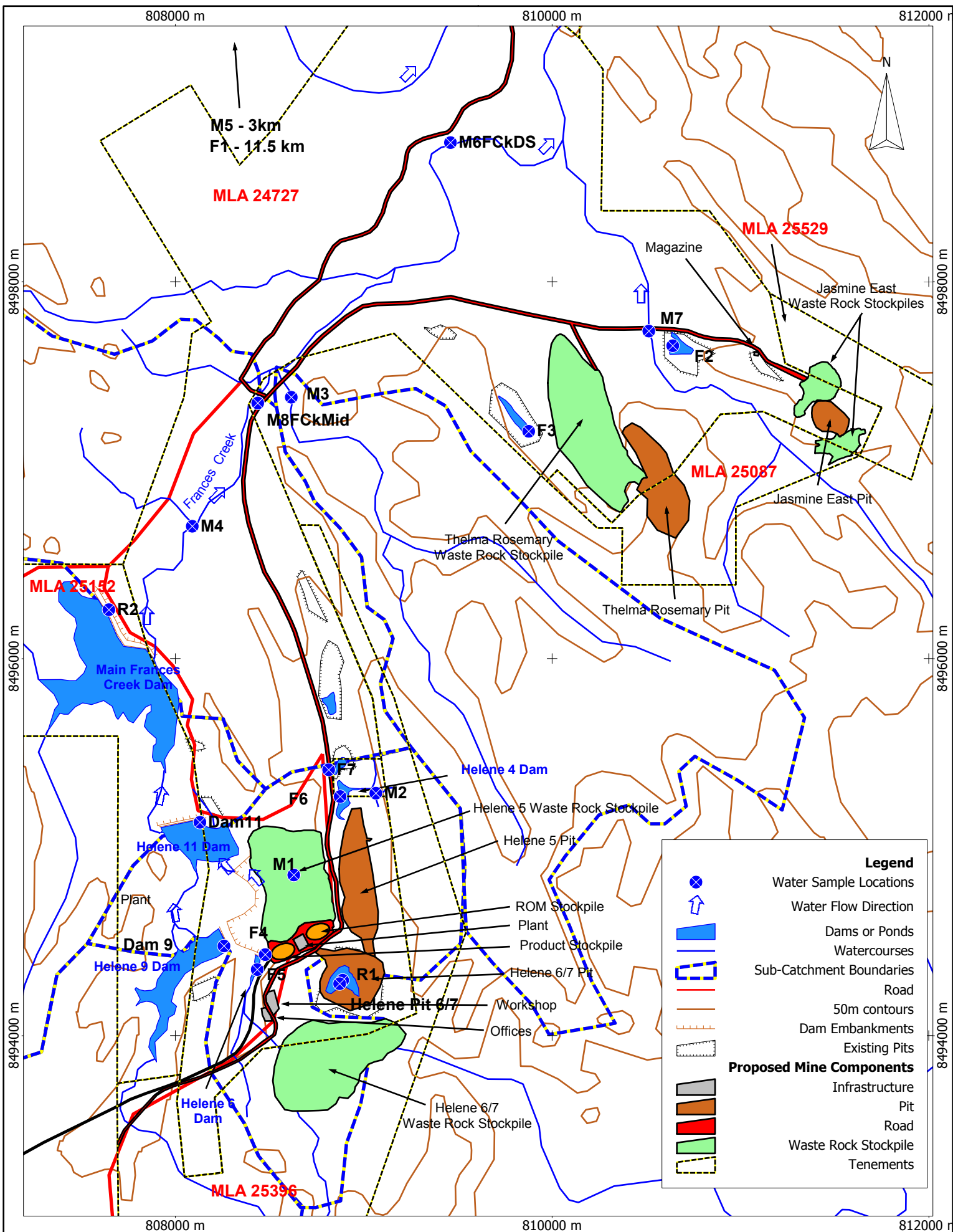
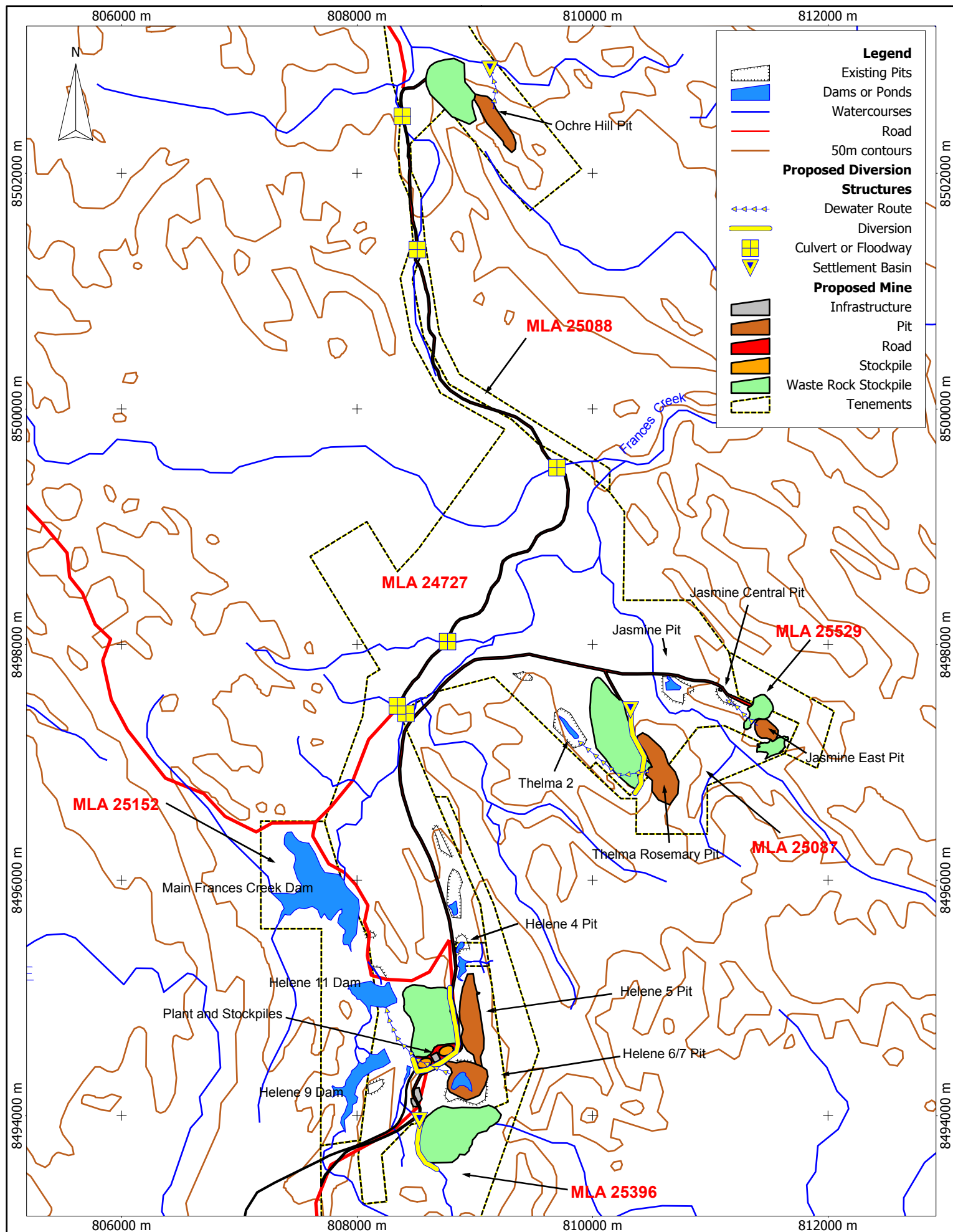








Environmental + Water
Resource Consultants

Scale: 1:40000
Original Size: A4
Air Photo Date
Datum: Australian Geocentric 1994 (GDA94)

0 1 km

Territory Iron
Frances Creek Mine

Location of Proposed Water
Diversions, Culverts and
Floodways

Figure 4

APPENDIX A

STREAMFLOW CALCULATIONS

Streamflow Calculations

A1. Peak Flow Calculations

Peak flow estimates were made using the regional techniques described in Weeks *et al.* (2002). These methods were developed by statistical analysis from gauged catchments, and used in design of the Alice Springs to Darwin Railway.

For the Katherine area the relationships developed are:

$$Q_5 = 6.43A^{0.627}$$

$$Q_{10}=9.20 A^{0.63}$$

$$Q_{20}=10.2A^{0.737}$$

$$Q_{50}=18.5 A^{0.657}$$

Where Q_Y is the peak discharge in cubic metres for a Y year average recurrence interval rainfall event, and A is the catchment area in square kilometres.

Application of the above equations to catchments in the Frances Creek project area provides the results shown in Table A1.

Table A1: Estimated Peak Flows for Frances Creek Catchments

	Catchment Area (km ²)	5 Year ARI Peak Flow (m ³ s ⁻¹)	10 Year ARI Peak Flow (m ³ s ⁻¹)	20 Year ARI Peak Flow (m ³ s ⁻¹)	50 Year ARI Peak Flow (m ³ s ⁻¹)
Helene 9 Dam	1.95	9.1	12.8	16.7	28.9
Helene 11 Dam	1.6	7.9	11.1	14.4	25.3
Frances Ck Main Dam	2.4	10.6	14.9	19.4	33.2
Helene 6 Dam	0.78	4.6	6.5	8.5	15.7
Helene 4 Dam	0.44	3.0	4.3	5.6	10.7
Ochre Hill Crossing - Dams	4.08	15.7	22.0	28.8	47.3
Ochre Hill Crossing - All	6.39	21.9	30.7	40.0	63.7
Thelma-Rosemary Dump US	0.15	1.4	1.9	2.5	5.2
Thelma-Rosemary Dump Total	0.48	3.2	4.6	5.9	11.3
Helene 6/7 WRS	0.224	1.8	2.6	3.4	6.8

A2. Volume Calculations

Comparison of the limited available flow records for Frances Creek with nearby gauging stations indicated that monitoring data from station G8180069 on the McKinlay River at Burrundie was the most representative of flows in Frances Creek. Estimated annual flow

volumes for Frances Creek have been calculated by scaling the statistical data available for McKinlay River at Burrundie by catchment area.

The calculations are a rough approximation; especially as no the Frances Creek catchments are a hundred times smaller than the catchment of G8180069. No local data is available for very small catchments however, so the data used is the best available.

The results of these calculations are shown in Table A2.

Table A2: Estimated Annual Flow Volumes for Frances Creek Catchments

	Catchment Area (km²)	10th Percentile Annual Flow (ML)	Median Annual Flow (ML)	Mean Annual Flow (ML)	90th Percentile Annual Flow (ML)	Maximum Annual Flow (ML)
Helene 9 Dam	1.95	103.7	527.7	614.1	1137.8	2181.1
Helene 11 Dam	1.6	85.1	433.0	503.9	933.6	1789.7
Frances Ck Main Dam	2.4	127.7	649.5	755.9	1400.4	2684.5
Helene 6 Dam	0.78	41.5	211.1	245.7	455.1	872.5
Helene 4 Dam	0.44	23.4	119.1	138.6	256.7	492.2
Ochre Hill Crossing - Dams	4.08	217.1	1104.1	1285.0	2380.7	4563.6
Ochre Hill Crossing - All	6.39	339.9	1729.3	2012.5	3728.6	7147.4
Thelma-Rosemary Dump US	0.15	8.0	40.6	47.2	87.5	167.8
Thelma-Rosemary Dump Total	0.48	25.5	129.9	151.2	280.1	536.9
Helene 6/7 WRS	0.224	11.9	60.6	70.5	130.7	250.6