



DIVERSIFIED SPECIES TECHNICAL NOTE

Number: DSTN-035
Date: October 2012

Assessment of *E. fastigata* Tree Height at Kaingaroa Cpt. 333

Summary

A 31 month old *Eucalyptus fastigata* progeny trial growing in Kaingaroa forest was assessed for height growth. Tree health and survival was good apart from some wind toppling. Growth was fairly uniform across the trial site. Average tree height was 4.5 metres with second generation families of Oakura origin amongst the most vigorous. A full list of estimated breeding values for each family and the best individual from each family are in Appendix 3. In a few years time the trees will be assessed for tree form before the final selections are made to take forward to form the next generation.

Authors: Stuart Kennedy, Charlie Low, Scion

Introduction

The trial was planted from seed collected from selections made by Mondi forest (South Africa), from first generation trials in Kaingaroa and Kinleith and from selections made in a stand of Oakura origin in Kaingaroa cpt 1227. The trial is an incomplete block design, 4 incomplete blocks per replicate, 30 replicates of single-tree plots of 125 families, 5 filler seedlots and two control seedlots.

Tree height at 31 months was measured in decimetres using height poles. A list of family means is in Appendix 2. Diameter growth is around one centimetre per metre of height, so the trees are very slender for their height compared to radiata pine. Tree growth is very good with the average height of trees now 4.5 metres, yet the trees are still 5 months short of three years old. The preceding trial, planted in Kaingaroa and Kinleith in 1979 averaged around 7 metres in height at age 5 years with the tallest trees at 13-14 metres. This could mean that early problems of inbreeding provided a high proportion of poorly grown trees in the 1979 trial.

Very little browsing by paropsis was seen and general health is excellent. Around 10% of trees were forked, although most forking was at ground level. Some toppling happened early on with the spot mounds not providing enough firm ground for the roots to stabilise the tree. The recent strong winds in March 2012 have also brought some trees down. Pigs have done some substantial digging, mainly around decaying radiata pine stumps in their search for huhu

grubs. The root systems of some trees have been exposed / damaged by pigrooting. There are some patches of blackberry that will get worse as the eucalypts won't shade it out totally. Growth of tutu is vigorous but all of the trees are well above all weeds.

Analysis

Eucalyptus species can be effected by micro site changes, for this reason (where significant) data was analysed spatially to remove as much of the micro site variation as possible. Genetic parameters and breeding values were estimated (Appendix 3) for traits using mixed model equations (Appendix 1) that were solved using the software package ASReml-R.

Discussion of Results

The Barrington Tops control seedlot performed poorly, as it did at Tylees (Kaingaroa) in the 1994 trial. The "genetic gain" seedlot comprised of 10 families that had performed well at Tylees also performed poorly (108 out of 132). At the family level, the best family (code 253 from Oakura) was 5.4 metres tall, while the worst was 3.8 metres. Survival was excellent, with the poorest survival being 87%. Families of Oakura origin, which performed well in the 1979 trials are performing well, although the odd Oakura family is poor. In general, the second generation seedlots from the 1979 trials are doing well as should be expected on a very similar site. The Mondi seedlots are not doing so well, nor are the second generation families from South African seedlots at Tylees.



DIVERSIFIED SPECIES TECHNICAL NOTE

Number: DSTN-035
Date: October 2012

An analysis by origin showed that the Tylees progenies were about 20 cm shorter than the second generation progenies from the 1979 trial and the Oakura progenies from Kaingaroa cpt 1227. The Tylees progenies had only 6% of trees with forks versus 13% the Oakura progenies. The Mondi progenies were also 20 cm shorter, with forking at 10%, while the 6 seed orchard selections from Kakarihi road were the tallest and had the lowest forking of 5%.

Growth is reasonably even across the trial (Figure 1). The trees occupy three columns between windrows. The trees in the central column were usually rather smaller than the trees on the edges of windrows that had more space to grow. The windrow effect also noted in the neighbouring *E. regnans* trial although noticeable was not considered as severe for the *E. fastigata* possibly due to the slightly slower height growth meaning that differences between columns are currently less accentuated. Following spatial analysis the residual variation (unexplained variation) (Figure 2) did not reveal such a strong linear column effect and thus did not require further analysis.

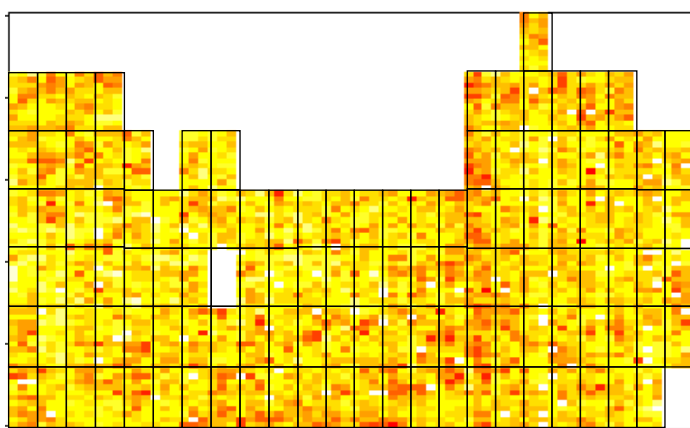


Figure 1. Raw height data, white boxes indicate missing trees, red boxes smallest trees and yellow boxes largest trees. Block boundaries (3 trees by 11) are indicated by the overlain grid.

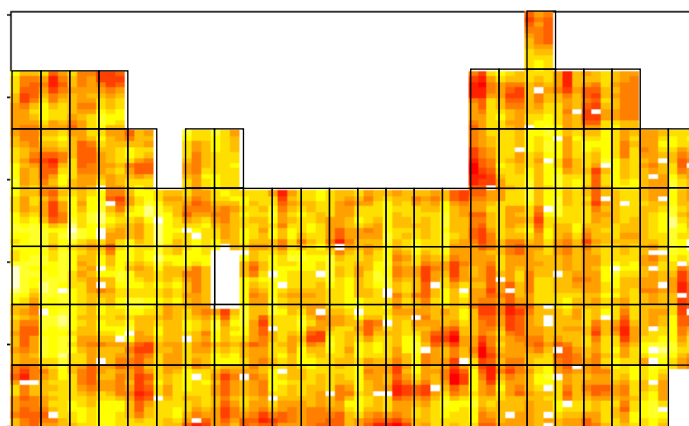


Figure 2. Plotted residual variation following spatial analysis. Block boundaries (3 trees by 11) are indicated by the overlain grid. A faint linear trend attributed to the presence of wind rows can be seen running through the middle row (darker lines) of each block.

A list of parental breeding values for height growth estimated using model 3 (Appendix 1) are in Appendix 3. Breeding values are an estimate of the genetic merit for each tree for each trait. The trees are almost large enough to select from based on the current height assessment. Some trees may be producing seed now, but it is likely to be at least another two years before any large scale collection can be made. Before selecting the final trees to form the basis of the next generation of the breeding cycle an assessment of tree straightness and form should be made. It is of particular importance that form be assessed and selected for in *E. fastigata* due to its propensity to break out early to heavy branches. The best individual of each parent is shown in Appendix 3 so that scion material can be collected from the best individual from the better families present in the trial to form a seed orchard.

References

Low, C.D., Dungey, H.S., Stovold, G.T., Nicholas, I.D. (2009) A breeding plan for New Zealand *Eucalyptus fastigata*. FFR Report No. FFR- DS013



DIVERSIFIED SPECIES TECHNICAL NOTE

Number: DSTN-035

Date: October 2012

Appendix 1. Variance components, individual heritabilities and log likelihoods of models fitted to height data.

	Model 1		Model 2		Model 3	
	Incomplete block		AR1 x AR1		AR1 x AR1 + units	
Component	Var.	SE	Var.	SE	Var.	SE
Tree	17.76	3.61	30.14	4.57	17.37	3.36
Replicate	5.48	2.09	5.66	2.08	3.11	1.80
Rep.Block	6.97	1.42	2.31	1.25	0.00	0.00
Residual	61.75	3.37	56.68	4.07	38.60	3.15
Row			0.45	0.03	0.77	0.03
Column			0.20	0.03	0.48	0.04
Units					34.40	3.39
h²_i	0.22		0.35		0.34	
LogL	-9820.32		-9666.37		-9645.33	

Note. The basic model used was as follows; $y = Xb + Z_1a + Z_2r + Z_3r.b + e$
 where: **y** is the vector of individual-tree observations on a trait, **b** is a vector of fixed effects (i.e., mean), **a** is a vector of random additive genetic effects of individual genotypes, **r** is a vector of random replicate effects, **r.b** is the random interaction between replicate and block, and **e** is a vector of random residual effects. **X**, **Z₁**, **Z₂** and **Z₃** are known incidence matrices relating the observations in **y** to effects in **b**, **a**, **r** and **r.b** respectively. Row and column were added to the design, placing each tree in a grid enabling trees to be analysed spatially.



DIVERSIFIED SPECIES TECHNICAL NOTE

Number: DSTN-035
Date: October 2012

Appendix 2. Age 31 months, family means arranged by descending height

code	planted	No. trees	survival%	Height (decimetres)			%forked	Provenance
				mean	min	max		
253	23	23	100	54.17	26	69	0.17	Oakura, NZ
281	23	23	100	51.09	35	63	0.04	Oakura, NZ
249	23	23	100	51	29	62	0.13	Oberon, NSW
266	22	21	95	50.9	37	63	0.1	Oakura, NZ
238	23	23	100	50.7	25	63	0.26	Oakura, NZ
246	22	22	100	50.18	32	60	0.18	Oberon, NSW
291	23	22	96	50.18	35	59	0	Easten Transvaal.
252	23	22	96	50.14	38	61	0.05	Oakura, NZ
277	23	20	87	50.05	26	63	0.15	Oakura, NZ
278	23	21	91	49.81	26	61	0.33	Oakura, NZ
248	22	22	100	49.68	24	60	0.05	Rossi, NSW
286	23	23	100	49.65	34	61	0.04	Jessievale S. O.
37	22	22	100	49.55	34	60	0.14	Jessievale SO
70	23	23	100	49.48	33	62	0.09	Eastern Transvaal
256	23	23	100	49.35	28	62	0.13	Oakura, NZ
263	23	20	87	49.3	29	60	0.1	Oakura, NZ
245	23	21	91	48.81	22	64	0.14	Oakura, NZ
283	23	22	96	48.73	34	63	0.05	Oakura, NZ
164	23	23	100	48.65	24	60	0.26	Mondi
207	23	21	91	48.38	30	60	0.1	Yetholme
268	22	20	91	48.3	30	66	0.1	Oakura, NZ
285	23	23	100	48.13	33	61	0.04	Jessievale S. O.
210	22	21	95	48.1	28	62	0.1	Natal, SA
260	22	21	95	47.76	15	61	0	Oakura, NZ
255	23	23	100	47.74	36	56	0.17	Oakura, NZ
270	23	20	87	47.65	23	63	0.1	Oakura, NZ
187	22	22	100	47.59	35	60	0	Mondi
242	23	23	100	47.57	32	58	0.09	Oakura, NZ
259	23	23	100	47.52	29	59	0.04	Oakura, NZ
224	22	21	95	47.43	32	61	0.14	Oakura, NZ
175	23	23	100	47.3	16	57	0.04	Mondi
240	23	23	100	47.3	19	58	0.17	Tikitere, NZ
152	22	22	100	47.18	35	61	0.09	Mondi
231	22	21	95	47.14	25	68	0.14	Cambridge, NZ
275	22	20	91	47.1	26	61	0.2	Oakura, NZ
170	23	23	100	47.04	17	61	0.13	Mondi



DIVERSIFIED SPECIES TECHNICAL NOTE

Number: DSTN-035
Date: October 2012

code	planted	No. trees	survival%	Height (decimetres)			%forked	Provenance
132	23	23	100	47	32	57	0	Jessievale SO
155	22	21	95	46.95	13	59	0.14	Mondi
153	22	20	91	46.9	32	59	0	Mondi
273	22	21	95	46.86	24	59	0.05	Oakura, NZ
211	22	22	100	46.82	8	63	0.14	Marlborough, NZ
154	23	21	91	46.81	21	62	0.1	Mondi
222	23	23	100	46.78	29	57	0.22	Robertson, NSW
279	23	23	100	46.7	22	64	0.13	Oakura, NZ
288	22	19	86	46.68	25	63	0.05	Jessievale S. O.
269	23	23	100	46.65	31	59	0.13	Oakura, NZ
60	23	23	100	46.61	19	61	0	Jessievale SO
160	22	22	100	46.59	30	62	0.09	Mondi
265	23	23	100	46.57	25	61	0.04	Oakura, NZ
225	23	22	96	46.5	30	57	0.14	Bendoc, VIC
229	23	22	96	46.5	27	58	0.36	Oakura, NZ
247	23	23	100	46.35	25	55	0.17	Tallaganda, NSW
257	23	23	100	46.3	26	61	0.13	Oakura, NZ
186	23	22	96	46.27	20	62	0.23	Mondi
282	22	22	100	46.23	26	58	0.23	Oakura, NZ
236	23	23	100	46.22	32	59	0.17	Oakura, NZ
121	23	22	96	46.05	24	58	0.14	Eastern Transvaal
292	23	23	100	46	33	57	0.09	Eastern Transvaal
250	23	23	100	45.96	23	60	0.04	Oakura, NZ
304	22	22	100	45.77	26	55	0.14	filler
32	23	23	100	45.74	21	54	0.09	Jessievale SO
244	23	22	96	45.73	25	58	0.09	Oakura, NZ
137	23	23	100	45.65	5	61	0	Jessievale SO
158	23	21	91	45.57	20	54	0.14	Mondi
272	23	21	91	45.57	22	62	0.14	Oakura, NZ
280	23	22	96	45.5	32	63	0.18	Oakura, NZ
58	23	23	100	45.43	23	59	0.13	Eastern Transvaal
174	23	23	100	45.43	27	61	0.09	Mondi
214	23	22	96	45.41	23	60	0.18	Waikato, NZ
251	23	23	100	45.26	24	60	0.17	Oakura, NZ
213	23	22	96	45.23	28	59	0.09	Rossi, NSW
267	23	22	96	45.23	18	55	0.14	Oakura, NZ
216	23	22	96	45.14	19	57	0	Natal, SA
166	23	23	100	45.09	10	60	0.13	Mondi



DIVERSIFIED SPECIES TECHNICAL NOTE

Number: DSTN-035
Date: October 2012

code	planted	No. trees	survival%	Height (decimetres)			%forked	Provenance
212	22	22	100	45.05	20	61	0.09	Oakura, NZ
151	22	22	100	45	15	63	0.05	Mondi
159	23	23	100	44.96	30	58	0.04	Mondi
178	23	23	100	44.96	26	59	0.09	Mondi
189	23	23	100	44.96	19	60	0.09	Mondi
185	23	22	96	44.95	26	60	0.09	Mondi
56	23	22	96	44.86	17	60	0	Eastern Transvaal
114	23	22	96	44.86	28	54	0.09	Eastern Transvaal
173	22	21	95	44.81	18	56	0.05	Mondi
284	23	23	100	44.78	20	60	0.09	Oakura, NZ
258	23	22	96	44.68	15	60	0.27	Oakura, NZ
289	23	23	100	44.65	25	60	0.13	Jessievale S. O.
271	23	21	91	44.57	21	58	0.14	Oakura, NZ
276	23	22	96	44.55	20	60	0.14	Oakura, NZ
254	22	21	95	44.52	22	55	0.29	Oakura, NZ
262	23	23	100	44.48	15	61	0.26	Oakura, NZ
234	23	22	96	44.45	27	61	0.05	Rotorua, NZ
237	23	22	96	44.41	25	62	0.18	Rotorua, NZ
261	23	22	96	44.41	17	57	0.05	Oakura, NZ
128	22	20	91	44.4	21	60	0.1	Jessievale SO
157	23	23	100	44.39	21	61	0.04	Mondi
61	22	22	100	44.36	33	52	0	Jessievale SO
305	23	23	100	44.3	26	55	0.04	filler
165	22	22	100	44.23	28	54	0	Mondi
303	23	22	96	44.14	20	58	0.05	filler
112	23	23	100	44.13	32	57	0.04	Eastern Transvaal
142	22	22	100	44.09	16	54	0.05	Jessievale SO
168	23	23	100	44.09	22	61	0.13	Mondi
183	22	22	100	44.05	27	61	0	Mondi
290	23	23	100	44	19	56	0.04	Jessievale S. O.
264	23	22	96	43.91	11	58	0.14	Oakura, NZ
181	22	22	100	43.73	17	60	0.05	Mondi
169	23	22	96	43.64	31	56	0.14	Mondi
912	23	22	96	43.64	20	57	0.05	G. gain (Tylees)
113	23	21	91	43.52	26	61	0.1	Eastern Transvaal
233	22	21	95	43.52	17	60	0.1	Natal, SA
26	24	24	100	43.5	25	61	0.04	Jessievale SO
162	23	23	100	43.48	27	57	0.13	Mondi



DIVERSIFIED SPECIES TECHNICAL NOTE

Number: DSTN-035

Date: October 2012

code	planted	No. trees	survival%	Height (decimetres)			%forked	Provenance
301	23	22	96	43.45	16	61	0.05	filler
180	23	23	100	43.39	24	55	0.22	Mondi
156	23	23	100	43.35	25	55	0.09	Mondi
302	23	22	96	43.32	11	59	0.14	filler
179	22	22	100	43.14	25	58	0.32	Mondi
300	23	23	100	43.09	17	60	0.22	filler
172	23	23	100	43	25	58	0.22	Mondi
176	23	22	96	43	26	62	0.14	Mondi
215	23	23	100	42.96	11	58	0.04	Natal, SA
161	23	22	96	42.55	28	52	0.05	Mondi
184	23	23	100	41.65	18	62	0.13	Mondi
274	23	23	100	41.65	5	60	0.17	Oakura, NZ
171	23	23	100	41.04	20	55	0.04	Mondi
69	23	22	96	40.82	13	63	0.05	Eastern Transvaal
150	23	23	100	40.43	18	56	0.13	Mondi
143	23	23	100	40.26	15	57	0.04	Jessievale SO
182	22	22	100	39.82	21	57	0.09	Mondi
188	23	22	96	39.68	13	58	0.18	Mondi
163	23	23	100	38.13	14	58	0	Mondi
911	22	22	100	38.05	25	47	0.23	Barrington Tops



DIVERSIFIED SPECIES TECHNICAL NOTE

Number: DSTN-035

Date: October 2012

Appendix 3. Parental breeding values and the best individual breeding value per parent

FCIn	Code	Parent BV	SE	Best ind. BV	SE	Tree	Rep	Provenance
2002066	253	8.26	2.43	7.42	3.37	29	7	Oakura, NZ
2002081	266	7.67	2.47	6.11	3.37	19	2	Oakura, NZ
891604	246	7.13	2.43	6.17	3.37	3	20	Oberon, NSW
2002064	252	7.00	2.45	6.68	3.37	26	4	Oakura, NZ
2002090	281	6.14	2.42	6.03	3.37	8	15	Oakura, NZ
891086	238	5.95	2.42	6.03	3.37	12	28	Oakura, NZ
891612	249	5.54	2.43	5.40	3.41	33	2	Oberon, NSW
2008521	291	5.32	2.45	5.00	3.37	7	10	Easten Transvaal.
891602	245	5.06	2.48	5.21	3.40	18	7	Oakura, NZ
2008506	286	4.52	2.42	4.78	3.37	17	11	Jessievale S. O.
2002087	278	4.23	2.47	5.18	3.37	3	20	Oakura, NZ
2003070	70	4.11	2.45	4.07	3.39	27	18	Eastern Transvaal
891051	224	4.07	2.45	4.81	3.37	33	26	Oakura, NZ
891027	210	4.06	2.44	5.17	3.42	6	16	Natal, SA
2002086	277	4.00	2.50	4.19	3.39	14	25	Oakura, NZ
2002078	263	3.93	2.53	4.27	3.38	23	3	Oakura, NZ
2002092	283	3.80	2.48	4.38	3.38	10	15	Oakura, NZ
2003037	37	3.59	2.43	3.79	3.38	22	28	Jessievale SO
896229	187	3.41	2.44	5.06	3.37	9	3	Mondi
891092	242	3.23	2.39	3.84	3.36	1	5	Oakura, NZ
2002075	260	3.13	2.45	4.24	3.38	22	1	Oakura, NZ
2002084	275	3.10	2.47	4.04	3.37	21	4	Oakura, NZ
2008121	121	3.05	2.45	4.26	3.37	14	4	Eastern Transvaal
2003060	60	2.95	2.42	3.24	3.37	24	28	Jessievale SO
2002070	256	2.76	2.42	4.11	3.37	15	22	Oakura, NZ
891067	229	2.54	2.44	3.63	3.38	10	18	Oakura, NZ
2002069	255	2.53	2.45	3.91	3.37	23	19	Oakura, NZ
2002047	268	2.41	2.48	6.00	3.39	1	12	Oakura, NZ
896205	152	2.34	2.42	3.97	3.37	30	29	Mondi
2008137	137	2.27	2.42	4.06	3.37	12	20	Jessievale SO
891029	211	2.16	2.51	3.74	3.42	3	22	Marlborough, NZ
2002091	282	2.10	2.42	4.73	3.37	13	7	Oakura, NZ
896216	164	1.94	2.43	3.43	3.38	17	26	Mondi
2002050	270	1.91	2.51	3.73	3.40	9	19	Oakura, NZ
891033	214	1.90	2.46	3.55	3.38	6	21	Waikato, NZ
891023	207	1.85	2.47	3.74	3.37	22	21	Yetholme
896209	156	1.75	2.42	4.23	3.37	18	4	Mondi
2008523	292	1.60	2.40	2.88	3.37	28	6	Eastern Transvaal
896212	160	1.49	2.42	3.23	3.37	16	23	Mondi



DIVERSIFIED SPECIES TECHNICAL NOTE

Number: DSTN-035

Date: October 2012

FCIn	Code	Parent BV	SE	Best ind. BV	SE	Tree	Rep	Provenance
2002074	259	1.44	2.42	3.36	3.37	1	19	Oakura, NZ
896239	185	1.24	2.45	3.73	3.37	17	10	Mondi
891090	240	1.11	2.42	2.95	3.37	28	20	Tikitere, NZ
2002052	272	1.07	2.47	4.03	3.37	19	19	Oakura, NZ
896207	154	1.05	2.48	3.15	3.41	1	19	Mondi
891611	248	0.91	2.42	2.70	3.37	13	2	Rossi, NSW
896206	153	0.89	2.47	2.48	3.37	4	18	Mondi
2002051	271	0.85	2.48	3.29	3.37	18	19	Oakura, NZ
891079	236	0.80	2.42	2.32	3.37	20	10	Oakura, NZ
896222	170	0.76	2.42	2.53	3.37	12	5	Mondi
896210	157	0.75	2.43	3.07	3.39	19	29	Mondi
2002077	262	0.75	2.42	3.75	3.38	18	25	Oakura, NZ
891608	247	0.69	2.42	3.36	3.37	13	6	Tallaganda, NSW
2002062	251	0.59	2.43	3.18	3.40	31	10	Oakura, NZ
2002088	279	0.44	2.42	3.05	3.37	30	14	Oakura, NZ
896240	186	0.43	2.45	3.70	3.38	10	14	Mondi
896218	166	0.42	2.42	3.73	3.37	10	14	Mondi
2002071	257	0.32	2.42	2.70	3.37	26	3	Oakura, NZ
891038	216	0.31	2.44	3.00	3.37	29	4	Natal, SA
891047	222	0.31	2.42	2.63	3.37	22	6	Robertson, NSW
2008504	285	0.29	2.42	2.42	3.38	25	9	Jessievale S. O.
2008132	132	0.19	2.42	1.63	3.38	6	16	Jessievale SO
896227	175	0.17	2.42	2.00	3.37	26	2	Mondi
2002061	250	0.15	2.42	1.99	3.37	30	10	Oakura, NZ
2002046	267	0.10	2.45	2.99	3.37	16	10	Oakura, NZ
896220	168	-0.04	2.42	3.18	3.37	16	2	Mondi
891080	237	-0.04	2.44	2.40	3.37	32	7	Rotorua, NZ
2008514	289	-0.19	2.42	1.91	3.40	4	22	Jessievale S. O.
2002053	273	-0.33	2.45	2.28	3.37	22	25	Oakura, NZ
2002080	265	-0.52	2.42	2.34	3.37	20	11	Oakura, NZ
2002076	261	-0.61	2.45	1.72	3.38	25	18	Oakura, NZ
2003032	32	-0.63	2.42	1.85	3.37	23	18	Jessievale SO
2008128	128	-0.64	2.47	2.07	3.39	15	6	Jessievale SO
2002089	280	-0.67	2.45	3.53	3.37	16	6	Oakura, NZ
896208	155	-0.84	2.45	1.44	3.37	28	5	Mondi
896211	158	-0.92	2.48	1.22	3.37	30	6	Mondi
2008513	288	-1.04	2.51	2.60	3.38	19	22	Jessievale S. O.
2002072	258	-1.08	2.45	1.20	3.37	9	8	Oakura, NZ
896204	151	-1.18	2.42	2.28	3.40	3	17	Mondi
896226	174	-1.18	2.42	1.63	3.37	5	9	Mondi
891035	215	-1.18	2.41	2.69	3.37	22	2	Natal, SA



DIVERSIFIED SPECIES TECHNICAL NOTE

Number: DSTN-035

Date: October 2012

FCIn	Code	Parent BV	SE	Best ind. BV	SE	Tree	Rep	Provenance
2003056	56	-1.19	2.44	2.31	3.37	19	20	Eastern Transvaal
891053	225	-1.21	2.47	1.06	3.37	33	18	Bendoc, VIC
891073	233	-1.23	2.48	2.92	3.37	9	11	Natal, SA
2002093	284	-1.23	2.42	1.91	3.37	32	17	Oakura, NZ
2008113	113	-1.25	2.47	2.66	3.39	16	29	Eastern Transvaal
891031	213	-1.30	2.47	2.24	3.38	27	10	Rossi, NSW
2008114	114	-1.34	2.44	1.10	3.37	19	14	Eastern Transvaal
891030	212	-1.36	2.45	2.27	3.37	27	6	Oakura, NZ
891069	231	-1.53	2.45	2.46	3.37	6	23	Cambridge, NZ
891601	244	-1.54	2.45	2.49	3.37	19	19	Oakura, NZ
896203	189	-1.62	2.42	2.81	3.37	1	20	Mondi
2003026	26	-1.68	2.39	2.73	3.37	10	7	Jessievale SO
896225	173	-1.76	2.45	1.26	3.38	17	21	Mondi
2003061	61	-1.81	2.42	1.00	3.37	7	24	Jessievale SO
2003058	58	-1.90	2.42	1.01	3.37	28	27	Eastern Transvaal
2002085	276	-2.15	2.44	2.03	3.37	21	28	Oakura, NZ
896235	181	-2.16	2.42	1.88	3.37	28	13	Mondi
896214	162	-2.40	2.42	1.10	3.37	7	27	Mondi
2002049	269	-2.40	2.42	1.38	3.38	12	14	Oakura, NZ
2002068	254	-2.44	2.44	1.83	3.37	16	20	Oakura, NZ
2008142	142	-2.45	2.42	1.03	3.37	8	28	Jessievale SO
896221	169	-2.86	2.47	0.97	3.40	31	7	Mondi
2008515	290	-2.93	2.42	1.01	3.37	15	14	Jessievale S. O.
891075	234	-2.98	2.45	1.20	3.37	12	12	Rotorua, NZ
896201	159	-3.01	2.41	1.07	3.37	29	10	Mondi
896234	180	-3.30	2.42	1.46	3.37	12	2	Mondi
2008112	112	-3.38	2.43	1.39	3.37	5	8	Eastern Transvaal
896217	165	-3.39	2.42	0.60	3.37	26	26	Mondi
896232	178	-3.41	2.42	1.61	3.37	21	9	Mondi
896237	183	-3.46	2.42	1.06	3.38	1	20	Mondi
2002079	264	-3.73	2.46	1.67	3.37	7	16	Oakura, NZ
896230	176	-3.74	2.45	-0.03	3.37	15	5	Mondi
896224	172	-3.82	2.42	0.25	3.37	7	27	Mondi
896233	179	-4.20	2.42	0.68	3.37	18	12	Mondi
896213	161	-4.89	2.45	0.27	3.41	3	19	Mondi
2002083	274	-5.54	2.42	0.92	3.39	25	7	Oakura, NZ
896238	184	-5.81	2.42	0.64	3.37	22	30	Mondi
896202	150	-5.87	2.44	-1.18	3.37	24	29	Mondi
896223	171	-6.03	2.45	-0.41	3.37	4	10	Mondi
896228	188	-6.74	2.45	-1.27	3.38	30	11	Mondi
2008143	143	-6.81	2.42	-1.18	3.37	5	7	Jessievale SO



DIVERSIFIED SPECIES TECHNICAL NOTE

Number: DSTN-035

Date: October 2012

FCIn	Code	Parent BV	SE	Best ind. BV	SE	Tree	Rep	Provenance
2003069	69	-7.32	2.45	-1.29	3.37	28	16	Eastern Transvaal
896236	182	-8.69	2.42	-1.59	3.37	12	7	Mondi
896215	163	-11.28	2.43	-3.31	3.37	8	24	Mondi