The influence of viticultural treatments on the accumulation of flavonoid compounds in grapes and their contribution to wine quality

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APPENDIX 2A

Buffers, solutions, reagents & media

Solutions, growth medias, buffers and reagents commonly used in this investigation are shown in the tables below. All chemicals were analytical or molecular biology grade and obtained from BD Biosciences (http://www.bdbiosciences.com) or Sigma-Aldrich (http://www.sigmaaldrich.com). Solutions were prepared with nanopure or deionised water and autoclaved as necessary. The sources of all other supplies used in this investigation are indicated in the relevant methods section.

Table 2A.1 Suppliers of chemicals, enzymes, growth media & other miscellaneous consumables

Manufacturer	Products	Website
BD Biosciences (CloneTech Laboratories)	Universal Genome Walking™ Kit	http://www.bdbiosciences.com
Extrasynthase	HPLC standards (malvidin-3-glucoside, quercetin-3-glucoside)	No website
Integrated Sciences (Stratagene)	PicoMaxx Taq The QuikChangeR II Site–Directed Mutagenesis Kit	http://www.integratedsci.com.au
Invitrogen	Hi-Fi, pfx, pfu and platinum Taq, electroporation cuvettes, Oligonucleotides (primers)	http://www.invitrogen.com
Promega	Duel-luciferase® reporter assay system, Molecular weight markers	http://www.promega.com
Qiagen	QIA gel extract, QIA plasmid prep, Qiagen PCR cloning kit, RNeasy plant RNA Kit, RNase free DNase Set	http://www.qiagen.com
Quantum Scientific (Fermentas)	Restriction endonucleases	http://www.quantum-scientific.com.au
Roche Diagnostics	Restriction endonucleases	http://www.roche-diagnostics.com

Table 2A.2 Downloadable sequence management programs & online databases

Program/ Database	Website
Primer 3 program	http://www-genome.wi.mit.edu/cgi-bin/primer/primer3_www.cgi
Chromas program	http://www.technelysium.com.au
ClustalW Alignment program	http://www.ebi.ac.uk/clustralW/
GeneDoc Display program	http://www.psc.edu/biomed/genedoc
BLAST analysis	http://www.ncbi.nlm.nih.gov/BLAST/
PLACE database	http://www.dna.affrc.go.jp/htdocs/PLACE
TIGR database	http://www.tigr.org/tigr-scripts/tgi/T_index.cgi?species=grape.
NCBI database	http://www.ncbi.nlm.nih.gov/
Trace database	http://www.ncbi.nlm.nih.gov/Traces/trace.cgi?

Table 2A.3 Solutions (& their composition) commonly used in this research

Solution	Composition
Analytical Methods	
Acidulated methanol	1.0 mL of acidified methanol (1% HCl v/v; 3mL conc HCL + 97mL methanol)
70% aqueous acetone extraction solvent	70% (v/v) aqueous acetone + 0.1% ascorbate. Add ascorbate fresh when ready to extract and store in dark at 4°C
Phloroglucinol buffer	0.25 g ascorbate, 1.25 g phloroglucinol, 215 mL conc. HCl, 25 mL methanol. Store in dark at 4°C. Lasts up to 3 weeks
Sodium acetate	200 mM, pH 7.5
Buffer A (model wine)	0.5 g potassium bitartrate in 800ml distilled water, add 120 mL of 96% ethanol. Adjust pH to 3.3 with hydrochloric acid (HLC) and make volume up 1.0 L with water
Buffer B (washing buffer)	9.86g of sodium chloride(NaCl) in 500 mL distilled water, add 12 mL glacial acetic acid and adjust pH to 4.9 with sodium hydroxide (NaOH) and make volume up to 1.0 L with distilled water
Buffer C (resuspension buffer)	50g of SDS in 800 mL distilled water, add 50 mL triethanolamine and monitor pH, when stabilises adjust pH to 9.4 with HCL and make volume to 1.0 L with distilled water
Ferric Chloride Reagent	2.7g ferric chloride ($FeCl_3$) in 800 mL distilled water, add 800mL of concentrated HCl (12.1 N; 33-37% HCl) and make volume up 1.0 L with water
Protein Solution	Mix 25 mL Bovine Serum Albumin with 25 mL Buffer B. Store at 4°C.
Molecular Methods	
DNA loading dye (10×)	78% glycerol, 0.25% (w/v) bromophenol blue, 0.25% (w/v) xylene cyanol, 10 mM EDTA
RNA loading dye (10×)	70% (v/v) deionised formamide, 10% (v/v) formaldehyde, 6% (v/v) agarose-gel loading dye (50% (v/v) glycerol, 1 mM EDTA, 0.4% (w/v) bromophenol blue), 14% (v/v) MOPS/EDTA buffer
RNA extraction buffer 1	5 M sodium perchlorate, 0.3 M Tris-HCl (pH 8.3), 1% (w/v) SDS, 1% (v/v) β-mercaptoethanol, 8.5% (w/v) PVPP, 2% (w/v) PEG 4000
RNA extraction buffer 2	5 M sodium perchlorate, 0.3 M Tris-HCl (pH 8.3), 1% (w/v) SDS, 1% (v/v) β-mercaptoethanol
TBE buffer	90 mM Tris-HCl, 90 mM borate, 2 mM EDTA, (pH 8.3)
TAE buffer	10 mM Tris-HCl (pH 7.6), 1 mM EDTA (pH 7.6)
LB (bacterial growth media)	Liquid = 1% (w/v) bacto-tryptone, 0.5% (w/v) yeast extract, 1% (w/v) NaCl, pH 7.0. Solid = add 1.2% (w/v) bacto-agar.
SOC (bacterial growth media)	Liquid = 2% (w/v) bacto-tryptone, 0.5% (w/v) yeast extract, 10 mM NaCl, 2.5 mM KCl, 10 mM $MgCl_2$, 20mM $MgSO_4$, 20 mM sucrose, pH 7.0. Solid = add 1.2% (w/v) bacto-agar.
Grape Cormier (GC) (plant growth media)	Liquid = 0.3% (w/v) Gamborg's B-5 basal medium, 3% (w/v) sucrose, 0.025% (w/v) casein hydrolysate, 0.93 µM kinetin, 0.54 µM NAA, pH 5.7-5.8. Solid = add 0.8% bacto-agar
Ampicillin	100 µg/mL (in water)
XGal	(40µg/mL) 100 mg 5-bromo-4 chloro-3-indol-β-D-galactoside dissolved in 2 mL N, N'-dimethyl-for-amide.

APPENDIX 2B

HPLC chromatograms

Shiraz grape skin and wine samples were analysed in triplicate. The method of HPLC separation for grape and wine anthocyanins and flavonols was kindly provided by Mark Downey (2002), and is also described in Bogs et al. (2005) and Takos et al. (2006). The absorbance was measured at 520 nm (anthocyanins), 353 nm (flavonols), 320 nm (hyroxycinnamaic acids) and 280 nm (total phenolics). Anthocyanin and flavonol peaks were identified by three means: a) comparison of their elution order with the published separations (Cheynier and Rigaud 1986; Wulf and Nagel 1978), b) comparison of the elution time and absorbance spectra with a commercial standards of malvidin-3-glucoside and quercetin-3-glucoside (Extrasynthese, France) c) LC-MS analysis (**Chapter 2, Section 2.2.1.3**). In both grapes and wine, the anthocyanin and flavonol compounds identified were expressed as malvidin-3-glucoside and quercetin-3-glucoside equivalents respectively, based on commercial standards (Extrasynthase, France).

Figure 2B.1 Typical Shiraz skin HPLC chromatogram

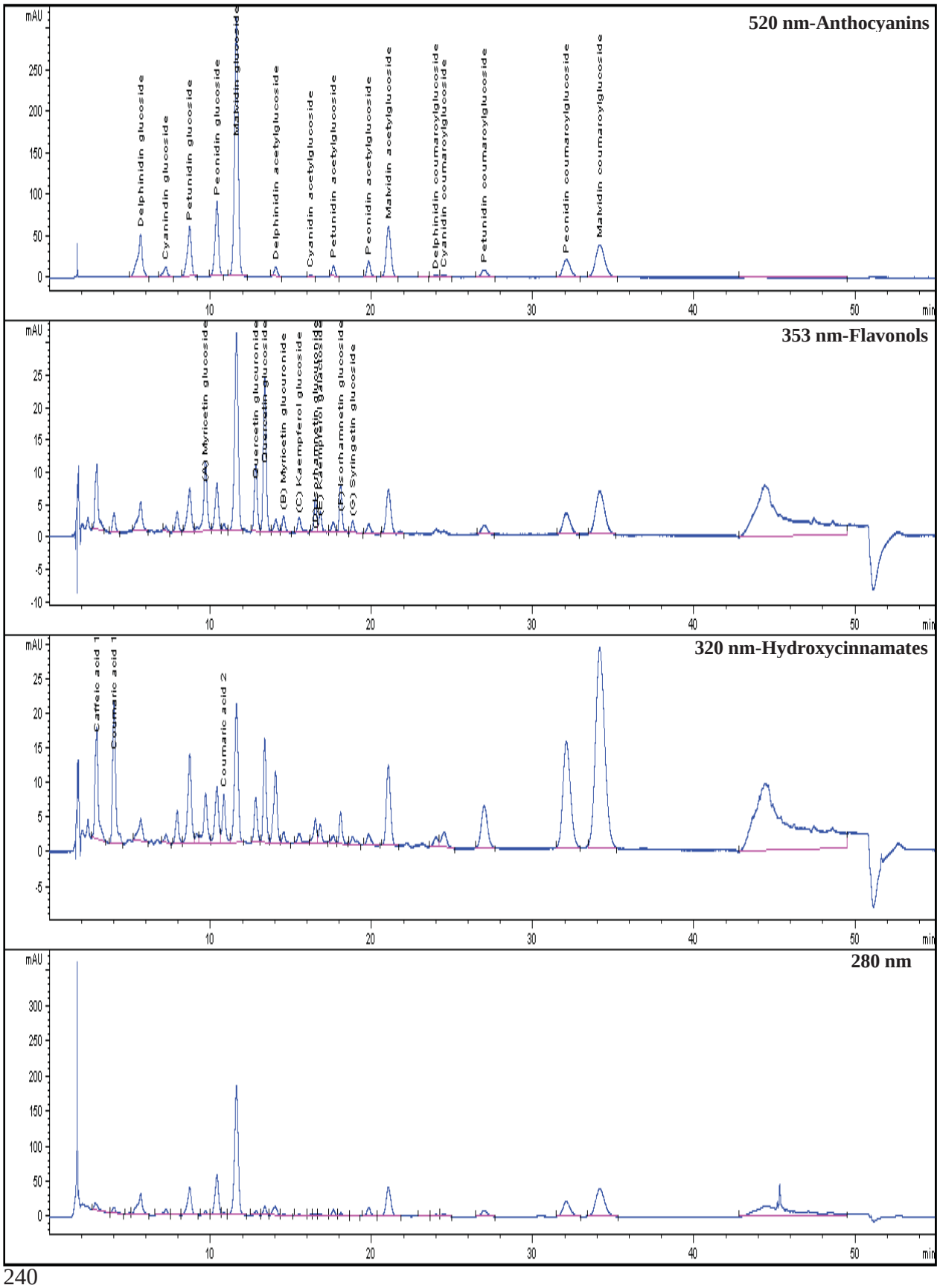
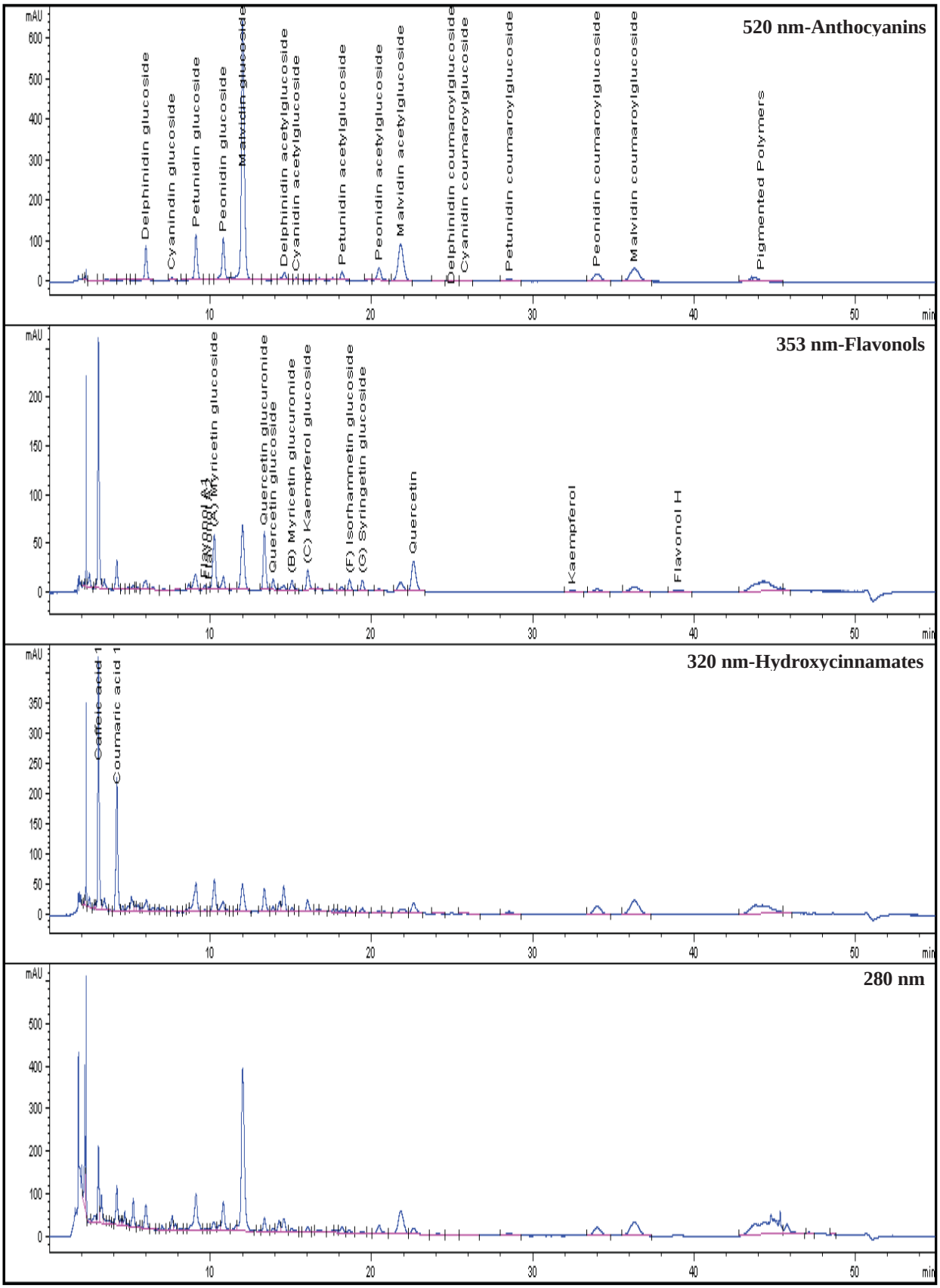


Figure 2B.2 Typical Shiraz wine HPLC chromatogram



APPENDIX 2C

Table of primers

Table 2C.1 RT-PCR primers used for analysis of flavonoid gene expression

Gene	Accession #	Reference	Forward primer	Reverse primer
VvFLS1	AY257978	Downey et al. 2003b	CAGGGCTTGCAGGTTTTTAG	GGGTCTTCTCCTTGTTCACG
VvFLS2	AY257979	Downey et al. 2003b	TGAGCTGGCTATAGGTCCTC	TGCATGTACACTGGAAAAGG
VvUFGT	X75968	Downey et al. 2004	TAACACATTGTGGATGGAACTCAT	ACCTTCAATTCTCACTCCAATCTC
VvLDOX	X75966	Bogs et al. 2005	ACCTTCATCCTCCACAACAT	AGTAGAGCCTCCTGGGTCTT
VvCHI	X75963	Unpublished	GGATGAGAAAATTGAAGCTGAG	TACAGGAACAAGAGGAACCAAC
VvUbiquitin1 (VvUBIQ1)	TC32075	Downey et al. 2003b	GTGGTATTATTGAGCCATCCTT	AACCTCCAATCCAGTCATCTAC

Table 2C.2 RT-PCR primers used in testing potential *AtMYB12* homolog candidate genes

Assigned TC #	TC #	Forward primer	Reverse primer
TC1	TC46393	ATAATAGCGATACGTGCGGTGT	AATAATCGGGACGCTTCG
TC2	TC41702	TCATAATCACATCAGCAGCAG	GGAAATCAGGTGCTAGTTTTTGTG
TC3	TC47032	GAAGTGGGGTTTGGATTATGTA	CAAATAAGGGAAGAGGAGAAAAG
TC4	TC47565	AGAATTCTAGGGTTTGGGTTGT	AATTCAAATTCTTGATCGGAAG
TC5	TC45624	CTAGCAGCCAACACCTATTCAT	ATTCCACATGCCTTTCTTTGTA
TC6	TC44301	GAGGAGCAACGTCTTGTAATTC	TTCTCTTTCTGCTCTCTCTGCT

Table 2C.3 RT-PCR primers used in testing potential microarray candidate genes

Assigned TC #	TC #	Unigene code	Forward primer	Reverse primer
TC7	TC39225	Vvi.10003	CAAACCCTTAGTGAAAGCACA	TAAAGGCACGCAAAGTACAAG
TC8	TC38623	Vvi.6975	CCCTTCCACATTATCATTTTCT	ACTGCATCAAAGTCTGAAAGGT
TC9	TC40540	Vvi.6616	AATCTCCTCCTTTCTTCACTGC	AAGTTTCTGTACCCCACCAAA
TC10	TC43962	Vvi.5444	TCGTCTGATGATATGAAGATGG	GTTGATTAGATGTGGGATTTGG
TC11	TC45686	Vvi.1267	GACGCTCAAAACAAAAAGTAAAA	CTCCACACCTAAAAGATAGAGCA
TC12	TC49275	Vvi.3440	TATTGAAGAACACCACAGCAAG	GTTCTACTTTTGGTGCCATTTC
TC13	TC46999	Vvi.7854	ATAAGCAGTTGGGTTTCCAATA	TCTTTTAAGTGGGTTCACAAGC

Table 2C.4 General primers used in PCR cloning

Role	Section	Primer name	Forward primer	Primer name	Reverse primer
Genomic Walking	5.2.1	*FLS1*pout	GCTTTCTTGCCCTCCACTTCTTTTTG	*FLS1*pnest	GTGAGCTTCTCCTCATCTGGGTCACT
Cloning into pLUC	5.2.1	LUCBAM	ATAGGATCCTCATTGTATCTTGTTGGCATATTT	LUCXHO	ATACTCGAGACTGCTTCCCTCTCTCTCTTACT
VvFLS1 Intron isolation	5.3.1	*FLS1*INT	CCTCTTCCATAACATCTG	*FLS1*INT	CCACTTTGCATACTCCTC

APPENDIX 3A

South Australian grape growing regions:

The Riverland & M^{c}Laren Vale

Table 3A.1 Riverland and McLaren Vale regional characteristics

	Riverland (warm)	McLaren Vale (cool)
Climate details [a,b]		
Altitude (m)	65.5	50-200m
Longitude (^{o}E)	140.6	138.33
Latitude (^{o}S)	-34.28	35.14
Mean January temperature (^{o}C)	23.2	23.4[c]
Heat degrees days (cut off 19^{o}C)(Oct-Apr) [d]	1767	1767
Sunshine hours (hrs)(Oct-Apr)	2002[e]	1765
Relative humidity 3PM (%)(Oct-Apr)	30	46
Annual rainfall (mm)	261	513
Growing season rainfall (mm)(Oct-Apr)	130	168
General description	Inland region, with high summer temperatures	Warm summers, with cool afternoon sea breezes
Vintage details [f]		
Current area (Ha)	19,551	6437
Total crushed (T)	369,173	43,428
Estimated value of total crush ($ million)	213	70
Top 3 varieties	Shiraz, Cabernet Sauvignon, Chardonnay	Shiraz, Cabernet Sauvignon, Chardonnay
Vineyard details [g]		
Soil type	The river valley terraces are sandy and the mallee highlands are sandy/ clay. Salt accumulation is widespread	Variable sand/ clay soils
Management practices	Vineyards are drip irrigated from River Murray (~5-7ML/Ha/season). Vines are trellised and most are mechanically pruned and harvested. Average yields range from 10-25 T/Ha	Vineyards are drip irrigated from mains supply (~0.8-1.5ML/Ha/season). Most vines are trained and either hand or mechanically pruned/ harvested. Average yields range from 5-15 T/Ha
Winery Details		
Region winery	Berri Estates Winery	Tintara Winery
Management practices	Fermented in large volumes, in close stainless steel vessels. Most wines are available to consumers with 12 months of harvest	Fermented in small volumes in open and closed stainless steel and cement vessels. Most wines aged in oak barrels and can it can take up to 36 months before wine makes it to consumers.
Wine product	Bulk to semi-premium ($5/L-$20/bottle)	Semi-premium to premium ($5/bottle-$55/bottle)

NOTES

[a]-Climate data for the Riverland is derived from Berri Station # 024002 (est. 1915), unless noted otherwise (Australian BOM Nov 2005)

[b]- McLaren Vale climate details derived from Noarlunga Weather Station (est. 2000), which is ~8 Km North of McLaren Vale), unless noted otherwise (AWBC Nov 2005)

[c]- The mean January temperature suggested by HWC (Sas and Lim 2003) is closer to 21.4^{o}C (as detailed in **Section 3.1.1.1.2**)

[d]- Calculation of heat degree days as developed by Gladstones 1992

[e]- Sunshine hours for the Riverland calculated from Gladsones 1992

[f] -Vintage data obtained from Phylloxera and Grape Industry Board of South Australia 2003

[g]-Vineyard descriptions as described by Dry et al. 2004b

NOTE: This figure is included on page 244 of the print copy of the thesis held in the University of Adelaide Library.

Figure 3A.1 Map of South Australia grape growing regions Riverland & McLaren Vale. Shiraz berry samples were received from two SA viticultural regions; Riverland (Berri Estates Winery 34° 26' South, 140° 61' East) & McLaren Vale (Tintara Winery 35°21' South, 138° 52' East). Fruit was collected from McLaren Vale, whilst couriered overnight from the Riverland. Map downloaded from Google Earth (Nov 2005).

APPENDIX 3B

Supplementary results for Chapter 3 (Flavonoid composition of Shiraz Grapes)

McLaren Vale & Riverland sample details

and

Data sets (On CD)

FILES ON CD: ***(Provided as Microsoft Excel documents)***

Appendix 3B MV03	McLaren Vale, 2003 data set
Appendix 3B MV04	McLaren Vale, 2004 data set
Appendix 3B RL03	Riverland, 2003 data set
Appendix 3B RL04	Riverland, 2004 data set

KEY

For data sets in Appendix 3B (On CD)

MV03	McLaren Vale, 2003
MV04	McLaren Vale, 2004
RL03	Riverland, 2003
RL04	Riverland, 2004
CSIRO	Commonwealth Science and Research Organisation
HWC	Hardy Wine Company
GQS	Grape Quality Stream
H	High Quality
L	Low Quality
SPEC	UV-VIS spectrophotometric analysis
PGA	Phloroglucinol analysis
PPA	Protein precipitation assay
BM	Benchmarking
MA	Maselli
T	Totals
D	Delphinidin
C	Cyanidin
PT	Petunidin
PO	Peonidin
M	Malvidin
G	Glucoside
AG	Acetyl-glucoside
CG	Coumaroyl-glucosides
pp	Pigmented polymers
Q	Quercetin
M	Myricetin
K	Kaempferol
S	Syringetin
GR	Glucuronide
GS	Glucoside
EGC	Epigallocatechin
C	Catechin
E	Epicatechin
ECG	Epicatechin gallate
A	Adducts
SK	Skin
SD	Seed

3B.1. McLaren Vale

3B.1.1 MV03

3B.1.1.1 CSIRO data

Grape samples

GQS	No. of samples	Sample name	
1H	6	MLE	1, 2, 3, 4, 5, 6
2	6	MLT	10, 13, 15, 16, 17, 18
3L	13	MLO	19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 30, 31, 32
	25		

Parameters - See **Section 3B.3**
-Berry factors
-Grape flavonoid (anthocyanin, flavonol, tannin) content and composition

Wine samples

GQS	No. of samples	Sample details
1H	6	
2	6	
3L	10	No MLO32, (MLO20&21), (MLO29&31)
	22	

Parameters - See **Section 3B.3**
-Wine anthocyanin and flavonol content and composition
-(&) Indicates grape samples which were blended during winemaking (i.e. same measurements)

3B.1.1.2 HWC data

Vineyard assessment (also referred to as Benchmarking factors (BM))

GQS	No. of samples	Sample name/details
1H	5	No MLT2
2	6	
3L	9	No MLO32, MLO28, (MLO20&21), (MLO29&31)
	20	

Parameters - See **Table 3B.1**
-(&) Indicates grape samples which measurements were the same

Weighbridge factors

GQS	No. of samples	Sample name/details
1H	5	No MLT2
2	6	
3L	9	No MLO32, MLO28, (MLO20&21), (MLO29&31)
	20	

Parameters
-Bunch weight (g), berry weight (g)
-Maselli analysis (MA): baume, pH, TA
-Anthocyanin (NIR colour (mg/g berry)) No MLO32, MLO24, MLE2 (MLO20&21) (MLO29&31)
-(&) Indicates grape samples which measurements were the same

Wine factors

GQS	No. of samples	Sample name/details
1H	6	
2	6	
3L	10	No MLO32, (MLO20&21), (MLO29&31)
	22	

Parameters
-Wine colour density, hue (**Note** There are many missing data points)
-Wine grade: 1(High quality) → 6(Low quality)
-(&) Indicates grape samples which were blended during winemaking (i.e. same measurements)

Pricing factors

GQS	No. of samples	Sample name/details
1H	6	2X MLE5, 2X MLE3, 3X MLE6
2	6	2X MLT18, 2X MLT13, 2X MLT17, 2X MLT16
3L	10	No MLO32, (MLO20&21), (MLO29&31), 2X MLO26, 2X MLO28
	22	

Parameters
-$/Tonne, $/bottle
-(X) Indicates more than one data point for each sample. The weighted average was calculated
-(&) Indicates grape samples which were blended during winemaking (i.e. same measurements)

3B.1.2 MV04

3B.1.2.1 CSIRO data

Grape samples

GQS	No. of samples	Sample name/details	
1	7	M	4, 5, 14, 15, 20, 22, 23
2	7	M	1, 3, 6, 8, 12, 13, 16
3	10	M	2, 7, 9, 10, 11, 17, 18, 19, 21, 24
	24		

Parameters - See **Section 3B.3**
-Berry factors
-Grape flavonoid (anthocyanin, flavonol) content and composition
-Grape tannin content

Wine samples

GQS	No. of samples	Sample name/details
1	6	(M14&M15)
2	6	(M6&M8)
3	8	(M10&M11), (M18&M19)
	20	

Parameters - See **Section 3B.3**
-Wine anthocyanin and flavonol content and composition
-(&) Indicates grape samples which were blended during winemaking (i.e. same measurements)

3B.1.2.2 HWC data

Vineyard assessment (also referred to as Benchmarking factors (BM))

GQS	No. of samples	Sample name/details
1	5	No M4, M15
2	7	
3	9	No M9
	21	

Parameters - See **Table 3B.1**

Weighbridge factors

GQS	No. of samples	Sample name/details
1	7	
2	7	
3	8	No M9, M24
	20	

Parameters
-Bunch weight (g), (No berry weight)
-Maselli analysis (MA): baume, pH, TA
-Anthocyanin (NIR colour (mg/g berry) and Col2Bx)

Pre-ferment factors

GQS	No. of samples	Sample name/details
1	5	
2	5	
3	5	
	15	

Parameters
-TSO2, TA, pH, Be, NH4, FAN, YAN
-**Note** There are many missing data points

Wine factors

GQS	No. of samples	Sample name/details
1	6	(M14&M15)
2	6	(M6&M8)
3	8	(M10&M11) (M18&M19)
	20	

Parameters
-Wine grade: 1(High quality) → 7(Low quality) No M3, M21
-Somers measurements:
-colour density, hue, chemical age 1, chemical age 2, degree of ionisation, total anthocyanins (mg/L), total phenolics (mg/L), A420, pressed baume
-(&) Indicates grape samples which were blended during winemaking (i.e. same measurements)

3B.2. Riverland

3B.2.1 RL03

3B.2.1.1 CSIRO data

GQS	No. of samples	Sample name/details	
1H	13	RL	1, 13, 15, 17, 2, 23, 25, 27, 3, 37, 38, 41, 7
2	17	RL	16, 19, 20, 21, 22, 24, 26, 28, 30, 31,32, 33, 35, 45, 46, 49, 50
3	9	RL	29, 34, 36, 4, 48, 5, 54, 55, 6
4	8	RL	10, 14, 39, 40, 42, 43, 44, 8
5L	4	RL	18, 51, 53, 9
Unclassified	4	RL	11, 12, 47, 52
	55		

Parameters - See **Section 3B.3**
-Berry factors
-Grape flavonoid (anthocyanin, flavonol) content and composition

3B.2.1.2 HWC data

GQS	No. of samples	Sample name/details
1H	13	
2	17	
3	9	
4	8	
5L	4	
Unclassified	0	No RL11, RL12, RL47, RL52
	51	

Parameters
-Vineyard assessment (benchmarking) - See **Table 3B.1**
-Berry weight (g), baume
-Anthocyanins (NIR colour (mg/g berry))
-Enduse/ Wine grade: 1(High quality) → 5(Low quality) No RL11, RL12, RL52

3B.2.2 RL04

3B.2.2.1 CSIRO data

GQS	No. of samples	Sample name/details	
1H	13	R	10, 13, 17, 18, 28, 29, 3, 30, 32, 4, 6, 8, 9
2	10	R	1, 11, 12, 14, 15, 16, 35, 43, 5, 7
3	11	R	2, 26, 27, 33, 34, 40, 45, 49, 52, 53, 54
4	10	R	20, 22, 23, 31, 36, 37, 38, 39, 41, 55
5L	11	R	19, 21, 24, 25, 42, 44, 46, 47, 48, 50, 51
	55		

Parameters - See **Section 3B.3**
-Berry factors
-Grape flavonoid (anthocyanin, flavonol) content and composition
-Grape tannin content

3B.2.2.2 HWC data

GQS	No. of samples	Sample name/details
1H	13	
2	10	
3	11	
4	10	
5L	11	
	55	

Parameters
-Vineyard assessment (benchmarking) - See **Table 3B.1**
-Berry weight (g), baume
-Anthocyanins (NIR colour (mg/g berry))
-Enduse/ Wine grade: 1(High quality) → 4(Low quality) No R55, R31

Table 3B.1 Vineyard assessment measurements recorded by Hardy Wine Company (HWC). Data is also known as benchmarking factors (BM). * indicates data was provided; blank cells indicate data was not provided.

NOTE: This table is included on page 251 of the print copy of the thesis held in the University of Adelaide Library.

3B.3. CSIRO measurements

3B.3.1 Berry factors

-Sampled all data sets: MV03, MV04, RL03, RL04

-100 berries were randomly selected for processing

-Measurements are an average of 100 berries

-Data: Berry weight (g), skin weight (g), seed weight (g), number of seeds, ^{o}Brix

-Calculated data: Skin weight per berry weight (also expressed also a proportion (%)), seed weight per berry weight (also expressed also a proportion (%))

3B.3.2 Grape & wine flavonoid content & composition

3B.3.2.1 HPLC analysis of anthocyanins & flavonols

3B.3.2.1.1 Grape

-Sampled all data sets: MV03, MV04, RL03, RL04

-Samples consisted of 100 berry skins, pooled together and finely ground to a powder

-Samples were analysed in triplicate and are expressed mg/g berry

-See **Appendix 2B, Figure 2B.1** for typical Shiraz grape HPLC chromatogram

- **Anthocyanins (A520)**

-Data: 15 anthocyanin compounds detected:

Delphinidin glucoside, cyanidin glucoside, petunidin glucoside, peonidin glycoside, malvidin glucoside, delphinidin acetyl-glycoside, cyanidin acetyl-glucoside, petunidin acetyl-glucoside, peonidin acetyl-glycoside, malvidin acetyl-glucoside, delphinidin coumaroyl-glucoside, cyanidin coumaroyl-glucoside, petunidin coumaroyl-glucoside, peonidin coumaroyl-glycoside, malvidin coumaroyl-glucoside

-Calculated data: Totals (T=sum of each compound type)

TAnthocyanins, TGlucosides, TAcetyl-glucosides, TCoumaroyl-glycosides, TDelphinidins, TCyanidins, TPetunidins, TPeonidins, TMalvidins

- **Flavonols (A353)**

-Data: 9 flavonol compounds detected:

Quercetin glucoside, quercetin glucuronide, flavonol A (myricetin glucoside), flavonol B (myricetin glucuronide), flavonol C (kaempferol glucoside), flavonol D (isorhamnetin glucuronide), flavonol E (kaempferol galactoside), flavonol F (isorhamnetin glucoside) flavonol G (syringetin glucoside)

-Calculated: Totals (T=sum of each compound type)

TFlavonols, TQuercetin-glycosides, TMyricetin-glycosides, TKaempferol-glycosides, TIsorhamnetin-glycosides

- **Hydroxycinnamaic acids (A320)**

-Data: Caffeic acid 1, Coumaric acid 1, Coumaric acid 2

-Calculated data: Totals (T=sum of each compound type) TCoumaric acids

3B.3.2.2.2 Wine

-Sampled data sets: MV03, MV04

-Raw wine samples were analysed in triplicate and are expressed g/L

-Abbreviated forms of the compounds listed (See **Key**)

-See **Appendix 2B, Figure 2B.2** for typical Shiraz wine HPLC chromatogram.

- **Anthocyanins (A520)**

-Data: 16 anthocyanin compounds detected:

Delphinidin glucoside, cyanidin glucoside, petunidin glucoside, peonidin glycoside, malvidin glucoside, delphinidin acetyl-glycoside, cyanidin acetyl-glucoside, petunidin acetyl-glucoside, peonidin acetyl-glycoside, malvidin acetyl-glucoside, delphinidin coumaroyl-glucoside, cyanidin coumaroyl-glucoside, petunidin coumaroyl-glucoside, peonidin coumaroyl-glycoside, malvidin coumaroyl-glucoside

-Additional peak= Pigmented polymers (pp). Incorporates large integrated peak at the end of the HPLC chromatogram

-Calculated data: Totals (T=sum of each compound type)

TAnthocyanins (TAnthocyanins + pp), TGlucosides, TAcetyl-glucosides, TCoumaroyl-glycosides, TDelphinidins, TCyanindins, TPetunidins, TPeonidins, TMalvidins

- **Flavonols (A353)**

-Data: 12 flavonol compounds detected:

Quercetin glucoside and quercetin glucuronide, flavonol A (myricetin glucoside), flavonol B (myricetin glucuronide), flavonol C (kaempferol glucoside), flavonol F (isorhamnetin glucoside) flavonol G (syringetin glucoside)

-No flavonol D (isorhamnetin glucuronide), flavonol E (kaempferol galactoside)

-Additional peaks (unknown)= flavonols A1, flavonols A2, flavonol H (not detected in 2004)

-Additional peaks (flavonol aglycones)= quercetin, kaempferol (not detected in 2004)

-Calculated: Totals (T=sum of each compound type)

TFlavonols, TQuercetin-glycosides, TMalvidin-glycosides

- **Hydroxycinnamaic acids (A320)**

-Data: Caffeic acid1 and Coumaric acid1

3B.3.2.2 UV-VIS Spectrophotometric analysis

3B.3.2.2.1 Grape

-Method based on Iland et al. (2000)

-Sampled all grape data sets: MV03, MV04, RL03, RL04

-Sampled wine data sets: MV03, MV04

-Grape and wine extracts (from HPLC analysis) were diluted in acidulated methanol

-Samples were analysed in triplicate; grape data expressed mg/g berry, wine data expressed g/L

-Data: (SPEC)-Total anthocyanins (A520), Total phenolics (A280)

3B.3.2.2.2 Wine

-Method as described by Somers and Evans (1977)

-Sampled wine data set: MV04

-Wine samples were analysed in triplicate and are expressed mg/L.

-Data: Colour density, hue, degree of red pigment colouration (%), total red pigments, total phenolics, total anthocyanins (mg/L), chemical age I, chemical age II, degree of ionisation of anthocyanins (%)

3B.3.2.3 Analysis of skin & seed tannins

3B.3.2.3.1 PGA

-Method based on that by Downey et al. (2003a) and Kennedy and Jones (2001)

-Sampled grape data set: MV03 (skin and seed)

-Samples consisted of 100 berry skins (seeds from 100 berries), pooled together and finely ground to a powder

-Only acid hydrolysis component of method performed

-Samples were analysed in triplicate and are expressed mg/g berry

- Skin

-Data: 7 tannin compounds detected:

Epigallocatechin-adduct, catechin-adduct, epicatechin-adduct, catechin, epicatechin gallate-adduct, epicatechin, epicatechin gallate

-Calculated data: Totals (T=sum of each compound type)

TSkin tannins, TSkin adducts, TSkin free monomers

- Seed

-Data: 6 tannin compounds detected:

Catechin-adduct, epicatechin-adduct, catechin, epicatechin gallate-adduct, epicatechin, epicatechin gallate

-Calculated data: Totals (T=sum of each compound type)

TSeed tannins, TSeed adducts, TSeed free monomers

3B.3.2.3.2 PPA

-Method based on that by Downey and Adams (2005) and Harbertson et al. (2002)

-Sampled grape data set: MV04, RL04 (skin and seed)

-Samples consisted of: 100 berry skins (or seeds from 100 berries), pooled together and finely ground to a powder

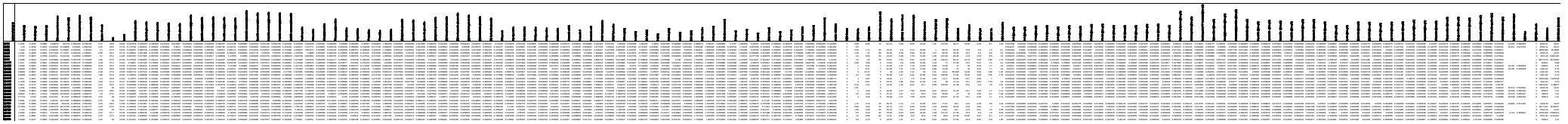
-Samples were analysed in triplicate and are expressed mg/ g berry

-Data: Total skin tannins, Total seed tannins

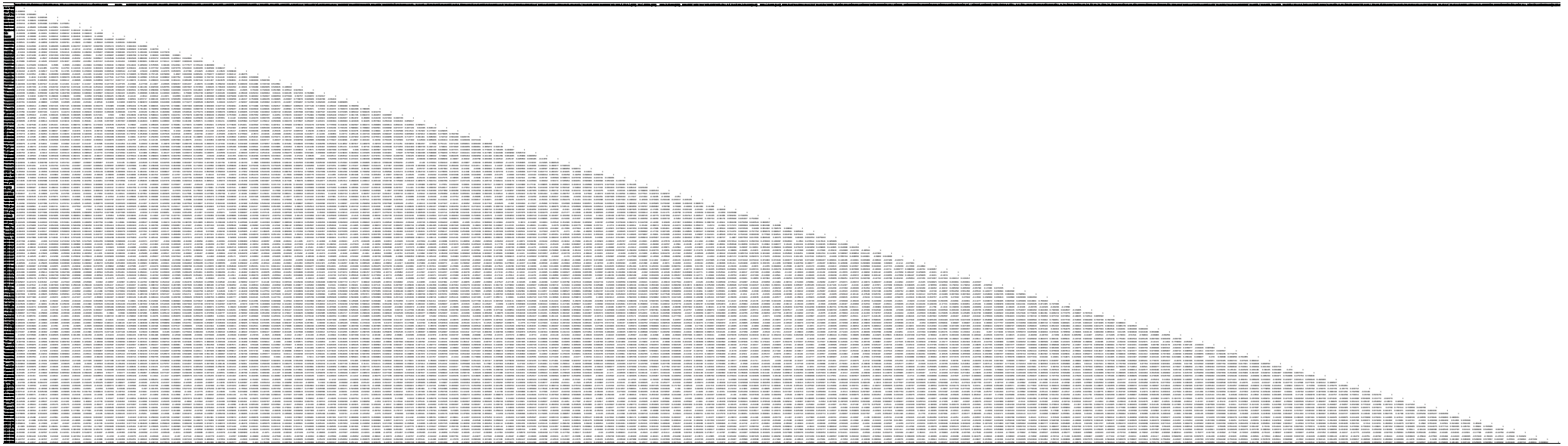
-Calculated data: Totals (T=sum of each compound type).

Total tannins (skin + seed)

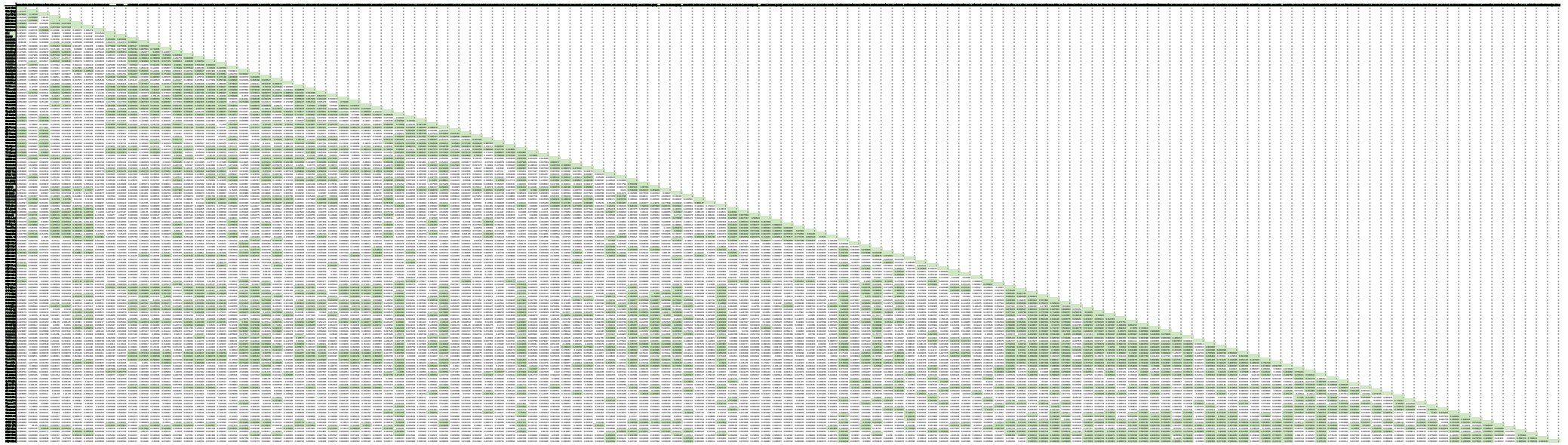
APPENDIX 3B MV03 - Mean Values



APPENDIX 3B MVOI - R Values



APPENDIX 3B MVI3 - R2 Values



APPENDIX 3B MV04 - Mean Values

CSIRO Sample ID	Berry Weight (g)	Skin Weight (g)	Seed Weight (g)	Skin mass per berry mass	Skin as a proportion (%)	Seed mass per berry mass	Seed as a proportion (%)	Number of seeds	Brix	Baume	Delphinidin glucoside	Cyanidin glucoside	Petunidin glucoside	Peonidin glucoside	Malvidin glucoside	Delphinidin acetylglucoside	Cyanidin acetylglucoside	Petunidin acetylglucoside	Peonidin acetylglucoside	Malvidin acetylglucoside
M1	0.967	0.2681	0.0539	0.277249	27.72492	0.055739	5.57394	1.96	28	15.56	0.120116	0.032154	0.164261	0.185638	0.78785	0.03209	0.005647	0.036906	0.055714	0.299089
M2	1.163	0.3911	0.0513	0.336285	33.62855	0.04411	4.411006	1.89	27.3	15.17	0.109059	0.022362	0.153321	0.157371	0.759602	0.029106	0.003997	0.032449	0.039847	0.244763
M3	0.8022	0.2648	0.0488	0.330092	33.00922	0.060833	6.083271	2.08	28.4	15.78	0.220104	0.048252	0.265137	0.243563	1.090147	0.040075	0.005692	0.045228	0.046983	0.289189
M4	1.2627	0.3572	0.0608	0.282886	28.28859	0.048151	4.815079	2.15	27.6	15.33	0.127341	0.02652	0.176095	0.192366	0.905856	0.032863	0.004197	0.036984	0.052856	0.317241
M5	1.1175	0.411	0.0588	0.367785	36.77852	0.052617	5.261745	2.09	26.1	14.50	0.130926	0.028587	0.174112	0.195688	0.987256	0.030988	0.00396	0.033696	0.047299	0.32341
M6	1.1059	0.3426	0.0597	0.309793	30.97929	0.053983	5.398318	2.03	24.5	13.61	0.085543	0.015816	0.112903	0.150632	0.781458	0.017049	0.001866	0.019425	0.031982	0.229456
M7	0.821	0.303	0.0486	0.369062	36.90621	0.059196	5.91961	2.04	25.9	14.39	0.115247	0.022122	0.152981	0.171635	0.932945	0.025009	0.003159	0.028647	0.041172	0.30924
M8	1.1077	0.348	0.0603	0.314164	31.41645	0.054437	5.443712	2.39	24.6	13.67	0.071368	0.013295	0.101503	0.111021	0.679485	0.018658	0.00201	0.021491	0.031362	0.257035
M9	1.1417	0.3863	0.0616	0.338355	33.83551	0.053955	5.395463	2.3	27	15.00	0.117086	0.021828	0.155342	0.163827	0.812844	0.024821	0.002794	0.028052	0.037465	0.233963
M10	0.761	0.2193	0.048	0.288173	28.81735	0.063075	6.30749	2.06	29.2	16.22	0.193053	0.037395	0.240948	0.190968	1.050694	0.040556	0.004749	0.04412	0.03712	0.322103
M11	1.0769	0.2807	0.0519	0.260656	26.06556	0.048194	4.819389	2.02	27.4	15.22	0.100066	0.017337	0.14374	0.126798	0.819571	0.024078	0.002693	0.028849	0.031711	0.275857
M12	1.0728	0.3154	0.0651	0.293997	29.3997	0.060682	6.068233	2.17	28.5	15.83	0.15419	0.037621	0.202109	0.192405	1.0173	0.035999	0.00523	0.040337	0.043032	0.326679
M13	1.0247	0.3128	0.0606	0.30526	30.52601	0.059139	5.913926	2.01	28.4	15.78	0.11034	0.027952	0.144955	0.148692	0.728199	0.028471	0.004294	0.032537	0.042457	0.302173
M14	1.2644	0.3734	0.0592	0.295318	29.53179	0.046821	4.682063	2.06	27.3	15.17	0.066911	0.011929	0.10463	0.110332	0.678931	0.020751	0.002258	0.02452	0.035429	0.271431
M15	1.1834	0.4503	0.058	0.380514	38.05138	0.049011	4.901132	2.02	26.8	14.89	0.089268	0.011916	0.110609	0.116322	0.767988	0.023275	0.002327	0.027655	0.038549	0.307823
M16	1.0256	0.2527	0.0645	0.246392	24.63924	0.06289	6.289002	2.33	27.3	15.17	0.074576	0.011169	0.115588	0.096341	0.822949	0.026023	0.002001	0.029981	0.031158	0.360507
M17	1.1799	0.3843	0.0575	0.325706	32.57056	0.048733	4.873294	2.4	27.5	15.28	0.086172	0.014583	0.117267	0.114019	0.706682	0.019631	0.002252	0.023409	0.03029	0.224219
M18	0.7937	0.2761	0.0461	0.347864	34.78644	0.058082	5.80824	1.88	27.8	15.44	0.111649	0.017066	0.14591	0.131424	0.864931	0.023356	0.002521	0.027277	0.033453	0.260456
M19	0.8575	0.2828	0.0574	0.329796	32.97959	0.066939	6.693878	2.27	26.9	14.94	0.078666	0.010703	0.12583	0.100125	0.869051	0.024693	0.002341	0.029553	0.031075	0.314408
M20	0.808	0.1909	0.0448	0.236262	23.62624	0.055446	5.544554	1.87	28.6	15.89	0.209847	0.024456	0.260714	0.140589	1.143406	0.061798	0.005488	0.061459	0.035942	0.412596
M21	0.9013	0.2909	0.0497	0.322756	32.2756	0.055143	5.514257	2	27.7	15.39	0.10552	0.016092	0.150449	0.131156	0.895328	0.026842	0.003029	0.030803	0.033562	0.288721
M22	0.8876	0.3206	0.0468	0.361199	36.11987	0.052726	5.272645	1.45	22.8	12.67	0.064518	0.010328	0.074741	0.062031	0.715525	0.021359	0.001875	0.019567	0.020379	0.33549
M23	1.1325	0.3453	0.0449	0.304901	30.49007	0.039647	3.96468	1.7	26.4	14.67	0.055262	0.009255	0.088334	0.085376	0.721206	0.013468	0.001281	0.015982	0.024297	0.245506
M24	1.2114	0.3458	0.0588	0.285455	28.54548	0.048539	4.853888	2.35	24	13.33	0.019675	0.003486	0.036736	0.046526	0.356358	0.006429	0.000937	0.006739	0.015585	0.121882

CSIRO Sample ID	Delphinidin coumaroylglucoside	Cyanidin coumaroylglucoside	Petunidin coumaroylglucoside	Peonidin coumaroylglucoside	Malvidin coumaroylglucoside	T.Anthocyanin	T.Glucoside	T.Acetylglucoside	T.Coumaroylglucoside	T.Delphinidin	T.Cyanidin	T.Petunidin	T.Peonidin	T.Malvidin
M1	0.011283	0.018812	0.048309	0.09469	0.351083	2.243641	1.29002	0.429445	0.524176	0.163489	0.056613	0.249475	0.336043	1.438022
M2	0.007869	0.012444	0.040438	0.075174	0.298046	1.985848	1.201715	0.350162	0.43397	0.146034	0.038803	0.226208	0.272392	1.302411
M3	0.009113	0.019126	0.05097	0.083407	0.324816	2.781801	1.867203	0.427166	0.487431	0.269292	0.073069	0.361336	0.373952	1.704152
M4	0.005485	0.018034	0.047651	0.099221	0.367645	2.410355	1.428178	0.444141	0.538036	0.165688	0.048751	0.26073	0.344444	1.590742
M5	0.002894	0.017404	0.048281	0.091918	0.413662	2.530081	1.516569	0.439352	0.574159	0.164808	0.049951	0.256089	0.334905	1.724328
M6	0.004454	0.018272	0.036451	0.075387	0.351521	1.932217	1.146352	0.29978	0.486086	0.107047	0.035955	0.16878	0.258001	1.362435
M7	0.00436	0.018573	0.041958	0.080295	0.36476	2.312102	1.39493	0.407225	0.509947	0.144616	0.043853	0.223585	0.293102	1.606945
M8	0.003033	0.015195	0.035241	0.066051	0.345534	1.772281	0.976672	0.330555	0.465054	0.093059	0.0305	0.158235	0.208433	1.282054
M9	0.004164	0.013925	0.038117	0.079652	0.295691	2.029571	1.270927	0.327095	0.43155	0.14607	0.038547	0.221512	0.280944	1.342498
M10	0.006831	0.017688	0.048504	0.06523	0.314904	2.614866	1.713059	0.448649	0.453157	0.24044	0.059833	0.333572	0.293319	1.687701
M11	0.006407	0.014951	0.041974	0.061857	0.316837	2.012725	1.207512	0.363188	0.442026	0.13055	0.034981	0.214563	0.220366	1.412264
M12	0.004973	0.019736	0.052095	0.07984	0.374531	2.586075	1.603625	0.451277	0.531173	0.195162	0.062587	0.29454	0.315276	1.718509
M13	0.004517	0.017108	0.03963	0.069373	0.298274	1.998972	1.160138	0.409932	0.428902	0.143328	0.049355	0.217122	0.260522	1.328645
M14	0.005892	0.01473	0.036916	0.068187	0.317729	1.770575	0.972733	0.354388	0.443454	0.093554	0.028917	0.166066	0.213948	1.268091
M15	0.005964	0.01513	0.044685	0.081164	0.404755	2.047411	1.096103	0.399629	0.551679	0.118507	0.029373	0.182929	0.236035	1.480566
M16	0.004695	0.016402	0.046085	0.063131	0.43699	2.137597	1.120623	0.44967	0.567304	0.105294	0.029572	0.191655	0.190629	1.620446
M17	0.009591	0.014393	0.037359	0.065676	0.301997	1.767539	1.038722	0.299801	0.429016	0.115394	0.031228	0.178035	0.209985	1.232898
M18	0.012329	0.018325	0.043935	0.072486	0.356816	2.121934	1.270981	0.347062	0.50389	0.147334	0.037912	0.217122	0.237364	1.482203
M19	0.008002	0.016617	0.044115	0.062161	0.396577	2.113917	1.184374	0.402071	0.527472	0.11136	0.029662	0.199498	0.193361	1.580036
M20	0.00553	0.018494	0.06569	0.068772	0.473923	2.988703	1.779012	0.577283	0.632408	0.277174	0.048438	0.387863	0.245303	2.029925
M21	0.005255	0.015748	0.045364	0.070852	0.364008	2.182729	1.298545	0.382957	0.501227	0.137617	0.03487	0.226616	0.235569	1.548058
M22	0.003146	0.012994	0.022502	0.03468	0.300805	1.699942	0.927143	0.398671	0.374128	0.089024	0.025197	0.11681	0.117091	1.35182
M23	0.004369	0.016225	0.04343	0.070197	0.464473	1.858863	0.959434	0.300534	0.598695	0.0731	0.026761	0.147746	0.17987	1.431186
M24	0.008848	0.011566	0.021616	0.050886	0.254289	0.961557	0.462782	0.151571	0.347205	0.034952	0.015989	0.06509	0.112996	0.732529

CSIRO Sample ID	(A) Myricetin glucoside	Quercetin glucuronide	Quercetin glucoside	(B) Myricetin glucuronide	(C) Kaempferol glucoside	(D) [illegible]	(E) [illegible]	(F) Isorhamnetin glucoside	(G) Syringetin glucoside	T.Flavonols	TQ-Glycoside	TM-Glycoside	TK-Glycoside	TI-Glycoside	Caffeic acid 1	Coumaric acid 1	Coumaric acid 2	T.coumaric acid
M1	0.046785	0.036359	0.063317	0.013187	0.006128	0.005491	0.007494	0.018531	0.010745	0.208037	0.099676	0.059972	0.013622	0.024022	0.006906	0.009741	0.002357	0.012099
M2	0.030336	0.007816	0.02336	0.009516	0.003397	0.00318	0.00143	0.008344	0.008609	0.095988	0.031176	0.039852	0.004827	0.011524	0.005425	0.004331	0.001819	0.00615
M3	0.054815	0.036545	0.070396	0.015219	0.006266	0.01095	0.009835	0.020689	0.012512	0.237229	0.106942	0.070034	0.016101	0.031639	0.006862	0.005746	0.00281	0.008555
M4	0.059669	0.025377	0.056255	0.016482	0.00738	0.006336	0.006661	0.021019	0.01352	0.212681	0.081632	0.076152	0.014041	0.027335	0.022425	0.021635	0.002734	0.024369
M5	0.070784	0.017583	0.04605	0.019325	0.009533	0.006659	0.005639	0.017227	0.016406	0.209207	0.063633	0.090109	0.015172	0.023887	0.027844	0.024064	0.002828	0.026892
M6	0.051659	0.022134	0.056626	0.014244	0.008189	0.007482	0.009769	0.021032	0.011467	0.202601	0.07876	0.065903	0.017958	0.028514	0.018998	0.014293	0.001525	0.015818
M7	0.049955	0.050918	0.069184	0.013625	0.00742	0.005627	0.010246	0.019896	0.010995	0.237867	0.120102	0.063579	0.017666	0.025524	0.03276	0.025562	0.000717	0.02628
M8	0.048062	0.018854	0.042403	0.013271	0.006678	0.003385	0.007515	0.017468	0.011983	0.169618	0.061258	0.061333	0.014192	0.020853	0.020308	0.017415	0.000761	0.018176
M9	0.037036	0.024507	0.04606	0.010146	0.005211	0.00484	0.006657	0.014845	0.008469	0.157771	0.070566	0.047183	0.011867	0.019685	0.026149	0.024048	0.000779	0.024827
M10	0.066765	0.028759	0.064776	0.016264	0.008326	0.007009	0.010209	0.018391	0.012265	0.232763	0.093535	0.083029	0.018535	0.0254	0.014057	0.011963	0.001616	0.013579
M11	0.041185	0.016484	0.03844	0.01123	0.005519	0.004072	0.004791	0.010882	0.008574	0.141176	0.054924	0.052415	0.01031	0.014954	0.014028	0.012291	0.002002	0.014292
M12	0.070372	0.025219	0.06345	0.017978	0.00849	0.007215	0.00862	0.019231	0.013956	0.234531	0.08867	0.08835	0.01711	0.026446	0.021727	0.021066	0.002688	0.023755
M13	0.055618	0.034272	0.068535	0.015556	0.00708	0.004328	0.011425	0.022361	0.013851	0.233025	0.102807	0.071175	0.018505	0.026688	0.02275	0.023358	0.001506	0.024864
M14	0.047922	0.01774	0.045027	0.01352	0.006276	0.003221	0.007579	0.017405	0.012096	0.170786	0.062767	0.061442	0.013855	0.020626	0.019883	0.019238	0.001163	0.020401
M15	0.04043	0.007992	0.026949	0.011474	0.006427	0.00154	0.003065	0.010861	0.01004	0.118777	0.034941	0.051903	0.009492	0.012401	0.027438	0.022487	0.002304	0.024791
M16	0.070688	0.027109	0.050192	0.019565	0.008306	0.007494	0.009486	0.017609	0.016093	0.226543	0.077302	0.090253	0.017792	0.025104	0.020313	0.021613	0.00163	0.023243
M17	0.026434	0.014185	0.029141	0.008152	0.004074	0.004992	0.003967	0.010611	0.007511	0.109068	0.043326	0.034587	0.008041	0.015604	0.018685	0.017778	0.001377	0.019154
M18	0.032019	0.024136	0.045023	0.009526	0.005515	0.009107	0.007138	0.014343	0.007218	0.154026	0.069159	0.041546	0.012653	0.02345	0.015481	0.013268	0.001268	0.014535
M19	0.044465	0.02595	0.043943	0.011668	0.006888	0.003802	0.0081	0.015269	0.009636	0.169722	0.069893	0.056133	0.014988	0.019071	0.019895	0.019363	0.001039	0.020402
M20	0.092732	0.038096	0.06507	0.020185	0.011691	0.006577	0.012341	0.023026	0.014047	0.283766	0.103166	0.112917	0.024032	0.029604	0.015661	0.018347	0.003327	0.021675
M21	0.044244	0.027578	0.048468	0.011659	0.006461	0.006205	0.008128	0.016007	0.008736	0.177486	0.076046	0.055903	0.014589	0.022212	0.018212	0.018243	0.00111	0.019354
M22	0.047725	0.021642	0.027988	0.01139	0.004988	0.006785	0.005182	0.008185	0.01105	0.144935	0.04963	0.059114	0.010171	0.014969	0.019726	0.015068	0.001261	0.016329
M23	0.039171	0.015625	0.036705	0.011618	0.006392	0.006058	0.006089	0.015053	0.009261	0.145972	0.05233	0.050789	0.012481	0.021111	0.018278	0.021205	0.001188	0.022393
M24	0.008699	0.007134	0.013091	0.003216	0.001986	0.003183	0.001488	0.005204	0.003153	0.047152	0.020224	0.011914	0.003474	0.008387	0.01488	0.014911	0.000748	0.015659

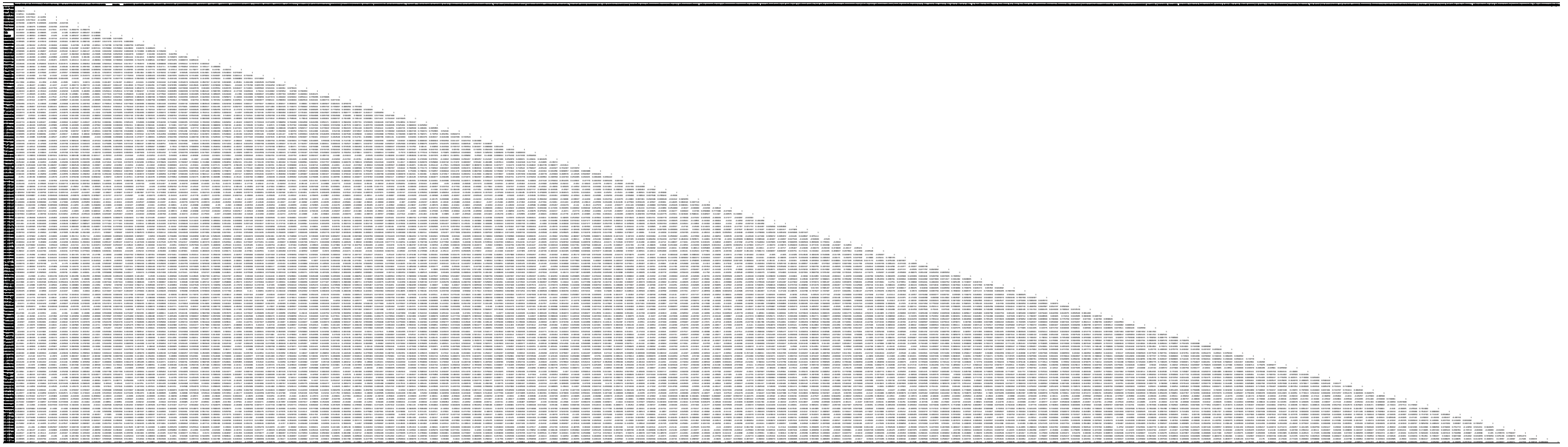
CSIRO Sample ID	SPEC T.anthocyanins	SPEC T.phenolics	Skin tannins	Seed tannins	Total Tannins	HWC Stream	HWC BM Ha	HWC BM T/Ha	HWC BM Vine Age (years old)	HWC BM Bunches p/m	HWC BM Bunches / Shoot	HWC BM Internode Length	HWC BM Shoots /m	HWC BM Pruning	HWC BM Cordon	HWC BM Canopy Mgt	HWC Bunch Weight (g)	HWC MA Brix	HWC MA Baume	HWC MA pH	HWC MA TA	HWC Anthocyanins	HWC Col/Brix	HWC Ionise	HWC PI TSO2	HWC PI TA	HWC PI pH	HWC PI Be	HWC PI NH4	HWC PI FAN	HWC PI YAN
M1	2.629679	0.580063	1.893786	2.231427	4.125213	2	0.86	3.232558	4	15.37	0.9	7.32	17.07	1	1	1	147	28.44	15.8	3.56	9.81	2.24	0.084528	2.78							0
M2	2.331902	0.498669	1.516334	2.041632	3.557966	3	3.19	1.498433	8	21.71	0.92	8.65	23.54	1	1	2	122.3	26.28	14.6	3.62	8.56	1.65	0.0625	4.78							0
M3	3.246145	0.715964	2.526271	2.548013	5.074284	2	1.65	4.466667	33	24.38	1.56	8.33	15.62	1	1	3	127	26.10	14.5	3.6	9.95	2.34	0.086347	7.37	41	6.6	3.41	14.8	126	289.15	392.47
M4	2.721403	0.583582	1.751297	2.455748	4.207045	1	0.88	4.25										27.90	15.5	3.53	9.1	1.97	0.072161	3.74	22	5.2	3.38	15.5	38	115	146.16
M5	3.010723	0.666216	1.239294	2.377045	3.616339	1	2.54	1.366142	103	15.05	1.22	6.52	12.37	1	1	1	140.8	25.74	14.3	3.56	9.3	2.25	0.083955	3.47	42	6	3.36	14.4	87	208	279.34
M6	2.225457	0.488982	1.34591	2.171645	3.517555	2	1.93	0.927461	35	45.46	1.25	6.56	36.49	1	2	1	88.3	23.58	13.1	3.65	7.14	1.75	0.07	1.79	22	5.8	3.34	13.3	71	270	328.22
M7	2.618659	0.584963	1.55146	2.124532	3.675992	3	1.5	4.266667	7	58.33	1.47	7.75	39.74	1	2	1	96.5	25.20	14	3.41	7.3	1.6	0.066946	6.4	3	5.3	3.49	13.8	80	221	286.6
M8	2.058267	0.464564	1.037555	2.095703	3.133258	2	1.13	4.230088	33	39.6	1.1	6.98	35.86	1	1	1	93.3	23.04	12.8	3.66	7.08	1.62	0.066667	4.78							0
M9	2.313797	0.510479	1.315371	2.31581	3.631182	3																1.72	0.066409	9.71							
M10	2.966321	0.662691	1.719062	2.804887	4.523949	3	1.6	1.75625	6	41.38	1.35	6.74	30.69	1	2	1	112.6	27.36	15.2	3.59	6.97	2.11	0.079623	2.81	23	4.2	3.65	14.6	41	132	165.62
M11	2.198508	0.469871	1.36114	1.822463	3.183603	3	1.6	1.525	10	45.27	1.4	6.12	32.3	1	2	1	119.6	29.16	16.2	3.49	8.05	2.43	0.085563	2.44							0
M12	2.925588	0.654586	1.95265	3.480898	5.433548	2	0.61	2.606557	4	14.47	0.96	7.41	15.11	1	1	1	154.4	28.08	15.6	3.6	6.93	1.98	0.069965	1.59	37	5	3.39	14.9	73	213	272.86
M13	2.387031	0.5351	1.344817	3.425537	4.770354	2	0.68	3.338235	4	11.26	0.8	6.71	14.11	1	1	1	179.9	27.36	15.2	3.64	7.3	2.27	0.078819	2.27	58	6.8	3.1	14.9	60	178	227.2
M14	2.065101	0.469734	1.684305	2.723984	4.408289	1	1.2	6.033333	28	36.12	1.1	7.19	32.94	1	2	1	125	26.28	14.6	3.61	7.52	1.93	0.069928	7.24	21	6.9	3.14	15.4	39	128	159.98
M15	2.256438	0.518067	1.412026	2.250569	3.662594	1	1.2	0.325									125	27.72	15.4	3.65	7.12	1.33	0.056356	0.39							
M16	2.432489	0.552017	2.065859	3.737062	5.802921	2	2.8	6.971429	6	18.73	1.32	8.06	14.18	1	1	1	159.4	28.44	15.8	3.71	6.8	2.15	0.078755	19.52	44	4.8	3.6	15.9	49	176	216.18
M17	2.128255	0.512988	1.998525	1.765047	3.763572	3	4	5.925	7	41.37	1.69	5.8	24.52	1	1	3	150.6	26.82	14.9	3.61	7.6	1.54	0.057463	23.7	3	4.9	3.53	15.1	29	106	129.78
M18	2.468586	0.540936	1.460442	2.522709	3.983151	3	1.5	10.08	6	34.25	1.37	6.42	25.07	1	1	2	128.4	27.36	15.2	3.54	8.85	1.93	0.073946	15.12							0
M19	2.411227	0.524092	1.868888	3.336461	5.205348	3	1.5	12.76	5	31.08	1.35	7.19	23.11	1	1	2	128	25.92	14.4	3.5	8.18	1.59	0.062109	19.14	21	5.4	3.68	15.5	61	280	330.02
M20	3.288863	0.700349	2.627316	2.277097	4.904413	1	4.2	1.5	33	21.28	1.22	7.5	17.44	2	1	1	140.8	26.10	14.5	3.58	7.69	2.33	0.087266	6.3							
M21	2.613627	0.564038	1.663794	1.90782	3.571634	3	3.2	6.759375	6	46.44	1.22	6.04	38.14	1	2	2	90.6	27.00	15	3.59	6.85	2.22	0.079004	21.63							
M22	2.114182	0.453562	1.650678	2.848467	4.499145	1	4.2	2.135714	33	20.59	1.14	6.64	18	2	1	1	135.4	23.94	13.3	3.5	6.98	1.83	0.070656	8.97	24	4	3.74	13.7	56	157	
M23	2.189435	0.519755	1.841141	1.814275	3.655415	1	1.6	3.73125	35	20.83	1.23	7.32	16.98	2	1	1	140.1	26.10	14.5	3.49	8.33	1.75	0.064576	5.97	5	4.8	3.56	14.8	60	131	179
M24	1.182892	0.30766	1.539344	1.782863	3.322207	3			6	59.17	1.61	10.17	36.67	1	3	3		24.12	13.4			0.93	0.041333	51.56							

CSIRO Sample ID	D-G (wine g/L)	C-G (wine g/L)	PT-G (wine g/L)	PO-G (wine g/L)	M-G (wine g/L)	D-AG (wine g/L)	C-AG (wine g/L)	PT-AG (wine g/L)	PO-AG (wine g/L)	M-AG (wine g/L)	D-CG (wine g/L)	PT-CG (wine g/L)	PO-CG (wine g/L)	M-CG (wine g/L)	Pigmented Polymers (wine g/L)	Tanthocyanins (wine g/L)	Tanthocyanins PP included (wine g/L)	T.glucosides (wine g/L)	T.acetylglucosides (wine g/L)	T.coumaroylglucosides (wine g/L)
M1	0.043205	0.006598	0.057339	0.058876	0.291443	0.014225	0.00162	0.014619	0.0226	0.098768	0.003279	0.006077	0.015314	0.04293	0.241866	0.676894	0.91876	0.457462	0.151831	0.067601
M2	0.036762	0.00339	0.051921	0.042571	0.292314	0.013099	0.001712	0.013184	0.019886	0.096037	0.002591	0.005342	0.01358	0.038601	0.336212	0.630992	0.967204	0.426958	0.143919	0.060115
M3	0.029664	0.002634	0.048199	0.04191	0.313395	0.013608	0.002342	0.012606	0.020387	0.096368	0.002089	0.00462	0.013008	0.033791	0.324902	0.634622	0.959524	0.435802	0.145311	0.053508
M4	0.03004	0.003733	0.050578	0.044759	0.298666	0.01157	0.001014	0.013433	0.019615	0.098694	0.002444	0.004651	0.011303	0.029738	0.228581	0.620236	0.848817	0.427775	0.144326	0.048135
M5	0.024298	0.002839	0.044081	0.037649	0.282412	0.011923	0.001788	0.011811	0.017533	0.092767	0.002133	0.003608	0.009213	0.027805	0.265949	0.569861	0.83581	0.391279	0.135822	0.04276
M6	0.018	0.00149	0.032585	0.02757	0.265411	0.009123	0.001477	0.008878	0.014592	0.083874	0.002331	0.002826	0.007998	0.023477	0.207609	0.499634	0.707243	0.345058	0.117945	0.036631
M7	0.027397	0.001793	0.042597	0.032897	0.33995	0.01113	0.000714	0.010605	0.014219	0.096858	0.003144	0.003108	0.006915	0.02096	0.258307	0.613287	0.871594	0.444634	0.134526	0.034128
M8	0.018	0.00149	0.032585	0.02757	0.265411	0.009123	0.001477	0.008878	0.014592	0.083874	0.002331	0.002826	0.007998	0.023477	0.207609	0.499634	0.707243	0.345058	0.117945	0.036631
M9	0.032021	0.002758	0.047941	0.040508	0.305772	0.012191	0.001508	0.0125	0.017536	0.088582	0.002693	0.00514	0.012748	0.038826	0.308521	0.620727	0.929248	0.429001	0.132318	0.059408
M10	0.031523	0.002474	0.04719	0.036455	0.321047	0.011382	0.001279	0.012131	0.01655	0.100479	0.002611	0.004408	0.009951	0.030774	0.214981	0.628254	0.843235	0.438689	0.141822	0.047743
M11	0.031523	0.002474	0.04719	0.036455	0.321047	0.011382	0.001279	0.012131	0.01655	0.100479	0.002611	0.004408	0.009951	0.030774	0.214981	0.628254	0.843235	0.438689	0.141822	0.047743
M12	0.0266	0.003527	0.043027	0.036247	0.262836	0.011712	0.001349	0.012444	0.017407	0.091127	0.0022	0.00386	0.00894	0.024721	0.257292	0.545994	0.803286	0.372236	0.134038	0.03972
M13	0.051045	0.006117	0.069042	0.059713	0.371719	0.019238	0.002494	0.018304	0.023197	0.123438	0.00431	0.006779	0.01446	0.037121	0.343793	0.806977	1.15077	0.557635	0.186671	0.062671
M14	0.026326	0.002388	0.045375	0.040184	0.307748	0.012345	0.001683	0.0114	0.017189	0.088319	0.003114	0.003555	0.011151	0.023941	0.276212	0.594717	0.870929	0.422021	0.130936	0.04176
M15	0.026326	0.002388	0.045375	0.040184	0.307748	0.012345	0.001683	0.0114	0.017189	0.088319	0.003114	0.003555	0.011151	0.023941	0.276212	0.594717	0.870929	0.422021	0.130936	0.04176
M16	0.031598	0.002803	0.048154	0.035788	0.319093	0.013807	0.002208	0.013745	0.016912	0.111917	0.002591	0.004419	0.009585	0.033539	0.317868	0.646461	0.96433	0.437736	0.15859	0.050135
M17	0.016391	0.001603	0.029911	0.024755	0.257851	0.007838	0.001354	0.008025	0.013516	0.077429	0.002359	0.00342	0.009077	0.027593	0.275204	0.481124	0.756327	0.330512	0.108163	0.042449
M18	0.017896	0.001191	0.031307	0.025304	0.275562	0.007509	0.001119	0.008223	0.012708	0.080504	0.002193	0.002499	0.006008	0.018568	0.193772	0.490592	0.684364	0.351259	0.110064	0.029268
M19	0.017896	0.001191	0.031307	0.025304	0.275562	0.007509	0.001119	0.008223	0.012708	0.080504	0.002193	0.002499	0.006008	0.018568	0.193772	0.490592	0.684364	0.351259	0.110064	0.029268
M20	0.026111	0.002472	0.044132	0.034385	0.306975	0.010744	0.001708	0.011434	0.015651	0.101362	0.002617	0.003863	0.009247	0.029752	0.313225	0.600453	0.913678	0.414075	0.140899	0.045479
M21	0.024352	0.001923	0.039588	0.029757	0.290668	0.010992	0.001986	0.010379	0.014061	0.087933	0.002387	0.004222	0.008787	0.03206	0.291526	0.559097	0.850623	0.386288	0.125352	0.047456
M22	0.018747	0.001778	0.03003	0.026594	0.285037	0.007845	0.001334	0.009126	0.013278	0.095205	0.003639	0.003617	0.008178	0.024669	0.266409	0.529078	0.795487	0.362187	0.126788	0.040103
M23	0.019058	0.001518	0.033148	0.024609	0.280737	0.008952	0.001432	0.009359	0.0123	0.086859	0.002428	0.003244	0.007293	0.021624	0.285353	0.51256	0.797913	0.359069	0.118902	0.034589
M24	0.003453	0.000358	0.010501	0.006632	0.171736	0.002644	0.000394	0.003222	0.006027	0.049101	0.001328	0.001411	0.002858	0.01077	0.14359	0.270435	0.414025	0.192679	0.061388	0.016367

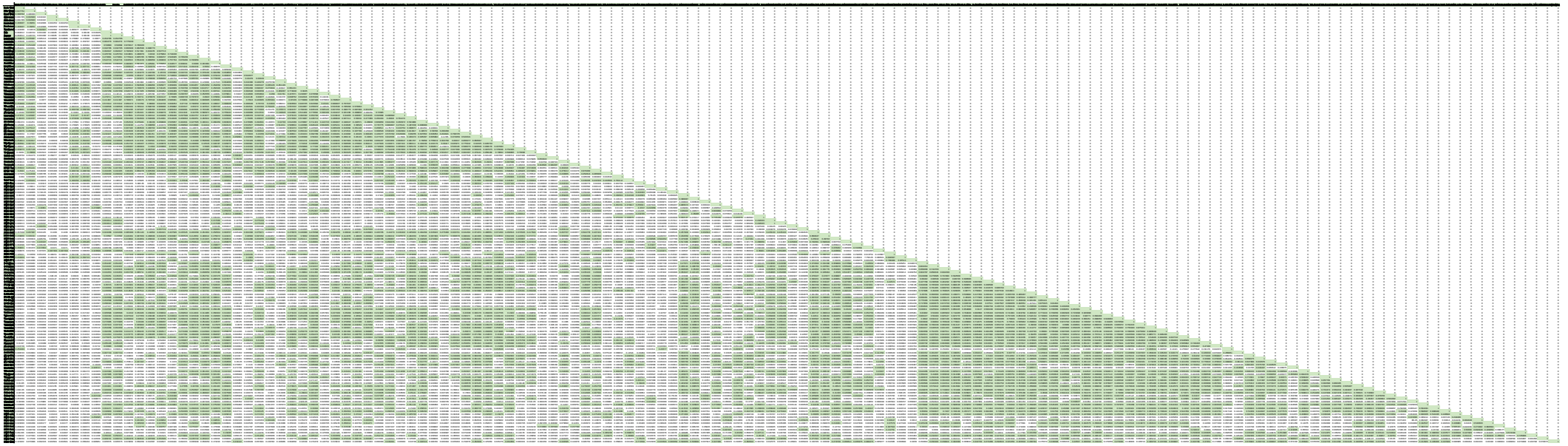
CSIRO Sample ID	T.delphinidin (wine g/L)	T.cyanidin (wine g/L)	T.petunidin (wine g/L)	T.peonidin (wine g/L)	T.malvidin (wine g/L)	Flavonol A1 (wine g/L)	Flavonol A2 (wine g/L)	(A) M-GS (wine g/L)	Q-GR (wine g/L)	Q-GS (wine g/L)	(B) M-GR (wine g/L)	(C) K-GS (wine g/L)	(F) I-GS (wine g/L)	(G) S-GS (wine g/L)	Quercetin (wine g/L)	T.flavonols (wine g/L)	TQ-glycoside (wine g/L)	TM-glycoside (wine g/L)	Caffeic acid 1 (wine g/L)	Coumaric acid 1 (wine g/L)
M1	0.06071	0.008218	0.078035	0.09679	0.433142	0.002425	0.02335	0.02722	0.024779	0.042845	0.008949	0.007852	0.013001	0.007312	0.002487	0.160221	0.067624	0.036169	0.038404	0.022554
M2	0.052452	0.005302	0.070447	0.076037	0.426953	0.001869	0.020644	0.028027	0.020887	0.032244	0.008626	0.006736	0.010316	0.00728	0.002163	0.13879	0.053131	0.036653	0.023735	0.013734
M3	0.045361	0.004976	0.065426	0.075304	0.443554	0.00197	0.021313	0.026532	0.019488	0.025871	0.009132	0.005696	0.008707	0.007691	0.001278	0.127679	0.045359	0.035665	0.037194	0.020603
M4	0.044053	0.004747	0.068662	0.075677	0.427097	0.002445	0.019206	0.030364	0.020017	0.031274	0.009853	0.007281	0.010131	0.00732	0.002094	0.139983	0.05129	0.040217	0.035494	0.019542
M5	0.038354	0.004627	0.0595	0.064396	0.402983	0.002026	0.020423	0.025715	0.017246	0.028678	0.009086	0.005783	0.009276	0.007625	0.00132	0.127178	0.045925	0.034802	0.029941	0.016782
M6	0.029454	0.002967	0.04429	0.050161	0.372762	0.002179	0.01272	0.026033	0.014106	0.008614	0.007622	0.008119	0.006323	0.007517	0.005745	0.098977	0.02272	0.033655	0.031689	0.017089
M7	0.041671	0.003506	0.05631	0.054031	0.457768	0.002131	0.014112	0.029766	0.019985	0.015296	0.007047	0.006151	0.005678	0.005292	0.005107	0.110566	0.035281	0.036813	0.020909	0.013476
M8	0.029454	0.002967	0.04429	0.050161	0.372762	0.002179	0.01272	0.026033	0.014106	0.008614	0.007622	0.008119	0.006323	0.007517	0.005745	0.098977	0.02272	0.033655	0.031689	0.017089
M9	0.046905	0.004266	0.065582	0.070793	0.433181	0.001685	0.013116	0.02383	0.020689	0.023669	0.006165	0.006799	0.007265	0.004599	0.003132	0.11095	0.044359	0.029995	0.026269	0.012245
M10	0.045516	0.003753	0.063729	0.062955	0.452301	0.001889	0.016059	0.028094	0.014302	0.019217	0.007186	0.006827	0.006044	0.005707	0.002909	0.108235	0.033519	0.03528	0.023325	0.01328
M11	0.045516	0.003753	0.063729	0.062955	0.452301	0.001889	0.016059	0.028094	0.014302	0.019217	0.007186	0.006827	0.006044	0.005707	0.002909	0.108235	0.033519	0.03528	0.023325	0.01328
M12	0.040511	0.004875	0.059331	0.062593	0.378683	0.002414	0.021639	0.021613	0.017345	0.027629	0.008526	0.00579	0.009447	0.0074	0.002993	0.124796	0.044974	0.03014	0.023326	0.013391
M13	0.074593	0.008611	0.094125	0.09737	0.532278	0.0034	0.033296	0.033207	0.024017	0.033708	0.011287	0.008829	0.012122	0.009675	0.005424	0.174965	0.057726	0.044494	0.039476	0.022693
M14	0.041785	0.00407	0.060331	0.068524	0.420008	0.002046	0.017888	0.030313	0.012068	0.014974	0.008063	0.006846	0.007029	0.007165	0.006022	0.112414	0.027042	0.038376	0.036634	0.019482
M15	0.041785	0.00407	0.060331	0.068524	0.420008	0.002046	0.017888	0.030313	0.012068	0.014974	0.008063	0.006846	0.007029	0.007165	0.006022	0.112414	0.027042	0.038376	0.036634	0.019482
M16	0.047996	0.005012	0.066318	0.062285	0.46485	0.003169	0.030603	0.032385	0.02059	0.035047	0.010642	0.008018	0.01138	0.009585	0.001547	0.162966	0.055637	0.043027	0.023222	0.015188
M17	0.026588	0.002958	0.041356	0.047348	0.362874	0.001499	0.01381	0.024247	0.017089	0.028132	0.00644	0.005231	0.007747	0.005267	0.001505	0.110967	0.045221	0.030687	0.025211	0.012461
M18	0.027598	0.00231	0.04203	0.044019	0.374634	0.00164	0.012694	0.024786	0.023983	0.022689	0.005941	0.005568	0.006182	0.004891	0.0041	0.112473	0.046672	0.030727	0.021382	0.01586
M19	0.027598	0.00231	0.04203	0.044019	0.374634	0.00164	0.012694	0.024786	0.023983	0.022689	0.005941	0.005568	0.006182	0.004891	0.0041	0.112473	0.046672	0.030727	0.021382	0.01586
M20	0.039472	0.00418	0.05943	0.059282	0.438089	0.002944	0.022953	0.033147	0.019246	0.021626	0.011221	0.008068	0.011013	0.010622	0.005395	0.146235	0.040872	0.044368	0.027632	0.016897
M21	0.037732	0.003909	0.054189	0.052606	0.410661	0.002492	0.019076	0.027539	0.025211	0.037261	0.007761	0.006129	0.009586	0.005913	0.002271	0.14324	0.062472	0.0353	0.02284	0.013144
M22	0.03023	0.003112	0.042774	0.048051	0.404911	0.00227	0.015582	0.022497	0.021156	0.01151	0.008236	0.007471	0.007232	0.00815	0.008756	0.112859	0.032666	0.030732	0.031765	0.019748
M23	0.030437	0.00295	0.045751	0.044202	0.38922	0.001964	0.013645	0.025721	0.014986	0.009229	0.0085	0.007676	0.005957	0.008147	0.006314	0.102139	0.024215	0.034221	0.027461	0.016153
M24	0.007424	0.000753	0.015134	0.015517	0.231607	0.000687	0.005578	0.017179	0.010045	0.014501	0.003167	0.001939	0.003774	0.002984	0.001097	0.060951	0.024546	0.020346	0.006125	0.005404

CSIRO Sample ID	SPEC WT anthocyanins (g/L)	SPEC WT phenolics (g/L)	Colour density	Colour Hue	Chemical Age 1	Chemical Age 2	Degree of ionisation of anthocyanins (%)	Total Phenolics (mg/L)	Total Anthocyanins (mg/L)	HWC colour density	HWC Hue	HWC Chemical Age 1	HWC Chemical Age 2	HWC Degree of ionisation of anthocyanins	HWC Total Anthocyanins (mg/L)	HWC Total Phenolics (mg/L)	HWC A420	HWC Pressed Be	HWC Wine Grade
M1	1.047098	0.330064	24	0.412406	0.097787	0.027377	305.46	83.80267	1243.438	30.635	0.539757	0.488417	0.478978	35.05456	542.1264	77.69	1.1583	2.6	3
M2	0.963837	0.305008	28.20667	0.372914	0.115904	0.038656	365.52	72.08667	1100.062	27.529	0.538879	0.614167	0.52672	40.61834	322.8591	65.34	0.9843	1.2	5
M3	0.970743	0.297842	27.83667	0.384242	0.109971	0.038339	356.62	68.08033	1088.436	32.694	0.527472	0.563453	0.501297	38.65073	465.1917	76.59	1.1253	2.9	
M4	0.916067	0.290871	22.30667	0.406763	0.087836	0.026455	288.2333	66.397	1038.92	18.076	0.548929	0.394425	0.316542	22.14642	615.6301	61.47	0.6623	1.6	2
M5	0.876547	0.270788	21.37667	0.399036	0.111848	0.033843	268.8733	62.357	1004.558	15.711	0.56204	0.616819	0.335574	19.49894	393.6625	47.67	0.6216	2.3	1
M6	0.783693	0.263349	17.47667	0.392986	0.102557	0.028779	223.16	57.13867	912.3089	19.759	0.558404	0.422402	0.333533	23.02302	611.9962	64.06	0.7653	0.9	4
M7	0.849688	0.276735	23.83667	0.372615	0.108046	0.038485	314.0133	57.67733	843.8244	25.563	0.53855	0.53395	0.45463	31.61675	459.0604	70.98	0.9352	0.9	7
M8	0.783693	0.263349	17.47667	0.392986	0.102557	0.028779	223.16	57.13867	912.3089	19.759	0.558404	0.422402	0.333533	23.02302	611.9962	64.06	0.7653	0.9	4
M9	0.876163	0.284924	24.3	0.387207	0.11139	0.031794	317.76	66.094	975.9111	23.199	0.555936	0.493129	0.403987	26.50029	529.4281	71.94	0.891	2.1	6
M10	0.86964	0.268838	21.54333	0.371397	0.096857	0.023911	288.02	64.68	1063.327	23.349	0.537231	0.445342	0.357936	24.99454	650.462	68.57	0.8677	3.1	6
M11	0.86964	0.268838	21.54333	0.371397	0.096857	0.023911	288.02	64.68	1063.327	23.349	0.537231	0.445342	0.357936	24.99454	650.462	68.57	0.8677	3.1	6
M12	0.810935	0.295697	27.94	0.369154	0.108807	0.030548	367.7933	86.46233	1261.809	30.253	0.524541	0.373558	0.375467	28.24099	852.6615	90.31	1.1739	2	3
M13	1.144365	0.347174	32.98667	0.366011	0.100378	0.028926	438.9	90.637	1463.047	27.457	0.511034	0.313375	0.319966	24.69017	989.4627	87.24	1.0463	1.5	1
M14	0.986667	0.327724	23.08333	0.402988	0.116	0.026168	293.44	90.435	1304.011	26.677	0.530873	0.411836	0.374348	25.59972	751.9615	86.33	1.0076	0	2
M15	0.986667	0.327724	23.08333	0.402988	0.116	0.026168	293.44	90.435	1304.011	26.677	0.530873	0.411836	0.374348	25.59972	751.9615	86.33	1.0076	0	2
M16	1.030024	0.321387	25.61	0.384118	0.116989	0.036799	327.36	72.861	1089.871	29.897	0.51523	0.429622	0.374747	27.5586	796.1942	87.4	1.1232	2.2	4
M17	0.770456	0.26874	19.49	0.396364	0.128425	0.042127	244.28	56.26333	770.6733	23.387	0.527464	0.389116	0.344008	25.3265	719.5625	80.95	0.9017	2.9	6
M18	0.754341	0.251533	18.09667	0.378246	0.107915	0.030551	235.9533	55.62367	832.1578	20.455	0.548683	0.362823	0.293117	21.28122	772.23	75.37	0.7944	1.4	7
M19	0.754341	0.251533	18.09667	0.378246	0.107915	0.030551	235.9533	55.62367	832.1578	20.455	0.548683	0.362823	0.293117	21.28122	772.23	75.37	0.7944	1.4	7
M20	0.976307	0.312759	23.43	0.402663	0.12261	0.033057	294.16	77.54067	1142.796	31.387	0.503497	0.310687	0.350307	26.87159	1039.462	93.74	1.1868	1.6	3
M21	0.861391	0.283023	23.22667	0.385752	0.125573	0.042233	294.14	62.32333	907.1156	26.051	0.510728	0.325488	0.320025	25.17666	912.8295	80.4	0.9831	3	
M22	0.777746	0.257626	24.3	0.343304	0.096351	0.036437	327.9667	59.39433	873.5956	25.368	0.49814	0.289256	0.355763	28.54609	826.6632	79.71	0.9965	0	3
M23	0.810935	0.276637	22.04667	0.370987	0.119559	0.043259	283.76	58.65367	817.6533	24.473	0.481775	0.260461	0.29632	23.73798	1013.397	90.07	0.974	0	3
M24	0.44259	0.156477	6.71	0.512473	0.177944	0.028611	73.41333	34.61567	515.1533	9.928	0.529502	0.28311	0.228289	17.36815	531.7987	46.97	0.3916	1.3	7

APPENDIX 3B MV04 - R Values



APPENDIX 3B MV04 - R2 Values



APPENDIX 3B RL03 - Mean Values

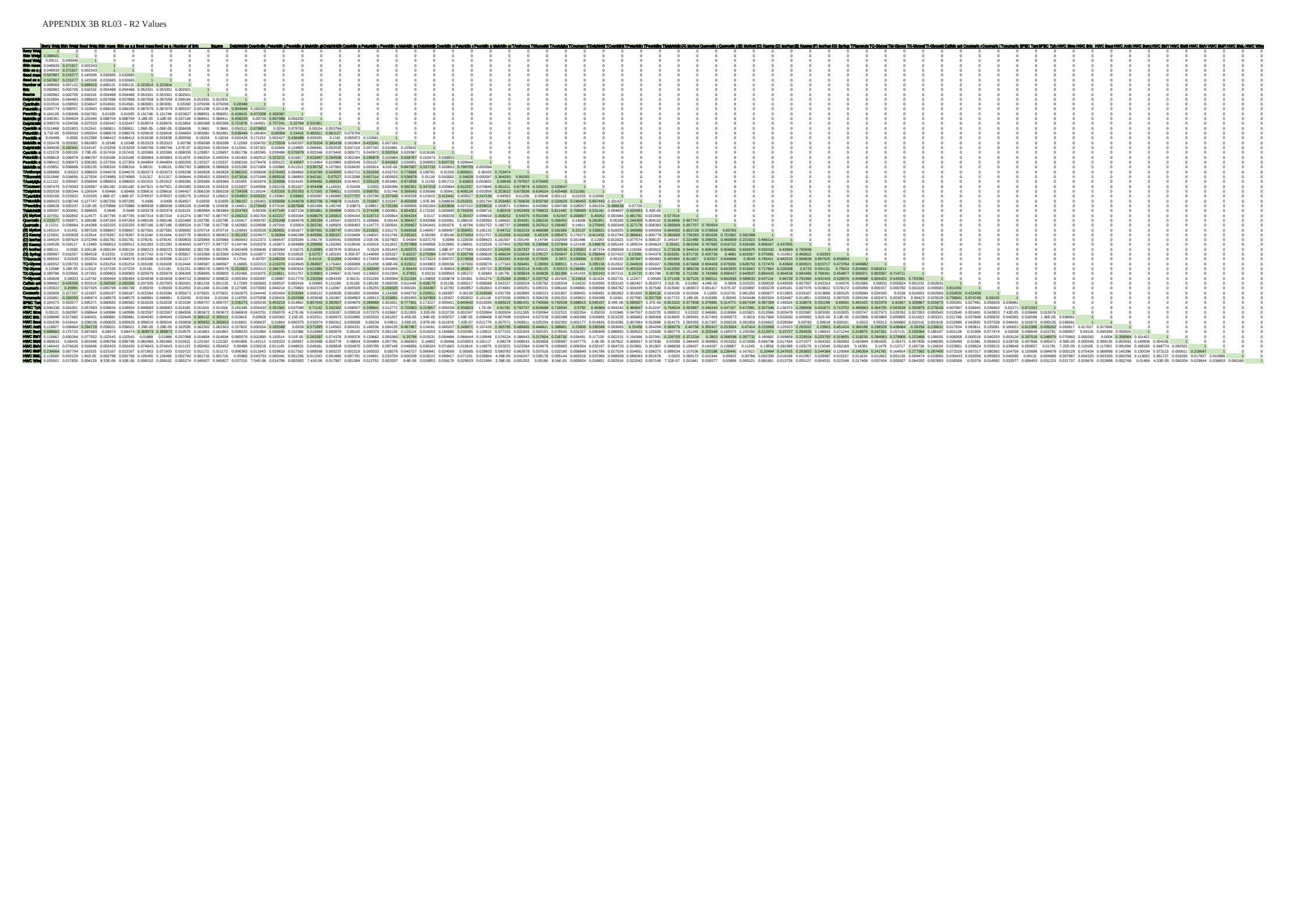
CSIRO Sample ID	Berry Weight (g)	Skin Weight (g)	Seed Weight (g)	Skin mass per berry mass	Skin as a proportion (%)	Seed mass per berry mass	Seed as a proportion (%)	Number of seeds	Brix	Baume	Delphinidin glucoside	Cyanidin glucoside	Petunidin glucoside	Peonidin glucoside	Malvidin glucoside	Delphinidin acetylglucoside	Cyanidin acetylglucoside	Petunidin acetylglucoside	Peonidin acetylglucoside	Malvidin acetylglucoside	Delphinidin coumaroylglucoside	Cyanidin coumaroylglucoside	Petunidin coumaroylglucoside	Peonidin coumaroylglucoside	Malvidin coumaroylglucoside	TAnthocyanins	TGlucosides	TAcetylglucosides	TCoumaroylglucosides	TDelphinidins	TCyanidins	TPetunidins	TPeonidins	TMalvidins
RL1	1.0222	0.3922	0.0603	0.383682	38.36823	0.05899	5.899041	2.21	27	15.00	0.030034	0.00553	0.0451090	0.057736	0.418701	0.011441	0.001206	0.015079	0.031816	0.238848	0.02264	0.006267	0.030025	0.064621	0.310935	1.289988	0.55711	0.29839	0.434488	0.064116	0.013003	0.090213	0.154173	0.968483
RL2	1.2	0.43	0.0681	0.358333	35.83333	0.05675	5.675	2.4	25.6	14.22	0.017783	0.003793	0.0238696	0.039399	0.252683	0.007355	0.001164	0.008723	0.022107	0.140481	0.016313	0.004623	0.018969	0.05862	0.230027	0.845909	0.337527	0.179831	0.328551	0.041451	0.00958	0.051561	0.120127	0.623191
RL3	1.3326	0.5048	0.0565	0.378808	37.88083	0.042398	4.239832	2.08	25.9	14.39	0.032815	0.004976	0.0441494	0.051866	0.361524	0.010276	0.001113	0.013476	0.02557	0.17866	0.0126	0.0059	0.026765	0.062139	0.259448	1.091279	0.495331	0.229096	0.366852	0.055691	0.01199	0.08439	0.139576	0.799632
RL4	1.3226	0.3833	0.0586	0.289808	28.9808	0.044307	4.430667	2.1	27.6	15.33	0.014844	0.002703	0.0252926	0.044925	0.311434	0.00793	0.00105	0.008508	0.024698	0.159395	0.023528	0.006343	0.025973	0.070729	0.296806	1.024158	0.399199	0.201581	0.423378	0.046302	0.010096	0.059773	0.140352	0.767635
RL5	1.222	0.484	0.066	0.396072	39.6072	0.05401	5.400982	2.48	26.4	14.67	0.033087	0.004854	0.0489066	0.055476	0.432572	0.009236	0.001284	0.011941	0.022673	0.176051	0.017232	0.00527	0.028581	0.060053	0.282927	1.19014	0.574895	0.221184	0.394062	0.059555	0.011407	0.089428	0.138202	0.891549
RL6	1.1672	0.4413	0.0593	0.378084	37.80843	0.050805	5.080535	2.19	26.2	14.56	0.021664	0.003771	0.0331856	0.054356	0.35022	0.006947	0.001151	0.009511	0.027572	0.162309	0.015242	0.005972	0.027372	0.078255	0.30281	1.10034	0.463197	0.207491	0.429652	0.043853	0.010895	0.070069	0.160184	0.815339
RL7	1.2712	0.3973	0.0591	0.312539	31.25393	0.046492	4.64915	2.12	25.8	14.33	0.023147	0.002661	0.0413737	0.044327	0.466882	0.009754	0.001054	0.011784	0.023911	0.224312	0.029802	0.005158	0.031507	0.05573	0.36532	1.336725	0.578392	0.270815	0.487518	0.062704	0.008873	0.084665	0.123968	1.056514
RL8	1.3321	0.4663	0.0596	0.350049	35.00488	0.044741	4.474139	2.31	27.2	15.11	0.016272	0.003902	0.0226781	0.04825	0.209333	0.006024	0.000999	0.005602	0.023996	0.10447	0.011088	0.005254	0.016173	0.063422	0.173156	0.71062	0.300435	0.141092	0.269093	0.033384	0.010155	0.044453	0.135668	0.486959
RL9	1.0855	0.2885	0.0585	0.265776	26.57761	0.053892	5.389222	2.17	27.5	15.28	0.023111	0.004736	0.0315030	0.046445	0.264372	0.007916	0.001172	0.010034	0.024229	0.1306	0.017957	0.006523	0.023147	0.062408	0.222208	0.87636	0.370167	0.17395	0.332242	0.048983	0.01243	0.064685	0.133082	0.61718
RL10	0.9553	0.2793	0.0584	0.292369	29.23689	0.061133	6.113263	2.27	26.3	14.61	0.027378	0.005318	0.0403634	0.062275	0.407426	0.009828	0.001084	0.011278	0.028844	0.210973	0.019375	0.006006	0.029296	0.06804	0.326883	1.254367	0.542761	0.262007	0.449599	0.056581	0.012408	0.080938	0.159158	0.945282
RL11	0.9567	0.3884	0.0608	0.405979	40.59789	0.063552	6.355179	2.27	25.4	14.11	0.040443	0.004025	0.0588348	0.051951	0.567945	0.013221	0.001225	0.015113	0.023118	0.251885	0.017482	0.00456	0.03435	0.055103	0.377015	1.51627	0.723199	0.304562	0.48851	0.071146	0.009811	0.108297	0.130172	1.196844
RL12	1.418	0.5011	0.0659	0.353385	35.3385	0.046474	4.647391	2.21	26.5	14.72	0.019447	0.003054	0.0314186	0.046311	0.330928	0.006872	0.001006	0.007814	0.02254	0.155955	0.013539	0.005583	0.028119	0.070211	0.308186	1.050985	0.431159	0.194187	0.425639	0.039858	0.009643	0.067351	0.139063	0.795069
RL13	1.4188	0.5197	0.0558	0.366295	36.62955	0.039329	3.932901	2.08	27	15.00	0.054105	0.009849	0.0724649	0.089698	0.509064	0.012975	0.001612	0.0167	0.033204	0.206011	0.013939	0.009057	0.030782	0.084649	0.293581	1.437692	0.735182	0.270502	0.432008	0.081018	0.020519	0.119947	0.207551	1.008657
RL14	0.9818	0.2923	0.0567	0.297718	29.77185	0.057751	5.775107	2.34	26.1	14.50	0.024173	0.003942	0.0379418	0.048547	0.357714	0.008389	0.001004	0.010301	0.02807	0.202209	0.022077	0.00734	0.034166	0.073016	0.342254	1.201142	0.472317	0.249973	0.478852	0.054639	0.012285	0.082409	0.149633	0.902177
RL15	0.9351	0.3669	0.0617	0.392364	39.23645	0.065982	6.598225	2.37	25	13.89	0.019052	0.004041	0.0304536	0.042801	0.321999	0.007739	0.001212	0.010153	0.021356	0.172837	0.016383	0.004379	0.025777	0.054315	0.28696	1.019457	0.418347	0.213296	0.387814	0.043174	0.009632	0.066384	0.118472	0.781796
RL16	1.4049	0.5205	0.0633	0.370489	37.0489	0.045057	4.505659	2.23	27.1	15.06	0.036911	0.007432	0.0469586	0.077737	0.356174	0.011605	0.001484	0.013529	0.033512	0.168334	0.012281	0.008135	0.026785	0.083213	0.256157	1.140247	0.525212	0.228464	0.386571	0.060797	0.017052	0.087273	0.194462	0.780664
RL17	1.0756	0.431	0.0494	0.400707	40.07066	0.045928	4.592785	1.88	27	15.00	0.042658	0.007717	0.0573563	0.064188	0.43375	0.010252	0.001363	0.012598	0.021417	0.175482	0.013138	0.005381	0.025028	0.052042	0.247539	1.169909	0.605669	0.221113	0.343128	0.066047	0.014461	0.094983	0.137647	0.856771
RL18	1.1613	0.4641	0.0684	0.399638	39.96383	0.0589	5.889951	2.37	25	13.89	0.022641	0.002622	0.0373286	0.038271	0.407059	0.007869	0.001184	0.009338	0.016684	0.176917	0.017478	0.004122	0.025634	0.045243	0.303432	1.115821	0.507921	0.211992	0.395908	0.047988	0.007928	0.0723	0.100197	0.887407
RL19	1.1521	0.476	0.0548	0.413159	41.31586	0.047565	4.756532	2.12	27.3	15.17	0.029442	0.004357	0.0452580	0.056167	0.412402	0.009732	0.001238	0.013129	0.028912	0.211339	0.017858	0.006128	0.03258	0.072783	0.332109	1.273432	0.547626	0.264349	0.461457	0.057032	0.011722	0.090967	0.157862	0.95585
RL20	1.1431	0.3874	0.0556	0.338903	33.8903	0.04864	4.863966	2.17	24.9	13.83	0.044553	0.007081	0.0567891	0.060334	0.466744	0.010434	0.001219	0.011664	0.023847	0.19531	0.013891	0.00666	0.032263	0.066941	0.336308	1.334039	0.635501	0.242474	0.456064	0.068879	0.01496	0.100716	0.151122	0.998362
RL21	1.2486	0.3272	0.0544	0.262053	26.20535	0.043569	4.35688	1.98	25.9	14.39	0.022368	0.003632	0.0333808	0.047843	0.302575	0.007776	0.000796	0.009213	0.022815	0.140821	0.018551	0.005415	0.023567	0.059725	0.239449	0.937926	0.409798	0.181421	0.346707	0.048695	0.009843	0.066161	0.130383	0.682845
RL22	1.1631	0.3682	0.0486	0.316568	31.65678	0.041785	4.178489	1.84	27.3	15.17	0.020685	0.003854	0.0365134	0.056207	0.350261	0.0076	0.000946	0.009349	0.026165	0.158226	0.022005	0.007051	0.027469	0.078644	0.282432	1.087408	0.467521	0.202286	0.417601	0.05029	0.011851	0.073331	0.161016	0.790919
RL23	0.9503	0.3206	0.048	0.337367	33.73671	0.05051	5.051037	1.7	25.4	14.11	0.037721	0.006186	0.0495808	0.066441	0.455778	0.010669	0.001304	0.012369	0.026069	0.189266	0.019695	0.006578	0.031021	0.074162	0.336926	1.323768	0.615707	0.239678	0.468383	0.068085	0.014068	0.092972	0.166673	0.981971
RL24	1.2016	0.3582	0.0576	0.298103	29.81025	0.047936	4.793609	2.33	26.5	14.72	0.03386	0.005801	0.0489547	0.063863	0.419796	0.009076	0.000885	0.008149	0.020205	0.134215	0.025716	0.00728	0.030545	0.07211	0.296535	1.176991	0.572275	0.17253	0.432186	0.068652	0.013966	0.087649	0.156179	0.850546
RL25	0.9219	0.3709	0.0546	0.402321	40.23213	0.059226	5.922551	2.07	25.5	14.17	0.026938	0.002016	0.0366333	0.037064	0.350822	0.008277	0.001279	0.009409	0.017928	0.16892	0.01601	0.004064	0.022823	0.046143	0.27248	1.020808	0.453474	0.205814	0.36152	0.051225	0.007359	0.068865	0.101136	0.792223
RL26	1.0282	0.3777	0.0579	0.367341	36.7341	0.056312	5.6312	2.4	26.1	14.50	0.040152	0.005748	0.0542514	0.057471	0.44351	0.010884	0.001478	0.013401	0.023476	0.205121	0.015483	0.004875	0.027625	0.055727	0.284208	1.24341	0.601133	0.25436	0.387918	0.066519	0.012101	0.095277	0.136674	0.932839
RL27	1.3211	0.4612	0.0632	0.349103	34.9103	0.047839	4.783892	2.18	25	13.89	0.040499	0.00691	0.0516333	0.063488	0.351468	0.008948	0.001148	0.010869	0.022723	0.129028	0.007328	0.006793	0.023344	0.069166	0.233181	1.026528	0.513999	0.172717	0.339812	0.056775	0.014851	0.085846	0.155378	0.713678
RL28	1.079	0.3441	0.0652	0.318906	31.89064	0.060426	6.042632	2.28	26.5	14.72	0.022187	0.003952	0.0328555	0.050811	0.313886	0.008402	0.000906	0.009866	0.028464	0.163156	0.01846	0.007503	0.030594	0.07966	0.316139	1.086842	0.423691	0.210794	0.452357	0.049049	0.012361	0.073316	0.158935	0.79318
RL29	1.3907	0.4656	0.0561	0.334795	33.47954	0.040339	4.03394	2.04	26.7	14.83	0.036844	0.006451	0.0548724	0.074376	0.44014	0.008967	0.001008	0.011177	0.023395	0.153849	0.012083	0.006725	0.026313	0.071962	0.279225	1.207388	0.612683	0.198396	0.396308	0.057894	0.014184	0.092362	0.169733	0.873215
RL30	1.2161	0.3625	0.0589	0.298084	29.8084	0.048434	4.843352	2.24	27.9	15.50	0.018821	0.00332	0.0296188	0.049984	0.306769	0.007044	0.000905	0.007927	0.023711	0.14167	0.021746	0.005697	0.022947	0.071518	0.260297	0.971974	0.408512	0.181256	0.382206	0.047611	0.009922	0.060493	0.145213	0.708735
RL31	1.3417	0.395	0.0671	0.294403	29.44026	0.050011	5.001118	2.32	27.3	15.17	0.024241	0.005274	0.0322415	0.059337	0.266158	0.009415	0.001024	0.010967	0.029239	0.130032	0.022584	0.00698	0.022028	0.072721	0.216734	0.908975	0.387251	0.180678	0.341047	0.05624	0.013278	0.065237	0.161297	0.612924
RL32	1.1585	0.3735	0.06	0.3224	32.23997	0.051791	5.179111	2.27	25.9	14.39	0.029491	0.006949	0.0369138	0.068531	0.292172	0.009537	0.001381	0.011622	0.032063	0.144364	0.012028	0.007408	0.022356	0.076714	0.223954	0.975483	0.434056	0.198967	0.342461	0.051056	0.015737	0.070891	0.177309	0.66049
RL33	1.0086	0.3833	0.0589	0.380032	38.00317	0.058398	5.839778	2.16	27.7	15.39	0.020029	0.004075	0.0304121	0.053703	0.313485	0.007869	0.001344	0.0092	0.028714	0.159193	0.019355	0.007058	0.025446	0.074982	0.276601	1.031465	0.421704	0.20632	0.403441	0.047254	0.012476	0.065058	0.157399	0.749278
RL34	1.0778	0.3649	0.059	0.33856	33.856	0.054741	5.474114	2.24	26.8	14.89	0.023165	0.003644	0.0378746	0.058039	0.418077	0.008554	0.001133	0.009734	0.030372	0.20398	0.022967	0.007255	0.033751	0.085244	0.383833	1.327622	0.540801	0.253772	0.53305	0.054686	0.012031	0.08136	0.173655	1.00589
RL35	0.9439	0.3335	0.0612	0.353321	35.33213	0.064837	6.483738	2.36	26.9	14.94	0.018178	0.002784	0.0312438	0.043928	0.377375	0.007387	0.001115	0.007936	0.019841	0.163332	0.026317	0.004908	0.024458	0.056088	0.307704	1.092593	0.473508	0.19961	0.419474	0.051881	0.008806	0.063638	0.119857	0.84841
RL36	1.3362	0.429	0.0748	0.32106	32.10597	0.05598	5.597964	2.51	28.5	15.83	0.040909	0.006504	0.0560534	0.081372	0.451346	0.012062	0.001163	0.013698	0.029825	0.185482	0.015363	0.007145	0.028168	0.076675	0.27793	1.283695	0.636185	0.24223	0.40528	0.068334	0.014812	0.09792	0.187872	0.914758
RL37	1.2017	0.3347	0.0531	0.278522	27.85221	0.044187	4.41874	2.09	25.6	14.22	0.028351	0.003229	0.0496281	0.048008	0.487899	0.010578	0.000938	0.013179	0.023475	0.240852	0.030347	0.00493	0.030585	0.0536	0.35981	1.38541	0.617116	0.289023	0.479272	0.069276	0.009098	0.093392	0.125083	1.088561
RL38	1.2016	0.3464	0.048	0.288282	28.82823	0.039947	3.994674	1.95	26.2	14.56	0.031641	0.005212	0.0504114	0.056153	0.397448	0.008249	0.000868	0.010983	0.020947	0.150095	0.024411	0.006047	0.025784	0.060422	0.278601	1.127274	0.540865	0.191143	0.395266	0.0643	0.012127	0.087179	0.137522	0.826144
RL39	1.2348	0.3986	0.0643	0.322805	32.28053	0.052073	5.207321	2.29	27.2	15.11	0.019535	0.004287	0.0314947	0.055224	0.347223	0.00826	0.001094	0.009627	0.02913	0.185954	0.02163	0.005203	0.024034	0.06483	0.289716	1.097243	0.457765	0.234066	0.405412	0.049425	0.010585	0.065155	0.149184	0.822894
RL40	1.3168	0.4198	0.0638	0.318803	31.88032	0.048451	4.845079	2.3	27.7	15.39	0.026261	0.004034	0.0396248	0.052286	0.363793	0.008956	0.000937	0.011408	0.02768	0.180611	0.017376	0.006774	0.029457	0.071578	0.307677	1.148452	0.486	0.229591	0.432861	0.052593	0.011745	0.080489	0.151544	0.852081
RL41	1.0835	0.4117	0.055	0.379972	37.99723	0.050761	5.076142	2.11	28.7	15.94	0.031525	0.018518	0.0403922	0.07177	0.342651	0.009876	0.004905	0.012298	0.031447	0.166347	0.016191	0.00688	0.024634	0.072767	0.251621	1.101824	0.504857	0.224874	0.372093	0.057593	0.030303	0.077325	0.175984	0.760619
RL42	0.7611	0.2286	0.0562	0.300355	30.03547	0.07384	7.384049	2.17	25.2	14.00	0.022267	0.003756	0.0355429	0.058477	0.442956	0.008638	0.000906	0.009279	0.026181	0.211764	0.025468	0.006635	0.031159	0.079742	0.401604	1.364373	0.562999	0.256767	0.544608	0.056372	0.011297	0.075981	0.1644	1.056324
RL43	1.2024	0.4046	0.058	0.336494	33.64937	0.048237	4.823686	2.04	27.3	15.17	0.030265	0.006781	0.0384354	0.063174	0.307258	0.008943	0.001289	0.010755	0.027948	0.149878	0.010099	0.006371	0.022032	0.065431	0.219123	0.967782	0.445914	0.198812	0.323056	0.049307	0.014441	0.071222	0.156553	0.676259
RL44	1.1479	0.3248	0.0693	0.282951	28.29515	0.060371	6.037111	2.37	28.2	15.67	0.011726	0.002311	0.0207502	0.039658	0.274184	0.00677	0.000938	0.006854	0.023505	0.149649	0.025552	0.004842	0.020157	0.05898	0.257238	0.903112	0.348629	0.187715	0.366768	0.044048	0.008091	0.047761	0.122142	0.681071
RL45	1.3554	0.4264	0.0671	0.314593	31.45935	0.049506	4.950568	2.37	25.7	14.28	0.020474	0.00378	0.0290202	0.049026	0.299298	0.007335	0.001144	0.008793	0.026811	0.153117	0.017367	0.007074	0.026194	0.074556	0.295187	1.019177	0.401598	0.1972	0.420379	0.045176	0.011998	0.064008	0.150393	0.747603
RL46	1.2041	0.3394	0.0683	0.28187	28.18703	0.056723	5.672286	2.27	25.8	14.33	0.022038	0.005615	0.0280384	0.069457	0.247335	0.008274	0.001218	0.009661	0.033529	0.128477	0.017106	0.008078	0.022493	0.092883	0.25361	0.947812	0.372484	0.181159	0.39417	0.047419	0.01491	0.060192	0.195869	0.629423
RL47	1.2946	0.4237	0.0557	0.327283	32.72826	0.043025	4.302487	2.16	27.5	15.28	0.034099	0.005701	0.0439996	0.070815	0.380676	0.010586	0.001028	0.011231	0.029953	0.162844	0.015843	0.007439	0.025594	0.08551	0.282159	1.167479	0.535291	0.215642	0.416546	0.060528	0.014169	0.080826	0.186278	0.825679
RL48	1.2906	0.386	0.0609	0.299086	29.90857	0.047187	4.718735	2.3	26.8	14.89	0.043156	0.005579	0.0548889	0.063037	0.456566	0.011845	0.00111	0.012701	0.024386	0.175927	0.020686	0.007059	0.031065	0.072127	0.324182	1.304314	0.623227	0.225968	0.455118	0.075686	0.013748	0.098655	0.15955	0.956675
RL49	1.1619	0.3979	0.0644	0.342456	34.24563	0.055426	5.542646	2.3	26	14.44	0.02369	0.005998	0.0289517	0.052993	0.263603	0.006944	0.001063	0.007053	0.020429	0.11753	0.009856	0.005345	0.017436	0.057417	0.189963	0.819939	0.375236	0.153283	0.294099	0.04813	0.012138	0.059175	0.128993	0.575113
RL50	1.2959	0.378	0.0662	0.291689	29.16892	0.051084	5.108419	2.34	26.9	14.94	0.026292	0.006546	0.0338394	0.066671	0.251078	0.008381	0.001365	0.009805	0.029368	0.114428	0.012554	0.006887	0.020316	0.07228	0.208736	0.936849	0.384427	0.163348	0.320774	0.047228	0.014799	0.06396	0.16832	0.574242
RL51	1.2387	0.3611	0.053	0.291515	29.15153	0.042787	4.278679	2.14	26.5	14.72	0.03881	0.006495	0.0479744	0.075346	0.414116	0.011761	0.001254	0.012575	0.031688	0.184987	0.017653	0.007783	0.027741	0.083773	0.300108	1.262063	0.582741	0.242265	0.437057	0.068224	0.015532	0.08829	0.190806	0.899211
RL52	1.2996	0.3901	0.0567	0.300169	30.01693	0.043629	4.362881	2.1	27.2	15.11	0.019582	0.006511	0.0284778	0.067762	0.268071	0.006554	0.000853	0.007201	0.02714	0.124812	0.013634	0.007204	0.021997	0.08005	0.235579	0.915426	0.390403	0.16656	0.358464	0.03977	0.014567	0.056776	0.174951	0.628462
RL53	1.2813	0.3087	0.06	0.240927	24.09272	0.046827	4.682744	2.16	28.3	15.72	0.032471	0.006412	0.0419860	0.073155	0.313723	0.010274	0.001372	0.011716	0.030423	0.133541	0.01467	0.007989	0.024311	0.081664	0.286852	1.223582	0.467746	0.187326	0.36731	0.057414	0.015773	0.078013	0.185242	0.68594
RL54	1.398	0.4344	0.0696	0.31073	31.07296	0.049785	4.978541	2.48	27.2	15.11	0.022788	0.004565	0.0324619	0.063599	0.371145	0.008538	0.000097	0.009669	0.02969	0.15052	0.018293	0.007385	0.026122	0.082993	0.288566	1.062253	0.439513	0.199388	0.423352	0.049619	0.01292	0.068252	0.175236	0.756225
RL55	1.1822	0.3205	0.0667	0.271105	27.11047	0.05642	5.642023	2.28	27.7	15.39	0.021142	0.004785	0.0313559	0.063319	0.326604	0.007442	0.000957	0.008386	0.030661	0.151685	0.021535	0.007943	0.027236	0.085179	0.303645	1.091875	0.447206	0.199131	0.445538	0.050119	0.013684	0.066978	0.179159	0.781934

CSIRO Sample ID	(A) Myricetin glucoside	Quercetin glucuronide	Quercetin glucoside	(B) Myricetin glucuronide	(C) Kaempferol glucoside	(D) Isorhamnetin glucuronide	(E) Kaempferol galactoside	(F) Isorhamnetin glucoside	(G) Syringetin glucoside	TFlavonols	TQ-Glycosides	TM-Glycosides	TK-Glycosides	TI-Glycosides	Caffeic acid 1	Coumaric acid 1	Coumaric 2	Tcoumaric acid	SPEC Tanthocyanins	SPEC Tphenolics	HWC Stream	HWC Brix	HWC Baume	HWC Anthocyanin	HWC Berry Weight (g)	HWC BMYield (T/Ha)	HWC BMShoot tip growth	HWC BMVine vigour	HWC BMFruit exposure (%)	HWC BMLeaf health	HWC Wine Grade
RL1	0.032476	0.041051	0.074491	0.012685	0.003214	0.005285	0.009145	0.028169	0.014457	0.220975	0.115542	0.045161	0.012359	0.033454	0.012397	0.010303	0.000946	0.011249	1.589199	0.390804	1	25.56	14.2	1.57	0.99	11.6	1	3	40	5	3
RL2	0.013066	0.01881	0.03117	0.005642	0.001553	0.004438	0.003234	0.014151	0.008146	0.100211	0.049981	0.018708	0.004786	0.018589	0.00825	0.004805	0.000679	0.005483	0.996803	0.264109	1	25.02	13.9	1.25	1.41	20.5	1	6	10	4	4
RL3	0.024802	0.017136	0.041304	0.008132	0.002329	0.004323	0.00327	0.018086	0.009128	0.12851	0.05844	0.032934	0.0056	0.022409	0.021527	0.016989	0.00257	0.019559	1.218001	0.312993	1	24.12	13.4	1.51	1.45	16.3	1	5	30	5	3
RL4	0.012435	0.015588	0.035086	0.006347	0.001409	0.00548	0.002897	0.019061	0.010058	0.108362	0.050674	0.018782	0.004306	0.024542	0.007402	0.005705	0.001305	0.00701	1.187587	0.312776	3	25.74	14.3	1.48	1.5	24.2	1	6	10	5	3
RL5	0.021691	0.019043	0.040609	0.008483	0.002445	0.007834	0.004161	0.014957	0.008484	0.127707	0.059652	0.030174	0.006606	0.022791	0.014497	0.010308	0.002761	0.013069	1.401924	0.351005	3	25.02	13.9	1.48	1.49	18	1	5	20	5	4
RL6	0.020796	0.018302	0.041467	0.007272	0.001973	0.008214	0.003657	0.018521	0.008768	0.12897	0.059769	0.028068	0.005631	0.026735	0.013136	0.009402	0.002635	0.012037	1.23163	0.311749	3	25.92	14.4	1.4	1.39	25.8	2	5	30	5	3
RL7	0.029296	0.016807	0.046665	0.015308	0.002289	0.004104	0.005119	0.024912	0.020014	0.164515	0.063472	0.044605	0.007408	0.029016	0.005632	0.005803	0.001136	0.006939	1.620408	0.413104	1	25.02	13.9	1.78	1.51	15.5	1	5	10	5	3
RL8	0.01111	0.011243	0.033022	0.004629	0.00168	0.004927	0.002839	0.016074	0.005653	0.091176	0.044265	0.015739	0.004519	0.021001	0.011498	0.009184	0.001422	0.010605	0.878396	0.268668	4	25.38	14.1	1.02	1.33	28	2	6	30	4	4
RL9	0.015667	0.016602	0.043329	0.005759	0.002002	0.005837	0.003866	0.01799	0.006175	0.117228	0.059932	0.021426	0.005868	0.023827	0.007277	0.007496	0.001684	0.00918	1.004978	0.264685	5	25.38	14.1	1.12	1.15	19.6	1	4	40	5	3
RL10	0.030648	0.031822	0.062527	0.0134	0.002842	0.010907	0.006152	0.027591	0.015434	0.201322	0.094348	0.044048	0.008994	0.038498	0.009951	0.008188	0.001891	0.010079	1.464509	0.362856	4	25.02	13.9	1.43	1.03	16.9	1	5	20	5	4
RL11	0.045304	0.017938	0.042184	0.015704	0.003366	0.00743	0.004614	0.018564	0.018461	0.173565	0.060122	0.061007	0.00798	0.025994	0.013429	0.008498	0.002397	0.010895	1.745417	0.415494											
RL12	0.029269	0.015262	0.048915	0.01082	0.002664	0.008725	0.005398	0.023907	0.013309	0.158269	0.064177	0.040089	0.008062	0.032632	0.010871	0.009187	0.003115	0.012302	1.218628	0.324544											
RL13	0.043576	0.043619	0.093907	0.014219	0.004145	0.009786	0.009202	0.036682	0.015745	0.270882	0.137526	0.057795	0.013347	0.046468	0.018325	0.016107	0.001954	0.018061	1.763137	0.454784	1	25.92	14.4	1.63	1.52	10.9	2	6	30	5	3
RL14	0.030837	0.03998	0.076874	0.011661	0.002994	0.012267	0.007787	0.031734	0.012651	0.226785	0.116854	0.042498	0.010781	0.044001	0.005486	0.006001	0.001129	0.00713	1.375359	0.353604	4	26.46	14.7	1.67	1.3	17.8	1	5	40	5	1
RL15	0.027805	0.029178	0.060446	0.010443	0.002558	0.011048	0.006631	0.024634	0.011795	0.184537	0.089624	0.038247	0.00919	0.035682	0.010101	0.007321	0.00158	0.008901	1.289439	0.330314	1	26.1	14.5	1.67	0.9	9.9	1	5	20	5	3
RL16	0.017373	0.013354	0.034389	0.006104	0.002222	0.004839	0.003134	0.014495	0.007188	0.103099	0.047743	0.023477	0.005357	0.019334	0.015416	0.01285	0.003043	0.015893	1.247046	0.319122	2	25.02	13.9	1.32	1.56	24.1	1	6	10	5	3
RL17	0.049151	0.038523	0.092612	0.016223	0.00411	0.015105	0.009204	0.035204	0.017258	0.277389	0.131135	0.065374	0.013314	0.050309	0.009734	0.006134	0.001382	0.007516	1.340685	0.368492	1	25.56	14.2	1.66	1.11	8.6	1	4	30	3	4
RL18	0.035766	0.020565	0.054785	0.014595	0.003102	0.009878	0.006843	0.025228	0.01603	0.186793	0.075351	0.050361	0.009945	0.035106	0.005634	0.003303	0.001061	0.004364	1.487	0.366828	5	24.48	13.6	1.54	1.25	16	1	4	40	5	4
RL19	0.034422	0.024945	0.058452	0.012213	0.002909	0.0058	0.006288	0.027091	0.014563	0.186683	0.083397	0.046635	0.009197	0.032891	0.011216	0.007183	0.001335	0.008518	1.460421	0.383669	2	26.64	14.8	1.39	1.18	15.4	1	7	30	5	4
RL20	0.037054	0.035671	0.069684	0.010841	0.004497	0.010256	0.007873	0.022752	0.010377	0.209005	0.105356	0.047895	0.01237	0.033008	0.010874	0.0086	0.001444	0.010044	1.564968	0.36254	2	23.76	13.2	1.55	1.22	23	1	5	20	4	3
RL21	0.017749	0.017403	0.044353	0.007	0.002023	0.006078	0.004673	0.019478	0.008125	0.126882	0.061756	0.024749	0.006696	0.025556	0.00339	0.004393	0.001153	0.005546	1.167615	0.302494	2	25.02	13.9	1.5	1.46	24.8	1	5	30	5	3
RL22	0.015594	0.014664	0.041853	0.007834	0.001633	0.006604	0.00366	0.022324	0.010217	0.124383	0.056516	0.023429	0.005293	0.028928	0.006958	0.005157	0.001509	0.006666	1.297548	0.34127	2	25.02	13.9	1.56	1.5	14	2	5	20	4	3
RL23	0.036074	0.030187	0.07503	0.014006	0.005084	0.014064	0.009412	0.035012	0.014113	0.232982	0.105217	0.05008	0.014496	0.049076	0.008304	0.00666	0.002036	0.008697	1.463057	0.370107	1	24.48	13.6	1.66	0.96	14.2	1	4	50	5	2
RL24	0.029062	0.022819	0.079967	0.009408	0.003944	0.016317	0.00965	0.032764	0.011407	0.215338	0.102786	0.03847	0.013594	0.049081	0.004768	0.00524	0.001728	0.006968	1.361978	0.31933	2	25.02	13.9	1.47	1.47	15.4	1	5	40	5	3
RL25	0.042135	0.036016	0.074349	0.013928	0.004223	0.008526	0.01077	0.033605	0.014147	0.237699	0.110365	0.056063	0.014993	0.042131	0.006806	0.006031	0.001021	0.007051	1.48965	0.322026	1	24.84	13.8	1.67	0.9	13.3	1	3	50	2	3
RL26	0.057442	0.049609	0.112054	0.021027	0.006187	0.010509	0.015454	0.046265	0.020289	0.338835	0.161664	0.078469	0.021641	0.056773	0.012538	0.010033	0.001814	0.011847	1.466193	0.369235	2	25.02	13.9	1.67	1.21	9.6	1	4	60	5	1
RL27	0.015141	0.014523	0.031475	0.005233	0.00202	0.004936	0.002576	0.01125	0.00572	0.092873	0.045998	0.020374	0.004595	0.016186	0.012275	0.007818	0.001628	0.009446	1.170709	0.28981	1	23.94	13.3	1.49	1.59	21.8	2	5	30	5	2
RL28	0.01755	0.019338	0.047098	0.007298	0.001984	0.006769	0.005364	0.021524	0.009237	0.136161	0.066435	0.024848	0.007348	0.028294	0.004694	0.004115	0.001001	0.005117	1.315699	0.340061	2	24.66	13.7	1.33	1.48	29.2	1	4	40	5	3
RL29	0.017413	0.011364	0.028668	0.007353	0.001971	0.005218	0.001824	0.012525	0.009601	0.095935	0.040031	0.024767	0.003794	0.017743	0.007167	0.004298	0.001462	0.00576	1.443233	0.351618	3	24.3	13.5	1.62	1.75	16.2	2	5	30	5	4
RL30	0.017053	0.015614	0.044265	0.007345	0.001897	0.007284	0.004113	0.02348	0.010777	0.131827	0.059879	0.024398	0.00601	0.030764	0.006839	0.007551	0.002251	0.009802	1.176324	0.287851	2	24.66	13.7	1.31	1.44	18.9	1	5	30	5	3
RL31	0.011564	0.017272	0.048484	0.006325	0.001827	0.006607	0.004746	0.022767	0.00724	0.126831	0.065755	0.017889	0.006572	0.029374	0.007527	0.008169	0.002013	0.010182	0.967843	0.304244	2	24.84	13.8	1.18	1.39	32.2	1	3	30	5	3
RL32	0.020711	0.023928	0.057724	0.007179	0.002411	0.005724	0.005933	0.02192	0.007281	0.152812	0.081652	0.027891	0.008345	0.027644	0.01119	0.010271	0.001886	0.012157	1.098169	0.291923	2	24.66	13.7	1.22	1.31	20.2	1	5	20	5	3
RL33	0.017083	0.021741	0.051049	0.007279	0.002103	0.008649	0.005023	0.02257	0.009634	0.145132	0.072791	0.024362	0.007126	0.031218	0.007505	0.007463	0.001859	0.009323	1.240161	0.319561	2	25.92	14.4	1.51	1.4	21.7	2	6	40	5	3
RL34	0.035337	0.025404	0.07193	0.014192	0.003626	0.009344	0.006746	0.034846	0.01623	0.217655	0.097335	0.049529	0.010371	0.044191	0.007085	0.00556	0.00143	0.00699	1.563059	0.398729	3	25.02	13.9	1.58	1.24	15.4	1	5	40	5	3
RL35	0.025693	0.023633	0.058652	0.012524	0.002821	0.012741	0.007032	0.028557	0.015643	0.187296	0.082285	0.038217	0.009853	0.041298	0.002855	0.002474	0.000847	0.003321	1.403796	0.370816	2	25.38	14.1	1.4	1.19	16.8	1	5	70	3	3
RL36	0.03498	0.020013	0.060112	0.012518	0.002929	0.009097	0.005455	0.028574	0.015461	0.189139	0.080124	0.047498	0.008385	0.037671	0.009243	0.009545	0.003211	0.012756	1.572808	0.398073	3	25.56	14.2	1.54	1.72	10.8	2	5	30	5	3
RL37	0.048939	0.043687	0.082956	0.023108	0.003164	0.006793	0.009486	0.0449	0.029081	0.292115	0.126643	0.072047	0.012651	0.051693	0.001649	0.001683	0.000000	0.001683	1.82609	0.461076	1	25.02	13.9	1.79	1.43	11.8	1	5	30	5	5
RL38	0.019475	0.027001	0.045821	0.008974	0.001785	0.006835	0.004391	0.019483	0.011148	0.144912	0.072822	0.028448	0.006176	0.026318	0.002217	0.001965	0.000000	0.001965	1.440444	0.367692	1	24.3	13.5	1.8	1.6	18.4	1	5	60	5	4
RL39	0.022657	0.021873	0.060938	0.010735	0.002222	0.004627	0.005964	0.029908	0.015088	0.174011	0.082812	0.033392	0.008186	0.034535	0.007538	0.007148	0.001227	0.008375	1.372039	0.375453	4	26.28	14.6	1.37	1.45	16.4	1	5	20	2	4
RL40	0.029408	0.018066	0.051127	0.010946	0.002558	0.005063	0.004598	0.023965	0.013418	0.15915	0.069193	0.040355	0.007157	0.029028	0.011968	0.01144	0.002261	0.0137	1.366649	0.359532	4	27.54	15.3	1.52	1.56	26.7	1	6	30	5	4
RL41	0.022557	0.021435	0.060537	0.010001	0.002712	0.009384	0.007425	0.027699	0.012375	0.174125	0.081972	0.032558	0.010137	0.037083	0.006822	0.005748	0.001683	0.007431	1.385031	0.37017	1	26.28	14.6	1.57	1.52	18	2	6	30	5	4
RL42	0.028145	0.041375	0.078964	0.014976	0.003943	0.019842	0.009202	0.039407	0.017235	0.253088	0.120339	0.043122	0.013145	0.059249	0.004317	0.004192	0.001468	0.00566	1.74393	0.428697	4	22.86	12.7	1.7	0.66	16	1	4	60	2	4
RL43	0.021164	0.019248	0.043277	0.007309	0.002155	0.004931	0.003629	0.016012	0.007581	0.125306	0.062526	0.028472	0.005784	0.020943	0.015133	0.012879	0.002145	0.015024	1.10938	0.299928	4	27.72	15.4	1.39	1.36	12.5	1	5	10	4	4
RL44	0.011949	0.01356	0.038716	0.007935	0.001642	0.004605	0.00346	0.024016	0.01255	0.118434	0.052276	0.019884	0.005102	0.028622	0.004735	0.004807	0.001095	0.005902	1.143477	0.328341	4	26.1	14.5	1.44	1.45	16.4	1	5	20	2	4
RL45	0.020047	0.015732	0.047178	0.007862	0.002252	0.0056	0.003648	0.022799	0.009599	0.134717	0.06291	0.027909	0.0059	0.0284	0.008502	0.009734	0.002235	0.011969	1.202547	0.337992	2	25.74	14.3	1.17	1.62	18.9	1	5	20	5	3
RL46	0.009645	0.013917	0.03738	0.005354	0.001471	0.004874	0.002622	0.017821	0.006064	0.099148	0.051297	0.014999	0.004093	0.022695	0.007884	0.010432	0.00239	0.012822	1.081787	0.320017	2	25.02	13.9	1.07	1.49	19.5	1	7	10	3	3
RL47	0.027764	0.023176	0.068244	0.009745	0.003059	0.01063	0.007079	0.033629	0.012579	0.195907	0.09142	0.03751	0.010139	0.044259	0.010523	0.011638	0.00346	0.015098	1.372232	0.371088			14.4	1.41	1.59	17.4	2	5	40	4	4
RL48	0.031794	0.023928	0.0703	0.013771	0.004701	0.014962	0.008156	0.032188	0.014915	0.214715	0.094227	0.045565	0.012858	0.04715	0.006097	0.007009	0.002833	0.009842	1.541188	0.383366	3	26.46	14.7	1.49	1.33	22.7	1	5	20	5	3
RL49	0.017178	0.020937	0.046571	0.005833	0.002119	0.008711	0.004937	0.017835	0.009724	0.120781	0.057193	0.023624	0.007	0.025777	0.010743	0.01398	0.002785	0.016844	0.843396	0.287735	3	23.94	13.3	1.24	1.27	21.1	1	5	20	5	3
RL50	0.01022	0.010308	0.02777	0.004355	0.001523	0.004485	0.002336	0.011509	0.004764	0.077267	0.038077	0.014575	0.003858	0.015994	0.00815	0.008581	0.00291	0.010672	0.959886	0.267741	2	26.1	14.5	1.09	1.46	28.2	1	7	10	5	3
RL51	0.032444	0.03046	0.07786	0.012352	0.004074	0.010899	0.008846	0.036633	0.014673	0.22824	0.10832	0.044796	0.01292	0.047532	0.008269	0.008433	0.001963	0.010396	1.395079	0.358315	5	24.48	13.6	1.32	1.45	28.8	1	5	10	5	4
RL52	0.023387	0.024348	0.077238	0.010211	0.002909	0.011436	0.007582	0.035672	0.012758	0.205536	0.101587	0.033599	0.010485	0.047108	0.009648	0.008362	0.002747	0.011109	1.035116	0.315471											
RL53	0.013695	0.011745	0.035625	0.005865	0.001712	0.006562	0.002081	0.015411	0.006771	0.101196	0.04737	0.01956	0.004522	0.022973	0.006661	0.006505	0.002418	0.008923	1.15135	0.2996	5	25.38	14.1	1.33	1.54	20.6	2	5	20	5	4
RL54	0.024558	0.02217	0.070167	0.009969	0.003047	0.012621	0.00716	0.035162	0.013126	0.19897	0.092337	0.034527	0.010297	0.048772	0.007618	0.007903	0.002974	0.010877	1.243217	0.352396	5	26.28	14.6	1.27	1.63	20.8	1	5	40	5	4
RL55	0.015495	0.012004	0.037669	0.007127	0.001971	0.007619	0.003115	0.018455	0.008878	0.112333	0.049673	0.022623	0.005086	0.026074	0.006213	0.006944	0.002636	0.009581	1.196762	0.328074	3	26.28	14.6	1.33	1.52	26.8	1	5	10	5	4

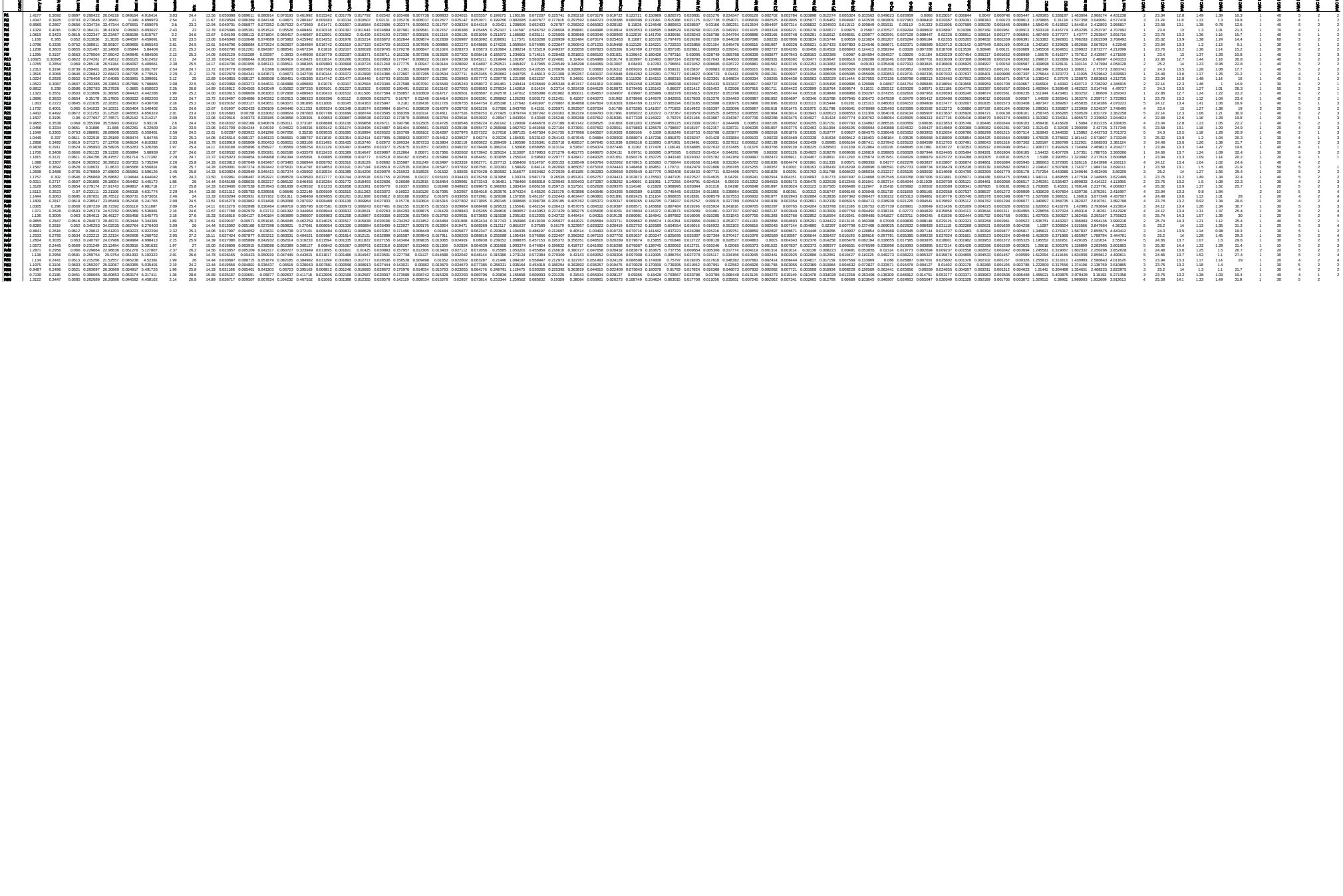
APPENDIX 3B RL03 - R Values

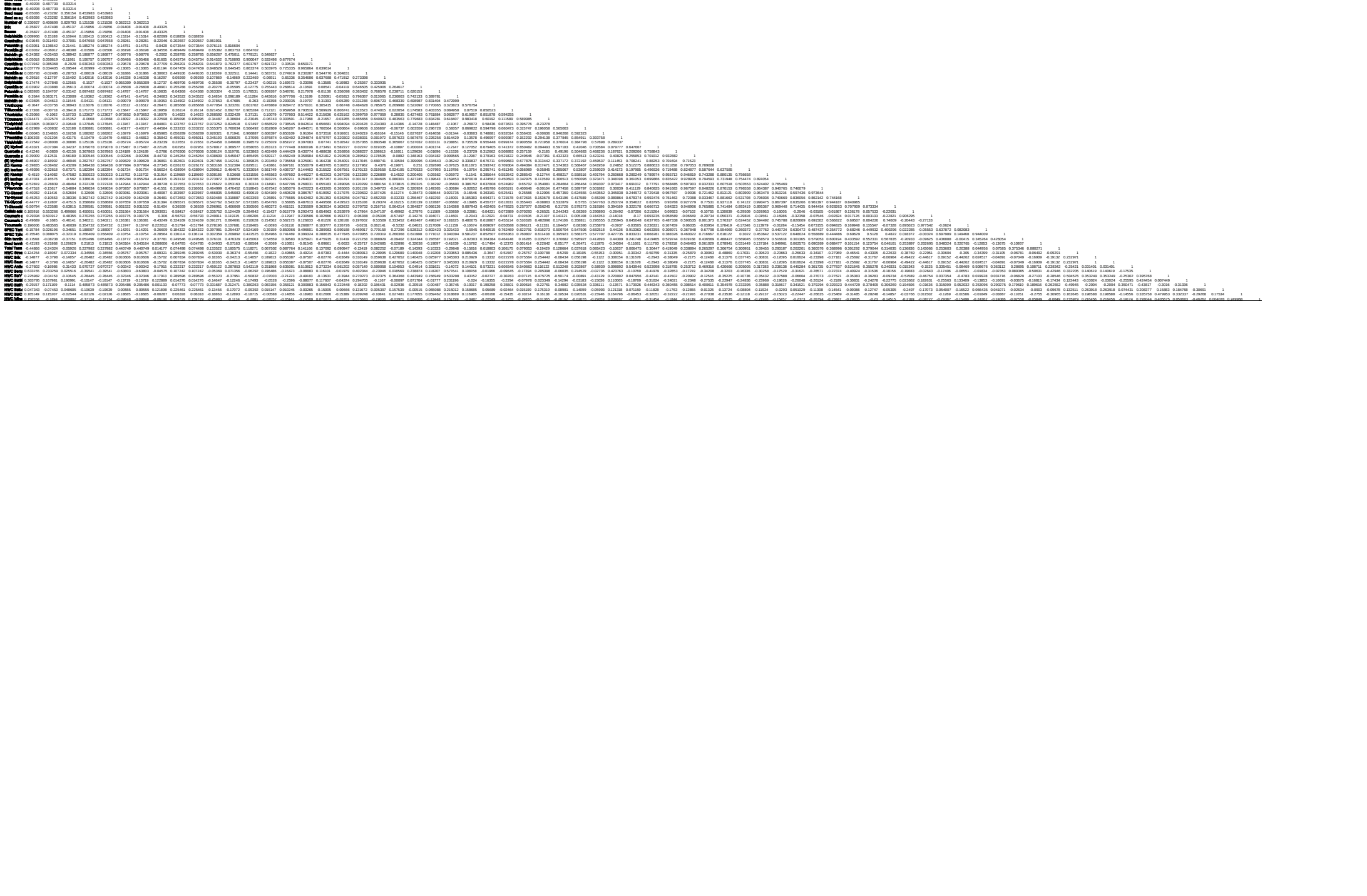
	Berry Weig	Skin Weigh	Seed Weig	Skin mass	Skin as a p	Seed mass	Seed as a	Number of	Brix	Baume	Delphinidin	Cyanidin	Petunidin g	Peonidin gl	Malvidin gl	Delphinidin	Cyanidin a	Petunidin a	Peonidin a	Malvidin ac	Delphinidin	Cyanidin c	Petunidin c	Peonidin c	Malvidin co	TAnthocya	TGlucoside	TAcetylglu	TCoumaro	TDelphinid	TCyanidini	TPetunidin	TPeonidins	TMalvinidin	(A) Myricet	Quercetin	Quercetin	(B) Myricet	(C) Kaemp	(D) Isorhar	(E) Kaemp	(F) Isorhan	(G) Syringe	TFlavonols	TQ-Glycos	TM-Glycos	TK-Glycos	TI-Glycosid	Caffeic aci	Coumaric	Coumaric 2	Tcoumaric	SPEC Tan	SPEC Tph	HWC Stre	HWC Brix	HWC Baum	HWC Anth	HWC Berry	HWC BMY	HWC BMS	HWC BMV	HWC BMF	HWC BML	HWC Wine
Berry Weig	1																																																																
Skin Weigh	0.631206	1																																																														
Seed Weig	0.301844	0.202351	1																																																												
Skin mass	-0.22347	0.60985	-0.0484	1																																																										
Skin as a p	-0.22347	0.60985	-0.0484	1	1																																																								
Seed mass	-0.75357	-0.46398	0.381455	0.180735	0.180735	1																																																						
Seed as a	-0.75357	-0.46398	0.381455	0.180735	0.180735	1	1																																																				
Number of	0.094699	0.084452	0.830313	0.010721	0.010721	0.473195	0.473195	1																																																			
Brix	0.304732	0.052011	0.127747	-0.23338	-0.23338	-0.23087	-0.23087	0.054049	1																																																		
Baume	0.304732	0.052011	0.127747	-0.23338	-0.23338	-0.23087	-0.23087	0.054049	1	1																																																	
Delphinidin	0.118295	0.290625	-0.29991	0.240616	0.240616	-0.31234	-0.31234	-0.22173	-0.11371	-0.11371	1																																																		
Cyanidin	0.116257	0.196219	-0.18614	0.12067	0.12067	-0.25116	-0.25116	-0.18116	0.281435	0.281435	0.532429	1																																																	
Petunidin g	0.061429	0.263737	-0.36475	0.26298	0.26298	-0.29509	-0.29509	-0.256	-0.14573	-0.14573	0.951129	0.400291	1																																															
Peonidin gl	0.322689	0.175635	-0.10384	-0.12268	-0.12268	-0.36297	-0.36297	-0.15468	0.313131	0.313131	0.663035	0.687974	0.556226	1																																														
Malvidin gl	-0.21298	0.070173	-0.34705	0.297833	0.297833	-0.00564	-0.00564	-0.19262	-0.26156	-0.26156	0.676926	0.085967	0.835455	0.23726	1																																													
Delphinidin	0.019402	0.155043	-0.19244	0.18013	0.18013	-0.13774	-0.13774	-0.1177	-0.0197	-0.0197	0.849516	0.405588	0.840976	0.572661	0.729315	1																																													
Cyanidin a	-0.10709	0.147657	-0.11199	0.301349	0.301349	0.003252	0.003252	-0.08147	0.26096	0.26096	0.224748	0.823925	0.142829	0.280683	0.03225	0.231915	1																																												
Petunidin a	0.009854	0.243933	-0.23453	0.297618	0.297618	-0.16315	-0.16315	-0.18626	-0.05367	-0.05367	0.79903	0.408	0.826789	0.494125	0.694702	0.927969	0.277048	1																																											
Peonidin a	0.212107	0.014125	0.111308	-0.21544	-0.21544	-0.12505	-0.12505	0.023612	0.438566	0.438566	0.142926	0.413707	0.049268	0.660673	-0.09691	0.340734	0.255092	0.350258	1																																										
Malvidin ac	-0.39431	-0.05551	-0.24898	0.321683	0.321683	0.230917	0.230917	-0.08922	-0.24349	-0.24349	0.350556	-0.06857	0.524937	-0.0189	0.822377	0.616798	0.053519	0.658211	0.084811	1																																									
Delphinidin	-0.30812	-0.53192	-0.11894	-0.35108	-0.35108	0.216231	0.216231	-0.00041	0.048413	0.048413	-0.33666	-0.39664	-0.13439	-0.35328	0.258188	-0.04511	-0.19266	-0.08451	-0.10238	0.394896	1																																								
Cyanidin c	0.34868	-0.01396	-0.00529	-0.39676	-0.39676	-0.32151	-0.32151	-0.08964	0.360495	0.360495	0.302879	0.428189	0.19871	0.759592	-0.05784	0.271001	0.098848	0.206572	0.769424	-0.17137	-0.13851	1																																							
Petunidin c	-0.24211	-0.08352	-0.25845	0.123164	0.123164	0.0767	0.0767	-0.10806	-0.20064	-0.20064	0.402991	-0.05012	0.568518	0.12968	0.795404	0.542684	-0.04673	0.544865	0.144858	0.799229	0.390478	0.197111	1																																						
Peonidin c	0.300687	-0.03119	0.079154	-0.37061	-0.37061	-0.21191	-0.21191	-0.01895	0.36514	0.36514	0.079492	0.276543	-0.01107	0.663679	-0.13951	0.104732	0.03936	0.034018	0.801038	-0.17507	-0.08974	0.905391	0.168654	1																																					
Malvidin co	-0.39224	-0.24221	-0.18744	0.079471	0.079471	0.285149	0.285149	-0.05275	-0.2982	-0.2982	0.123676	-0.26647	0.320761	-0.10636	0.732633	0.327205	-0.1282	0.303173	0.002451	0.816705	0.580717	-0.02574	0.892586	0.058262	1																																				
TAnthocya	-0.23847	-0.01518	-0.31453	0.209942	0.209942	0.045527	0.045527	-0.16822	-0.20695	-0.20695	0.605239	0.09437	0.759272	0.291311	0.957491	0.736949	0.052078	0.708206	0.125391	0.882987	0.32982	0.109953	0.897581	0.06519	0.838733	1																																			
TGlucoside	-0.10885	0.136586	-0.35754	0.27384	0.27384	-0.11476	-0.11476	-0.22281	-0.18829	-0.18829	0.820376	0.266549	0.930063	0.443683	0.97065	0.821748	0.115273	0.779125	0.030421	0.73272	0.105734	0.104364	0.739108	-0.01862	0.603542	0.928789	1																																		
TAcetylglu	-0.33335	-0.02422	-0.2381	0.298334	0.298334	0.178641	0.178641	-0.09636	-0.17137	-0.17137	0.425975	0.040939	0.573495	0.118932	0.811469	0.704666	0.120063	0.74507	0.231282	0.985828	0.33605	-0.04139	0.798768	-0.06043	0.772328	0.893032	0.755384	1																																						
TCoumaro	-0.31222	-0.26475	-0.17317	-0.03438	-0.03438	0.218908	0.218908	-0.05818	-0.18525	-0.18525	0.12624	-0.20238	0.303688	0.032043	0.674098	0.339019	-0.1195	0.300333	0.174346	0.748533	0.589083	0.175967	0.901225	0.265792	0.9753	0.820898	0.57376	0.730512	1																																				
TDelphinid	-0.04515	0.01855	-0.35567	0.068264	0.068264	-0.19135	-0.19135	-0.21547	-0.07962	-0.07962	0.857033	0.340741	0.912776	0.505325	0.846856	0.893874	0.141438	0.81779	0.132136	0.6079	0.191222	0.243741	0.639628	0.043101	0.451578	0.820388	0.913249	0.659915	0.459957	1																																			
TCyanidini	0.17935	0.154667	-0.14849	-0.00043	-0.00043	-0.28024	-0.28024	-0.16815	0.354982	0.354982	0.504928	0.964013	0.366008	0.772431	0.045683	0.407307	0.760103	0.3947	0.580986	-0.09596	-0.35131	0.642995	0.022957	0.497128	-0.21361	0.109953	0.237612	0.033366	-0.10114	0.339237	1																																		
TPetunidin	-0.02056	0.196835	-0.35742	0.259413	0.259413	-0.20881	-0.20881	-0.23436	-0.16306	-0.16306	0.886655	0.324739	0.96905	0.494042	0.89594	0.865956	0.127206	0.867091	0.123884	0.675233	-0.0014	0.22121	0.742921	0.04236	0.506442	0.872145	0.959061	0.721546	0.496442	0.925981	0.318476	1																																	
TPeonidins	0.329588	0.072437	0.005675	-0.26624	-0.26624	-0.29315	-0.29315	-0.07891	0.393622	0.393622	0.379488	0.528624	0.270473	0.898804	0.033142	0.381771	0.196799	0.313226	0.857436	-0.07487	-0.22848	0.91313	0.164687	0.91598	-0.02389	0.191418	0.209719	0.069199	0.167503	0.285191	0.699312	0.278012	1																																
TMalvinidin	-0.32924	-0.05533	-0.29942	0.254559	0.254559	0.14275	0.14275	-0.13831	-0.2898	-0.2898	0.474113	-0.05797	0.661169	0.085051	0.949664	0.6284	-0.01317	0.611709	-0.03084	0.924285	0.414961	-0.07736	0.88985	-0.09337	0.896203	0.975914	0.871684	0.900801	0.842074	0.728808	-0.06787	0.787708	-0.00736	1																															
(A) Myricet	-0.32795	0.053306	-0.33849	0.409627	0.409627	0.08552	0.08552	-0.11287	-0.29625	-0.29625	0.547004	0.041274	0.649782	0.056431	0.779794	0.579494	0.064449	0.564547	-0.17554	0.751155	0.108167	-0.24154	0.59529	-0.31467	0.555205	0.735357	0.742695	0.723512	0.458112	0.632866	-0.04103	0.69409	-0.14768	0.760009	1																														
Quercetin	-0.50356	-0.22555	-0.44518	0.217403	0.217403	0.200371	0.200371	-0.14314	-0.3206	-0.3206	0.387837	0.09883	0.452999	0.067662	0.53412	0.406874	0.058079	0.43089	-0.03794	0.621624	0.2051	-0.1003	0.43361	-0.19594	0.429723	0.551626	0.515962	0.605353	0.374273	0.511714	0.044609	0.494276	-0.06405	0.560944	0.779581	1																													
Quercetin	-0.34944	-0.16329	-0.37983	0.149415	0.149415	0.08465	0.08465	-0.09124	-0.13307	-0.13307	0.403314	0.169082	0.443867	0.198091	0.513577	0.41101	0.092158	0.353231	0.023257	0.509369	0.203576	0.032807	0.43352	-0.04185	0.40092	0.53385	0.517312	0.506446	0.382244	0.525305	0.142649	0.47663	0.079896	0.515431	0.810991	0.890311	1																												
(B) Myricet	-0.3812	-0.11962	-0.31149	0.242191	0.242191	0.166076	0.166076	-0.09946	-0.26592	-0.26592	0.353331	-0.0594	0.51054	-0.04332	0.766603	0.488617	0.037264	0.470989	-0.17657	0.805927	0.382697	-0.29916	0.597035	-0.32424	0.668671	0.749812	0.6849	0.762618	0.575647	0.582941	-0.13426	0.58394	-0.20015	0.802717	0.923974	0.760696	0.779635	1																											
(C) Kaemp	-0.35212	-0.06187	-0.35145	0.281544	0.281544	0.107443	0.107443	-0.10382	-0.28779	-0.28779	0.592733	0.158042	0.600033	0.200721	0.667826	0.547866	0.102026	0.440478	-0.10837	0.543429	0.054685	-0.03821	0.521971	-0.10843	0.470169	0.642081	0.673238	0.534295	0.419966	0.64143	0.113066	0.621805	0.0279	0.626633	0.858069	0.762646	0.866996	0.769654	1																										
(D) Isorhar	-0.44094	-0.31245	-0.26897	0.0422	0.0422	0.279537	0.279537	-0.02887	-0.16114	-0.16114	0.246258	0.111236	0.258161	0.170834	0.395193	0.162914	0.023615	0.004485	-0.16614	0.20938	0.192817	0.081238	0.365839	0.080141	0.401992	0.393889	0.38463	0.179077	0.401828	0.340043	0.10781	0.27852	0.090206	0.386195	0.470605	0.545922	0.685499	0.470769	0.682725	1																									
(E) Kaemp	-0.44105	-0.18471	-0.36719	0.223635	0.223635	0.17718	0.17718	-0.06777	-0.21847	-0.21847	0.367075	0.12798	0.404812	0.069923	0.508886	0.387645	0.139818	0.32081	-0.10873	0.507905	0.222617	-0.11785	0.398536	-0.18035	0.397369	0.502781	0.489865	0.487795	0.34848	0.498875	0.07172	0.435344	-0.068	0.511478	0.814412	0.876175	0.957456	0.79132	0.897868	0.661706	1																								
(F) Isorhan	-0.3084	-0.24125	-0.32425	0.011564	0.011564	0.090679	0.090679	-0.07805	-0.04129	-0.04129	0.205934	0.025479	0.283309	0.103682	0.466996	0.312851	0.037608	0.23	0.037992	0.51534	0.401081	0.000328	0.42188	0.013537	0.491523	0.517046	0.430131	0.500536	0.485698	0.432706	0.023638	0.343738	0.062545	0.522147	0.737912	0.780025	0.932138	0.81054	0.77028	0.654591	0.892096	1																							
(G) Syringe	-0.30166	-0.1277	-0.254	0.152677	0.152677	0.1332	0.1332	-0.07627	-0.15287	-0.15287	0.205585	-0.12991	0.397289	-0.10009	0.719423	0.406427	0.000969	0.379604	-0.15915	0.795217	0.519888	-0.31293	0.566347	-0.29433	0.697247	0.718076	0.613292	0.744881	0.615245	0.506896	-0.19345	0.483539	-0.21066	0.784985	0.819584	0.648643	0.682716	0.958221	0.613092	0.390643	0.678684	0.789892	1																						
TFlavonols	-0.40805	-0.16233	-0.39013	0.211134	0.211134	0.139277	0.139277	-0.10591	-0.21439	-0.21439	0.412807	0.084085	0.49621	0.107745	0.64121	0.460478	0.069729	0.412867	-0.06843	0.651116	0.269488	-0.09853	0.523506	-0.15518	0.531209	0.647424	0.611551	0.630159	0.480518	0.574604	0.036741	0.545845	-0.03133	0.657011	0.900892	0.908334	0.971949	0.897162	0.886234	0.664992	0.95217	0.931464	0.811686	1																					
TQ-Glycos	-0.41177	-0.18903	-0.41216	0.176788	0.176788	0.126917	0.126917	-0.11155	-0.20146	-0.20146	0.408228	0.149042	0.458344	0.157932	0.533786	0.420051	0.082695	0.38915	0.002638	0.561258	0.209292	-0.01249	0.4446	-0.09633	0.421121	0.553616	0.530028	0.553634	0.389223	0.533982	0.112304	0.494893	0.032041	0.544342	0.820773	0.951019	0.987467	0.79294	0.852924	0.654591	0.953685	0.903171	0.688305	0.97467	1																				
TM-Glycos	-0.34739	0.007206	-0.33632	0.370444	0.370444	0.108675	0.108675	-0.11095	-0.29254	-0.29254	0.502795	0.014592	0.621904	0.03023	0.78809	0.563665	0.058056	0.547764	-0.17849	0.777451	0.184287	-0.26085	0.604828	-0.32206	0.594439	0.750476	0.738326	0.745138	0.496972	0.62896	-0.06695	0.674778	-0.16416	0.783168	0.994603	0.786329	0.814834	0.958668	0.847151	0.477816	0.820549	0.76885	0.869673	0.913598	0.825721	1																			
TK-Glycos	-0.42519	-0.15383	-0.37049	0.244751	0.244751	0.161179	0.161179	-0.07941	-0.2427	-0.2427	0.438709	0.139193	0.468627	0.108428	0.564627	0.441189	0.132071	0.361462	-0.11093	0.528687	0.179777	-0.09779	0.441895	-0.1638	0.426369	0.552833	0.552121	0.511259	0.376076	0.549766	0.08494	0.497323	-0.04228	0.554878	0.843968	0.862536	0.952065	0.801896	0.94574	0.681629	0.992202	0.876448	0.674446	0.953609	0.945297	0.845406	1																		
TI-Glycosid	-0.37527	-0.28325	-0.33278	0.022218	0.022218	0.157918	0.157918	-0.06872	-0.08265	-0.08265	0.235295	0.054748	0.298111	0.133335	0.481761	0.290418	0.036191	0.176915	-0.02375	0.459668	0.36723	0.026037	0.438019	0.035766	0.502633	0.519535	0.45028	0.438754	0.498136	0.438092	0.052256	0.35068	0.076355	0.520985	0.712408	0.768447	0.928814	0.767875	0.804435	0.816872	0.89071	0.970783	0.726688	0.92179	0.896901	0.738303	0.885094	1																	
Caffeic aci	0.260888	0.652961	0.057588	0.531594	0.531594	-0.19366	-0.19366	0.022392	-0.03512	-0.03512	0.415801	0.256247	0.315496	0.304	0.094072	0.348122	0.108859	0.436111	0.26122	0.107001	-0.65435	0.107611	0.014726	0.081041	-0.20532	0.074322	0.189161	0.171272	-0.21288	0.100475	0.230528	0.287067	0.228194	0.005922	0.137552	0.006357	-0.03	-0.10077	0.095021	-0.22251	-0.084	-0.20812	-0.20919	-0.05182	-0.01816	0.074996	-0.0351	-0.22942	1																
Coumaric	0.368676	0.519529	0.165604	0.256514	0.256514	-0.22434	-0.22434	0.109786	0.106056	0.106056	0.356504	0.270339	0.210271	0.413392	-0.04878	0.334764	0.074338	0.36777	0.456427	-0.01384	-0.57826	0.328374	-0.05345	0.287825	-0.27218	-0.01585	0.073011	0.078509	-0.22334	0.083653	0.307834	0.185568	0.409328	-0.11808	0.029538	-0.03764	0.000753	-0.18411	0.057252	-0.21251	-0.08588	-0.14079	-0.27599	-0.07111	-0.01254	-0.02797	-0.04717	-0.17488	0.900607	1															
Coumaric 2	0.38847	0.327562	0.349181	0.012911	0.012911	-0.12483	-0.12483	0.235952	0.275556	0.275556	0.20658	0.210812	0.058773	0.468181	-0.09012	0.17037	0.03289	0.067702	0.366589	-0.22301	-0.46959	0.407427	-0.03729	0.491982	-0.17807	-0.05381	0.014933	-0.14801	-0.09166	-0.02215	0.286116	0.040799	0.513924	-0.15594	-0.11182	-0.33169	-0.10364	-0.24751	0.026022	0.113378	-0.17061	-0.11785	-0.28831	-0.16758	-0.18532	-0.15033	-0.11855	-0.05393	0.504512	0.657617	1														
Tcoumaric	0.394793	0.509956	0.214182	0.220396	0.220396	-0.2167	-0.2167	0.142932	0.148121	0.148121	0.346097	0.273871	0.190829	0.449551	-0.0604	0.32001	0.07002	0.326363	0.464641	-0.05878	-0.58975	0.364592	-0.05322	0.348018	-0.26853	-0.0248	0.065105	0.035401	-0.20886	0.066314	0.321574	0.166075	0.455751	-0.13309	0.001478	-0.10191	-0.02122	-0.20844	0.054072	-0.15642	-0.10886	-0.14433	-0.29502	-0.09569	-0.04973	-0.05544	-0.06504	-0.15978	0.870656	0.987294	0.768974	1													
SPEC Tan	-0.32307	-0.05981	-0.30866	0.246134	0.246134	0.138667	0.138667	-0.14503	-0.24229	-0.24229	0.486082	0.015335	0.673211	0.121085	0.926252	0.61873	0.069852	0.606686	-0.04001	0.88176	0.416205	-0.07363	0.802148	-0.11662	0.827777	0.938846	0.861782	0.8617	0.773313	0.738375	-0.00284	0.771898	-0.00232	0.955679	0.760222	0.616183	0.561044	0.816966	0.622378	0.386686	0.563985	0.575498	0.806232	0.693848	0.594454	0.787191	0.592425	0.561848	-0.07281	-0.16577	-0.2386	-0.191	1												
SPEC Tph	-0.21526	-0.03163	-0.24019	0.169807	0.169807	0.081752	0.081752	-0.1191	-0.10496	-0.10496	0.40663	0.06658	0.592944	0.193878	0.843457	0.584894	0.092506	0.581929	0.113012	0.848577	0.46223	0.016063	0.742181	-0.00413	0.785881	0.890363	0.790372	0.846188	0.761052	0.685449	0.065895	0.696309	0.110666	0.89108	0.709921	0.588509	0.589209	0.820342	0.554568	0.369287	0.536662	0.649517	0.844838	0.69933	0.603982	0.750685	0.553063	0.612802	-0.08926	-0.13016	-0.19079	-0.1507	0.933286	1											
HWC Stre	0.034787	-0.25099	0.242166	-0.37548	-0.37548	0.150323	0.150323	0.290791	0.289261	0.289261	-0.21661	-0.20917	-0.241	-0.00207	-0.15513	-0.16182	-0.19879	-0.26885	0.125168	-0.10934	-0.00182	0.117168	-0.0367	0.181285	0.017437	-0.10633	-0.17339	-0.11096	0.048522	-0.22434	-0.13961	-0.21808	0.10356	-0.09957	-0.18226	-0.21647	-0.13441	-0.12578	-0.10984	0.058985	-0.18135	-0.0556	-0.10457	-0.14404	-0.16605	-0.16959	-0.16448	-0.0233	-0.11638	-0.03743	0.207009	0.008613	-0.14025	-0.11259	1										
HWC Brix	0.169959	0.132911	0.201075	0.029682	0.029682	-0.0636	-0.0636	0.180681	0.547824	0.547824	-0.14006	0.079119	-0.14249	0.004634	-0.18031	-0.0312	0.178563	0.045077	0.302004	0.008028	0.0044	0.098526	0.003282	0.091684	-0.08425	-0.10269	-0.16595	0.047831	-0.04999	-0.13036	0.115011	-0.09318	0.096984	-0.12084	-0.02215	-0.13211	-0.02394	-0.04359	-0.13401	-0.17889	-0.09519	7.62E-05	0.007827	-0.05355	-0.0622	-0.02837	-0.10795	-0.05763	0.108565	0.193928	0.173297	0.20091	-0.12883	0.003681	0.191471	1									
HWC Baum	0.178436	0.139334	0.18983	0.028715	0.028715	-0.07758	-0.07758	0.175665	0.552858	0.552858	-0.1297	0.081466	-0.13653	0.019356	-0.17599	-0.01767	0.173315	0.048371	0.310017	0.005996	-0.00169	0.109435	0.000861	0.108529	-0.08409	-0.09752	-0.15891	0.047977	-0.04665	-0.12217	0.11952	-0.08924	0.112683	-0.11905	-0.01884	-0.13156	-0.01504	-0.04426	-0.12893	-0.16842	-0.08849	0.013431	0.010042	-0.0469	-0.05595	-0.02611	-0.10157	-0.04379	0.114	0.206619	0.193205	0.215477	-0.12519	0.011616	0.191471	1	1								
HWC Anth	-0.34616	-0.08163	-0.51452	0.242943	0.242943	-0.00479	-0.00479	-0.40323	-0.2496	-0.2496	0.328363	0.012412	0.534386	-0.06245	0.755709	0.338472	0.065811	0.410291	-0.30681	0.684081	0.352365	-0.24537	0.591499	-0.32776	0.604802	0.693178	0.666942	0.623427	0.507996	0.539042	-0.06069	0.595449	-0.23302	0.754373	0.63842	0.59196	0.503949	0.688578	0.483704	0.354293	0.511881	0.48952	0.671881	0.600165	0.546377	0.662166	0.51341	0.486448	-0.13392	-0.28916	-0.3938	-0.32658	0.78319	0.677689	-0.3063	-0.13045	-0.13269	1							
HWC Berry	0.830471	0.419205	0.295792	-0.2911	-0.2911	-0.60817	-0.60817	0.139912	0.402322	0.402322	0.089625	0.17887	0.081821	0.319978	-0.14138	0.03129	0.037688	0.019474	0.247257	-0.34659	-0.12729	0.393686	-0.13923	0.34614	-0.27776	-0.14813	-0.04683	-0.28026	-0.17699	0.020216	0.258634	0.022843	0.354863	-0.24653	-0.38891	-0.57057	-0.44224	-0.39403	-0.46051	-0.47673	-0.51384	-0.36884	-0.26692	-0.46902	-0.49725	-0.3964	-0.5083	-0.43382	0.033588	0.138129	0.278341	0.174299	-0.22281	-0.12562	0.025623	0.20288	0.213071	-0.22542	1						
HWC BMY	0.346355	-0.01626	0.278481	-0.36406	-0.36406	-0.13741	-0.13741	0.192532	0.120845	0.120845	-0.2551	-0.05379	-0.38796	-0.00975	-0.51322	-0.27272	-0.09683	-0.34739	0.224431	-0.5079	-0.12463	0.307383	-0.25777	0.346335	-0.27609	-0.43237	-0.46648	-0.46767	-0.18561	-0.34224	0.04706	-0.39289	0.192512	-0.47623	-0.61011	-0.52943	-0.51633	-0.59811	-0.42508	-0.26431	-0.47912	-0.47518	-0.56538	-0.56412	-0.53298	-0.61637	-0.47272	-0.44666	-0.09142	0.017822	0.200731	0.055908	-0.53621	-0.49897	0.265863	-0.01679	-0.02001	-0.59914	0.318469	1					
HWC BMS	0.289193	0.290156	-0.04414	0.082438	0.082438	-0.28717	-0.28717	-0.12458	0.34956	0.34956	0.204463	0.376979	0.171238	0.436964	-0.05186	0.061462	0.297053	0.069884	0.240397	-0.258	-0.38473	0.307669	-0.1818	0.317989	-0.28771	-0.08083	0.062915	-0.19232	-0.21858	-0.0049	0.409649	0.081592	0.397036	-0.18325	-0.21551	-0.26435	-0.23098	-0.27036	-0.22302	-0.13204	-0.26829	-0.23292	-0.24514	-0.25267	-0.248	-0.23392	-0.26046	-0.21974	0.162784	0.14075	0.243767	0.169525	-0.08757	-0.07397	-0.00677	0.074468	0.095579	-0.05993	0.387213	0.064078	1				
HWC BMV	0.382678	0.273178	0.12902	-0.04933	-0.04933	-0.27321	-0.27321	0.105514	0.224615	0.224615	-0.07057	0.198038	-0.10557	0.220524	-0.22177	-0.09396	0.186749	-0.07606	0.311687	-0.21669	-0.19059	0.267699	-0.11669	0.346229	-0.15238	-0.15292	-0.15709	-0.16421	-0.07939	-0.17944	0.254427	-0.11688	0.318281	-0.21642	-0.3308	-0.37973	-0.37375	-0.33534	-0.37224	-0.30232	-0.43952	-0.33623	-0.24934	-0.37922	-0.38458	-0.33722	-0.42865	-0.35304	0.15476	0.191373	0.167973	0.197353	-0.22507	-0.1327	-0.0085	0.345246	0.343441	-0.30182	0.433773	0.216273	0.30414	1			
HWC BMF	-0.48442	-0.26037	-0.32143	0.152207	0.152207	0.268148	0.268148	-0.10355	-0.1057	-0.1057	0.079885	-0.10928	0.172682	-0.131	0.29928	0.015387	-0.03632	0.023089	-0.28941	0.20181	0.246253	-0.15514	0.225499	-0.16912	0.284223	0.252147	0.238779	0.148994	0.238431	0.204417	-0.13238	0.186147	-0.19046	0.298385	0.396278	0.46924	0.486252	0.409417	0.452703	0.497811	0.542081	0.494332	0.346508	0.495332	0.491712	0.406083	0.526861	0.536149	-0.26893	-0.31196	-0.28348	-0.32366	0.36864	0.308187	-0.05594	-0.27465	-0.26268	0.381308	-0.3606	-0.27039	-0.02471	-0.46867	1		
HWC BML	0.345975	0.228536	0.00426	-0.05287	-0.05287	-0.35566	-0.35566	0.052851	0.041421	0.041421	0.244296	0.209172	0.255815	0.226354	0.106503	0.248768	0.088208	0.32356	0.183724	0.018394	-0.13499	0.313716	0.267079	0.189642	-0.00655	0.127465	0.167864	0.071722	0.044905	0.192523	0.261742	0.29877	0.227328	0.057449	-0.01316	-0.12387	-0.09607	-0.08752	-0.04805	-0.1349	-0.11383	-0.17025	-0.12311	-0.10778	-0.108	-0.03375	-0.09734	-0.17293	0.188238	0.179042	0.236438	0.200712	-0.03619	-0.07063	-0.08937	0.065765	0.057492	-0.016	0.336187	0.227436	0.127528	0.133519	-0.12605	1	
HWC Wine	0.159689	0.133548	0.064258	0.002921	0.002921	-0.09029	-0.09029	-0.01654	0.214072	0.214072	-0.19291	0.002745	-0.12165	-0.0534	-0.00272	-0.13415	0.037206	-0.11292	-0.04513	0.009898	0.129818	-0.1902	-0.17214	-0.11173	-0.00489	-0.03596	-0.04074	-0.00903	-0.03039	-0.12981	-0.054	-0.14846	-0.08455	-0.00085	-0.10789	-0.17486	-0.19637	0.01098	-0.28575	-0.11716	-0.23479	-0.06731	0.152145	-0.13193	-0.19348	-0.07699	-0.25356	-0.08884	-0.13549	-0.18374	-0.1224	-0.1816	0.080328	0.1767	0.147435	0.140272	0.151288	-0.05262	0.118576	-0.00658	-0.0143	0.172753	-0.19711	-0.24529	1

APPENDIX 3B RL03 - R2 Values

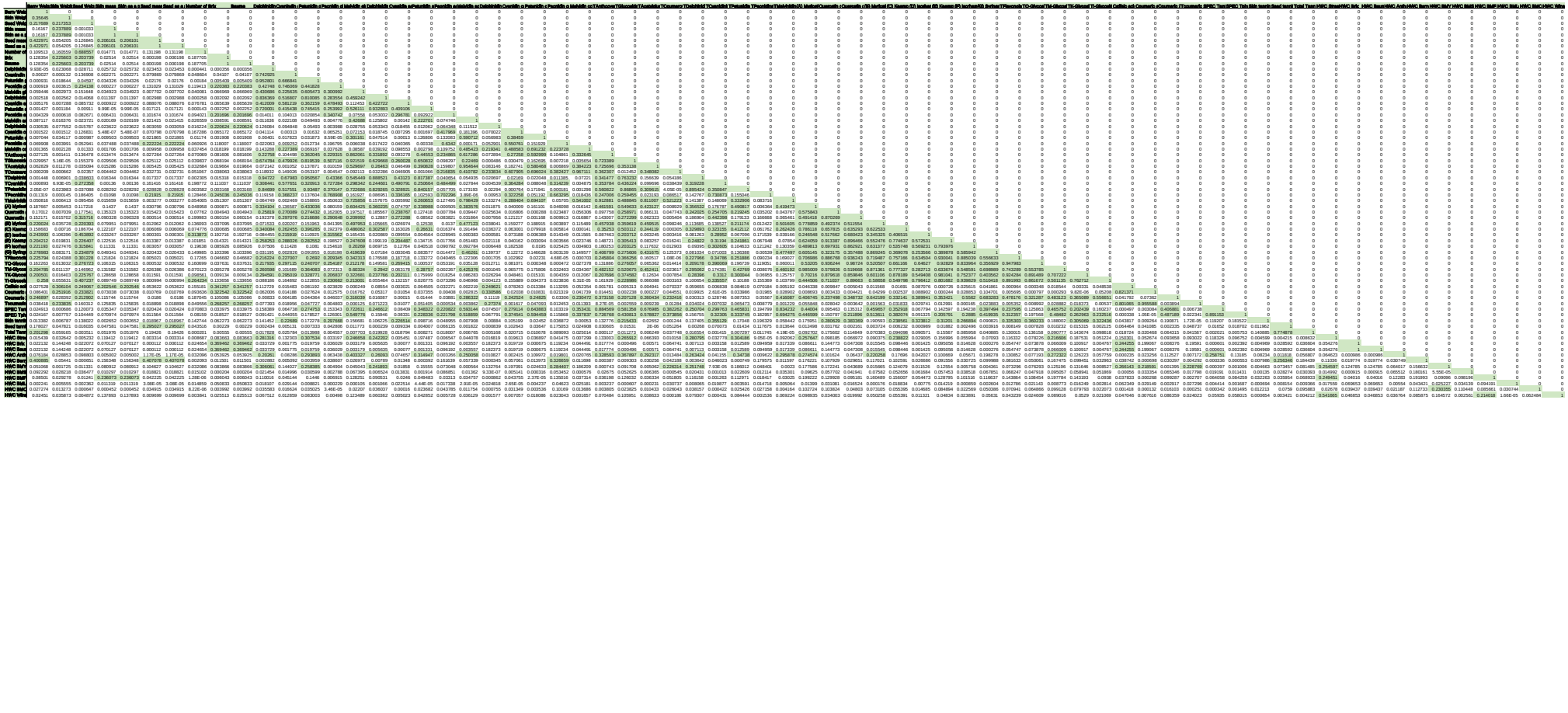


APPENDIX 3B RL04 - Mean Values





APPENDIX 3B RL04 - R2 Values



APPENDIX 4A

Maps of experimental plots

(Light induction of flavonol biosynthesis)

NOTE: This figure is included on page 256 of the print copy of the thesis held in the University of Adelaide Library.

Figure 4A.1 Map of Slate Creek Vineyard, Willunga. Light induction experiments were conducted in a commercial vineyard, Harvey's Slate Creek, in Willunga, South Australia (34^{o} 46' South, 138^{o} 32' East). Varieties sampled included Shiraz & Chardonnay vines grown on modified Scott-Henry trellises. The experimental plot included a single block each for 180 Shiraz vines (6 rows & ten panels) & 72 Chardonnay vines (four rows & six panels). Boxes were applied to both sides of the row & a two-panel & two-row buffer was employed to avoid end effects. Map downloaded from Google Earth (Nov 2005).

NOTE: This figure is included on page 257 of the print copy of the thesis held in the University of Adelaide Library.

Figure 4A.2 Map of Coombe Vineyard, Adelaide University Waite Campus. Diurnal experiments were conducted at the Coombe Vineyard on the Waite Campus of Adelaide University (Adelaide, South Australia, latitude 34° 56' South, longitude 138° 36' East). The experiment plot included two N-S facing rows of 180 Shiraz (clone BVRC12S) vines, & a two-panel & five-row buffer was employed to avoid end effects. Map downloaded from Google Earth (Nov 2005).

APPENDIX 4B

Supplementary results for Chapter 4 (Light induction of flavonol biosynthesis)

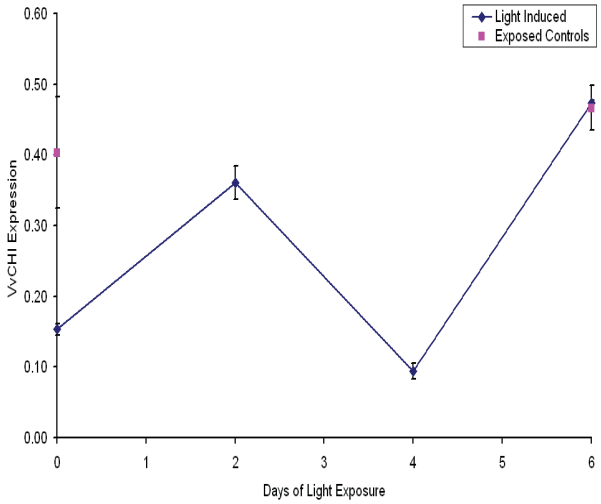
The influence of bunch light exposure on expression of *VvLDOX* & *VvCHI* in Shiraz & Chardonnay berries during development

The influence of bunch light exposure on expression of *VvLDOX* and *VvCHI* in Shiraz and Chardonnay berries during development are in graphs below. Detailed descriptions of samples and key sampling dates are discussed in **Chapter 4**. Boxes were applied to vines at budburst in the 2003-2004 season. At each stage in development, boxes were removed from vines and berries/inflorescences were randomly sampled from shaded (now Light Induced (LI)) along with nearby control berries (Exposed Controls (EC)). Light induced samples were taken every 2nd day for 6 days, when another exposed control sample was taken. At pre-veraison and post-veraison time-points, an additional shaded control (SC) sample was also taken on day 6. For each sample, 100 berries (5-10 inflorescences) were pooled together. Error bars represent the standard error ($\pm$ SEM) for three analytical replicates. Expression of *VvLDOX* and *VvCHI* is relative to *VvUBIQ1* expression determined by RT-PCR.

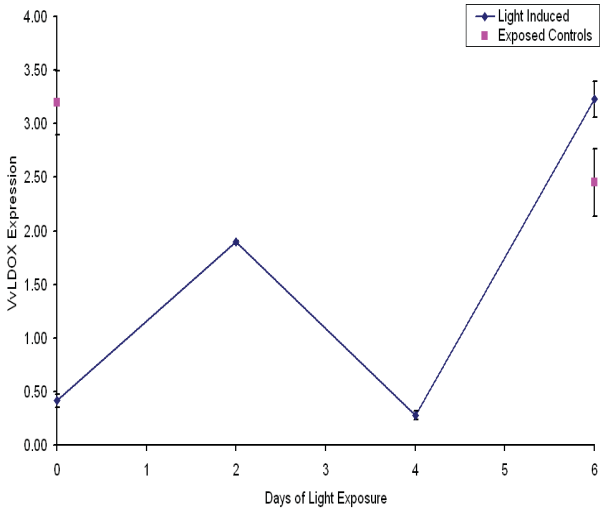
Figure 4B.1 RT-PCR expression of *VvCHI* & *VvLDOX* genes in Shiraz berries during development

FLOWERING - SHIRAZ

VvCHI

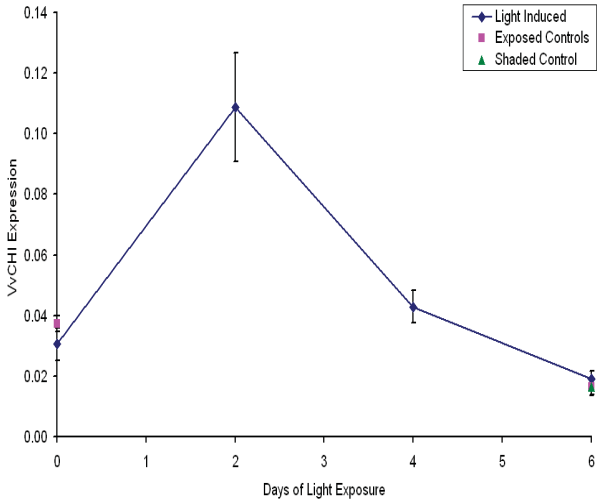


VvLDOX

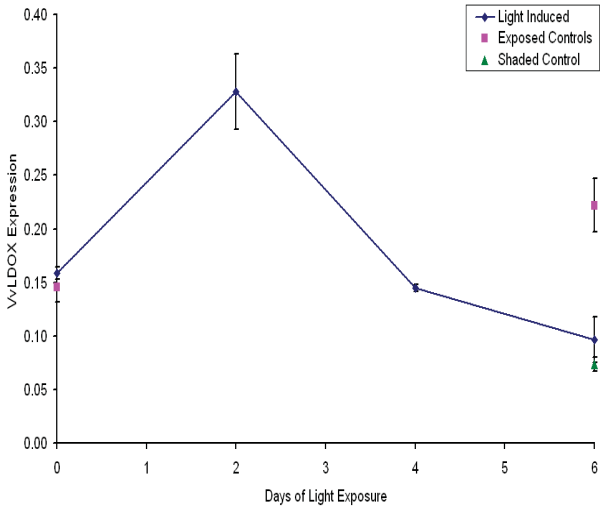


PRE-VERAISON - SHRIAZ

VvCHI

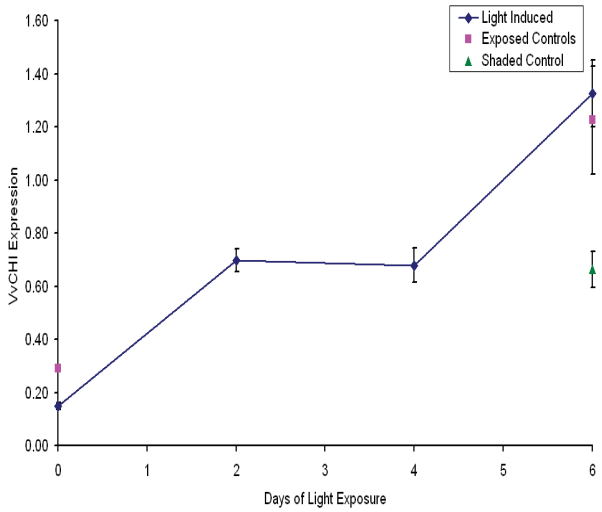


VvLDOX

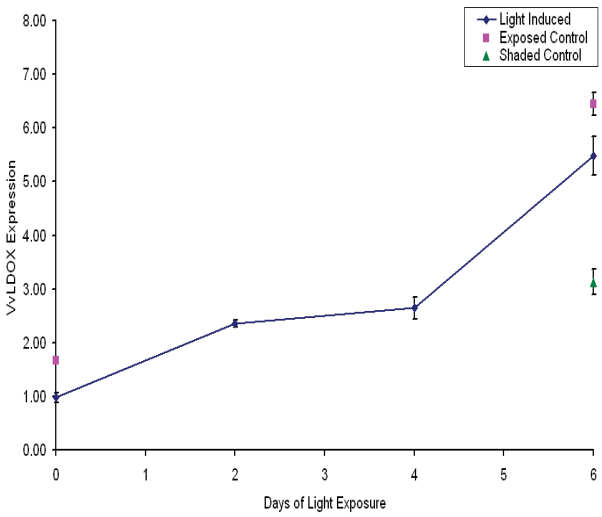


POST-VERAISON - SHIRAZ

VvCHI

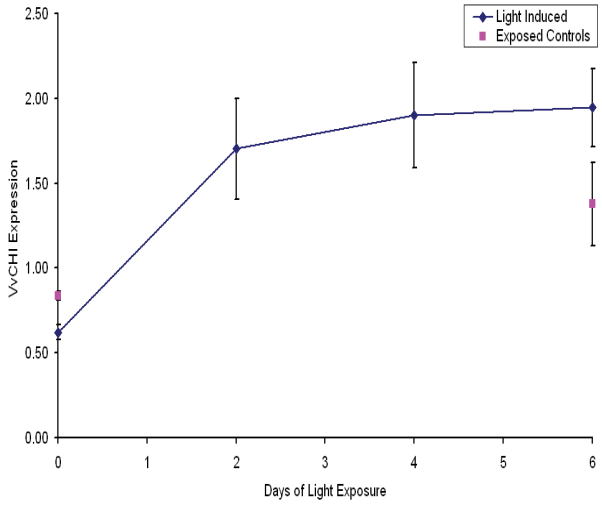


VvLDOX



HARVEST - SHIRAZ

VvCHI



VvLDOX

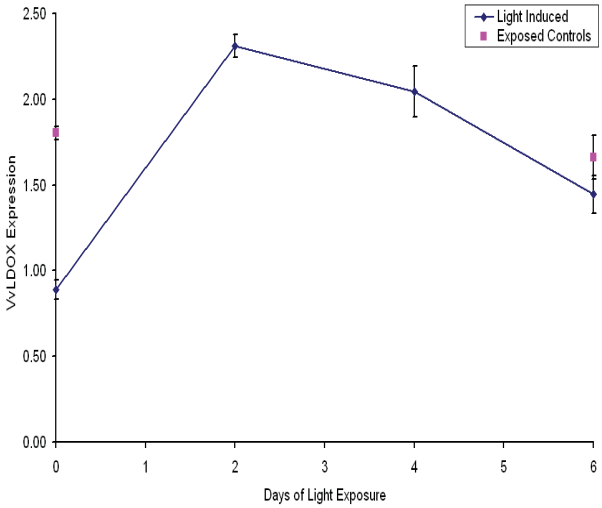
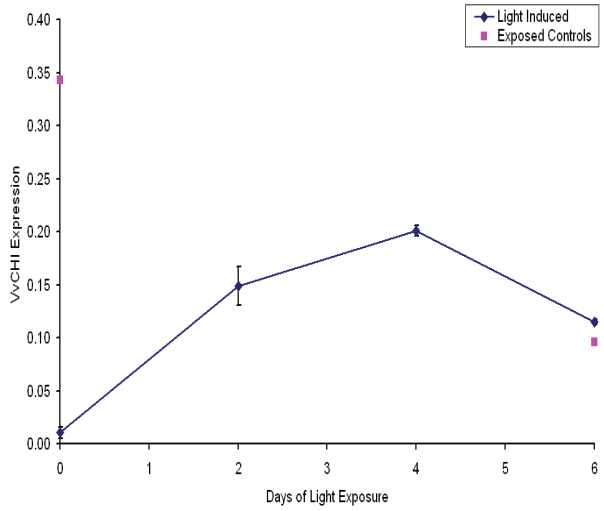


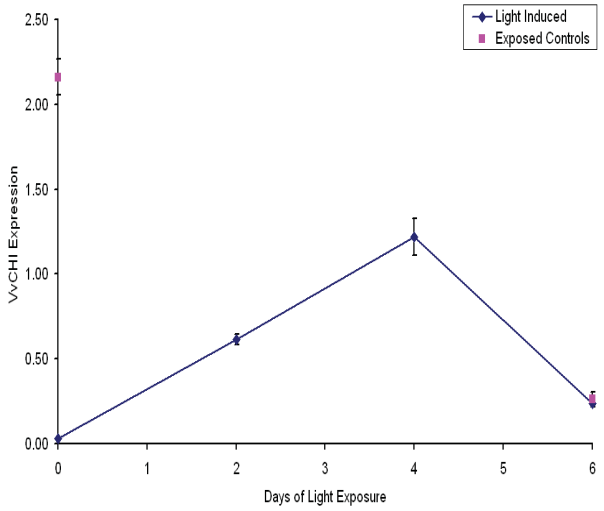
Figure 4B.2 RT-PCR expression of *VvCHI* & *VvLDOX* genes in Chardonnay berries during development

FLOWERING - CHARDONNAY

VvCHI

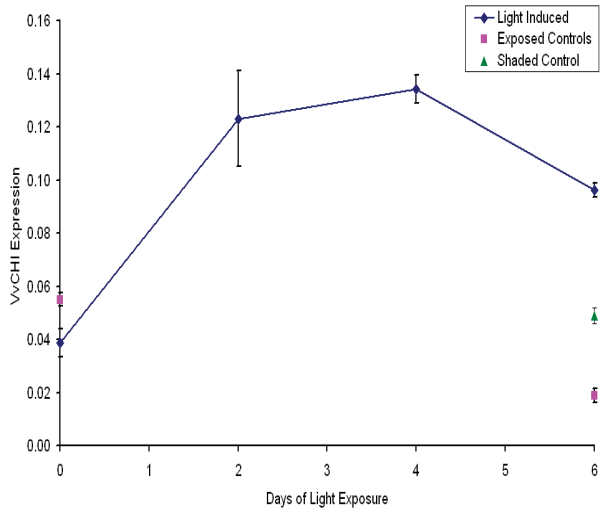


VvLDOX

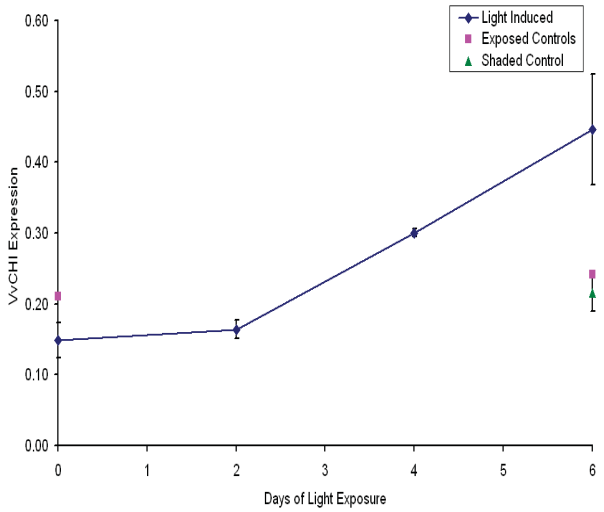


POST-VERAISON – CHARDONNAY

VvCHI

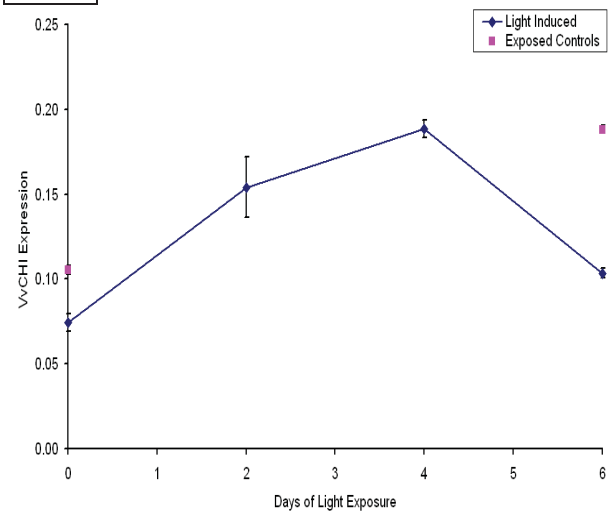


VvLDOX

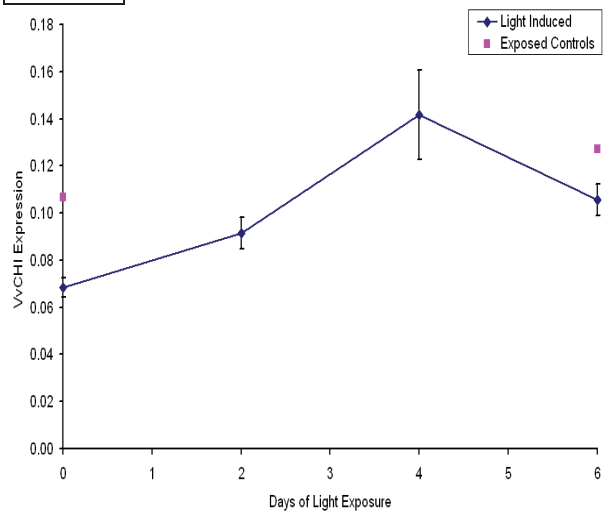


HARVEST - CHARDONNAY

VvCHI



VvLDOX



APPENDIX 5A

Supplementary results for Chapter 5 (Molecular mechanisms of flavonol biosynthesis)

Microarray data (On CD)

FILE ON CD: Appendix 5A Microarray data ***(Provided as a Microsoft Excel document)***

Total RNA was extracted from light-exposed and dark-control Chardonnay cells (as described in **Chapter 5**). Microarray analysis involved hybridisations using the Affy-1-cycle labelling technique. The *V. vinifera* cDNA microarray slide contained 16,602 unique sequences, (part of the NCBI grapevine database http://www.ncbi.nlm.nih.gov/). The microarray procedures and *V. vinifera* slide information are available on the Affymetrix website (http://www.affymetrix.com).

The raw data was analysed in Avadis (V4) (Strand Life Sciences, USA). The probe level was corrected using a normalisation method (GC-RMA), which accounts for technical bias in a sample. The data was then log transformed (base 2) which compresses the data, allowing large differences to stand out. Differential expression analysis (DEA) was performed on each gene, resulting in the following headings:

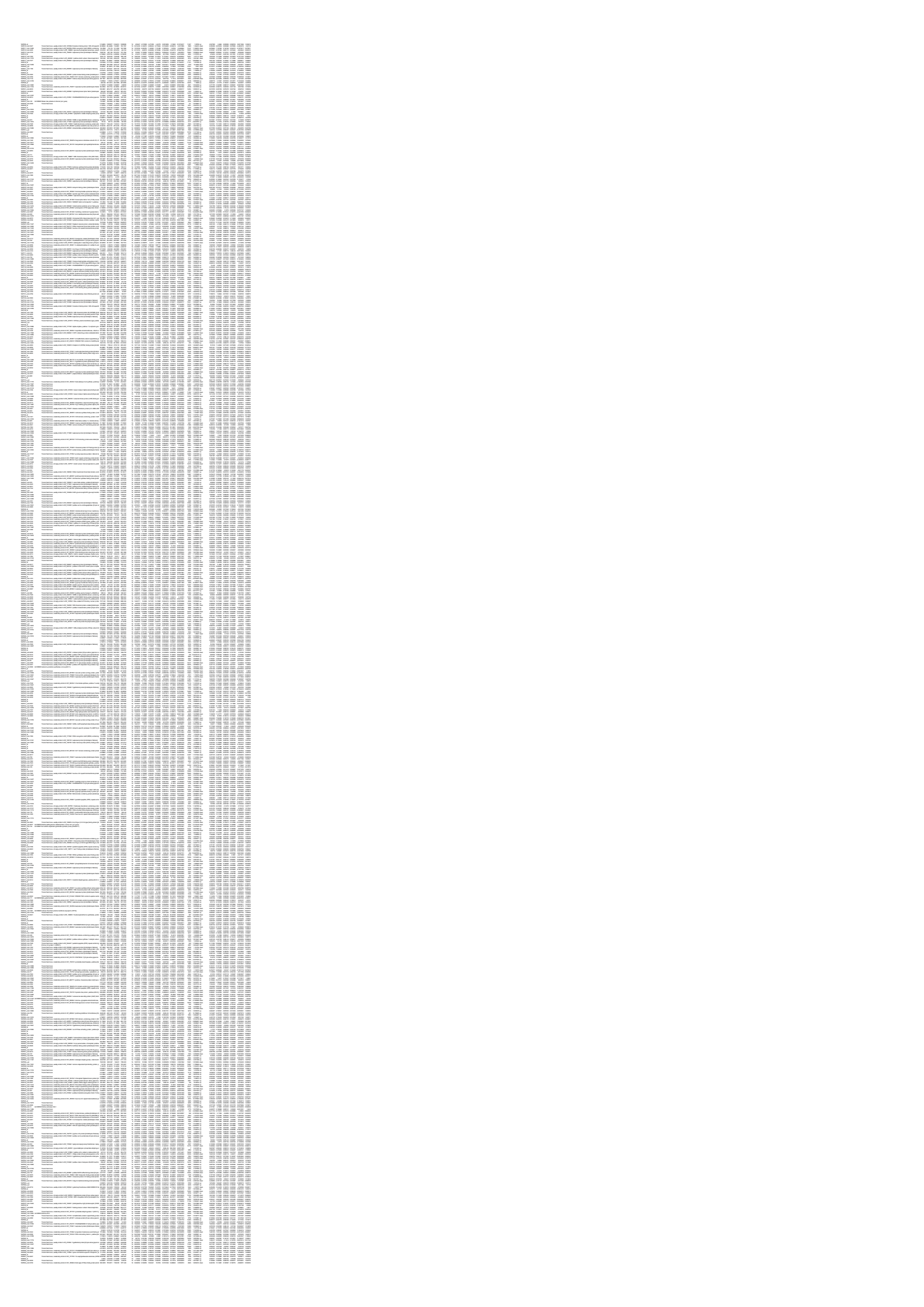
-Corrected p value. An unpaired t-test was conducted on the technical replicates; the correction type, Benjamini-Hochberg. The corrected p value indicates which genes significantly changed in response to light, where $p<0.001$ is highly significant and ns is not significant.

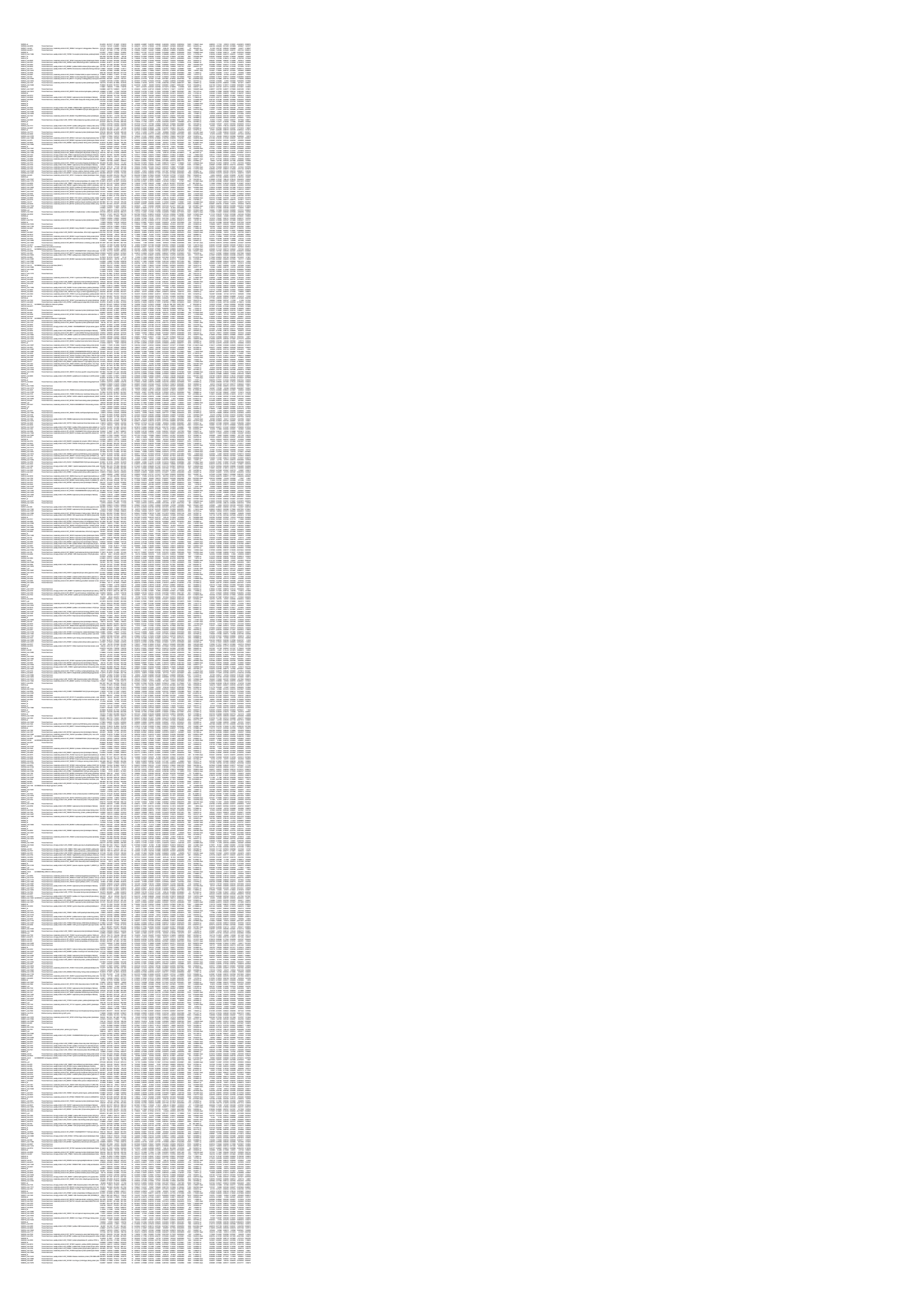
-Rank. These values are closely associated with the corrected p value, ranging from 0-16,601.

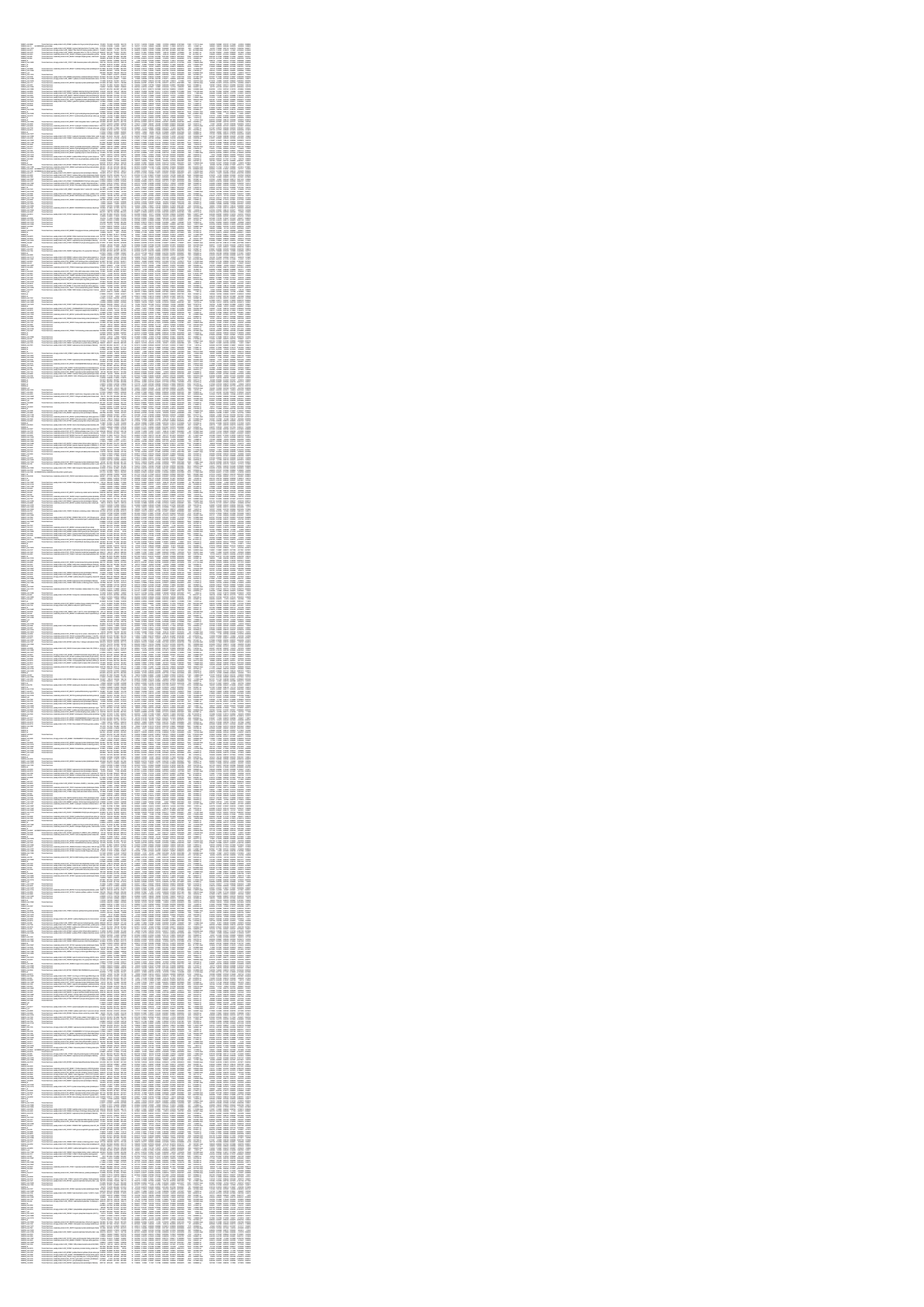
-Absolute value. These values are used to indicate the difference in gene expression between the light and dark samples. It is also represented as L-D.

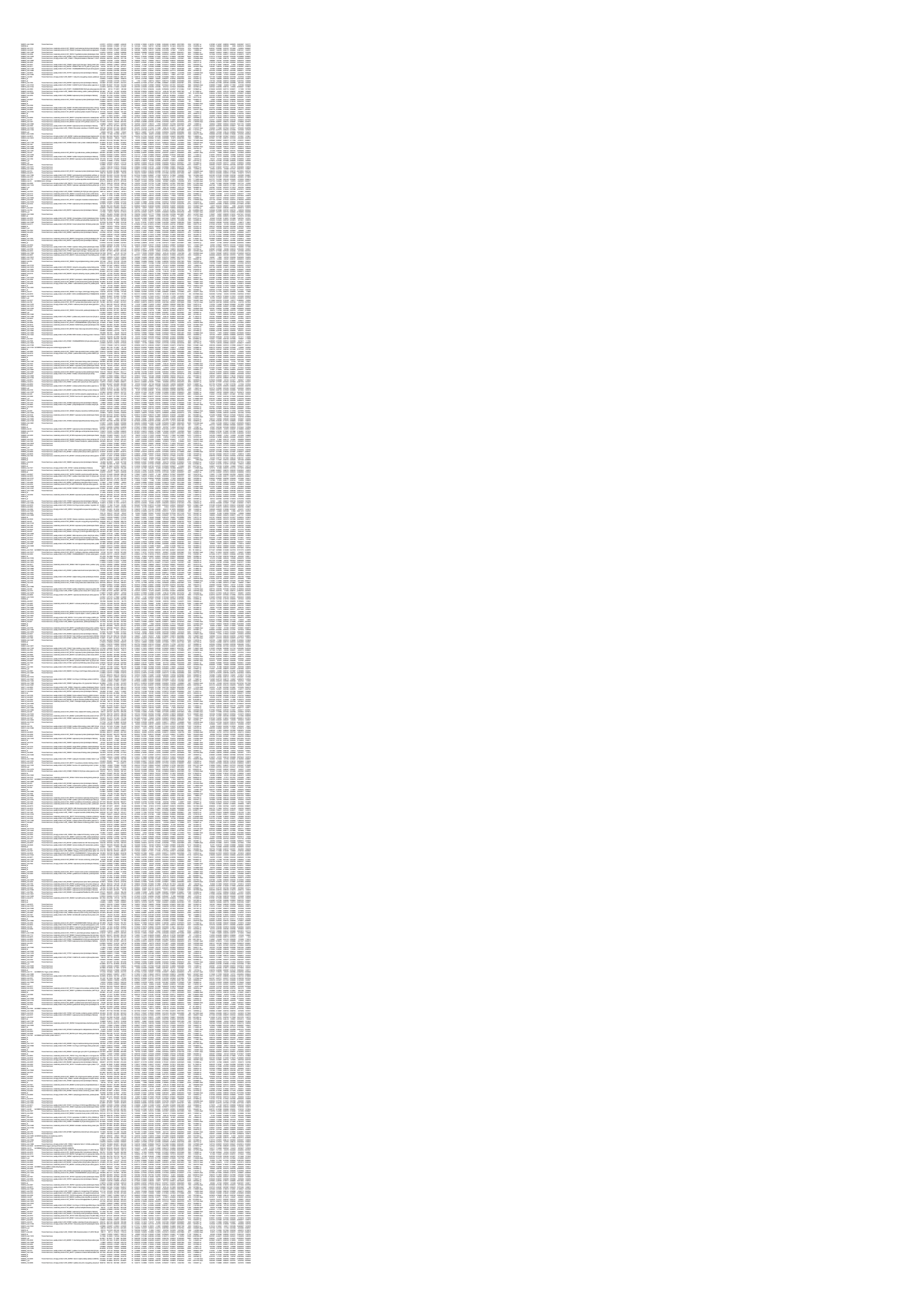
-Regulation. Indicates whether genes are up/down regulated in response to light. This is quantified as the ratio of L/D (additional calculation-no correction), where values >1.0 indicated up-regulation in response to light.

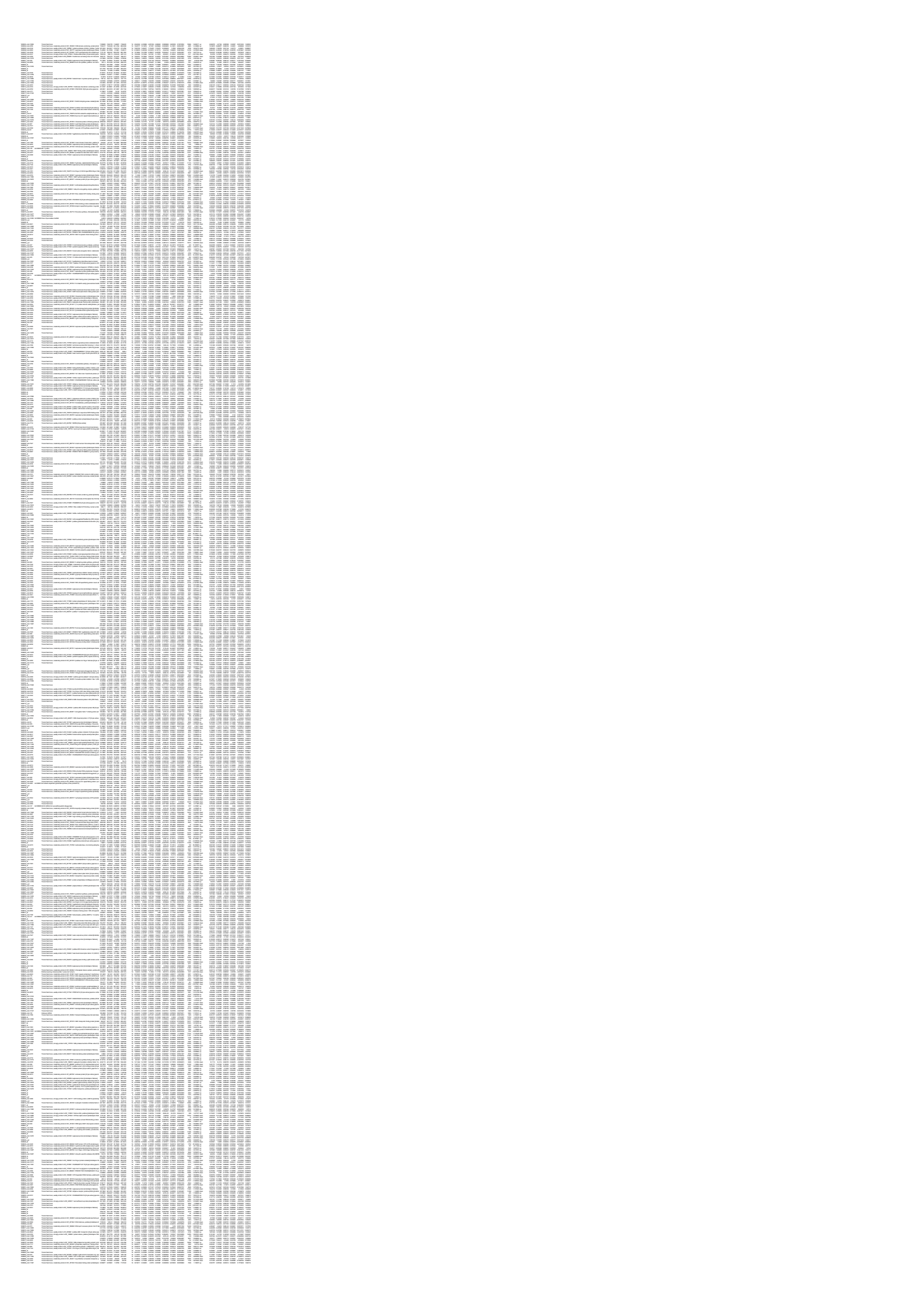
APPENDIX 5A - Microarray Data

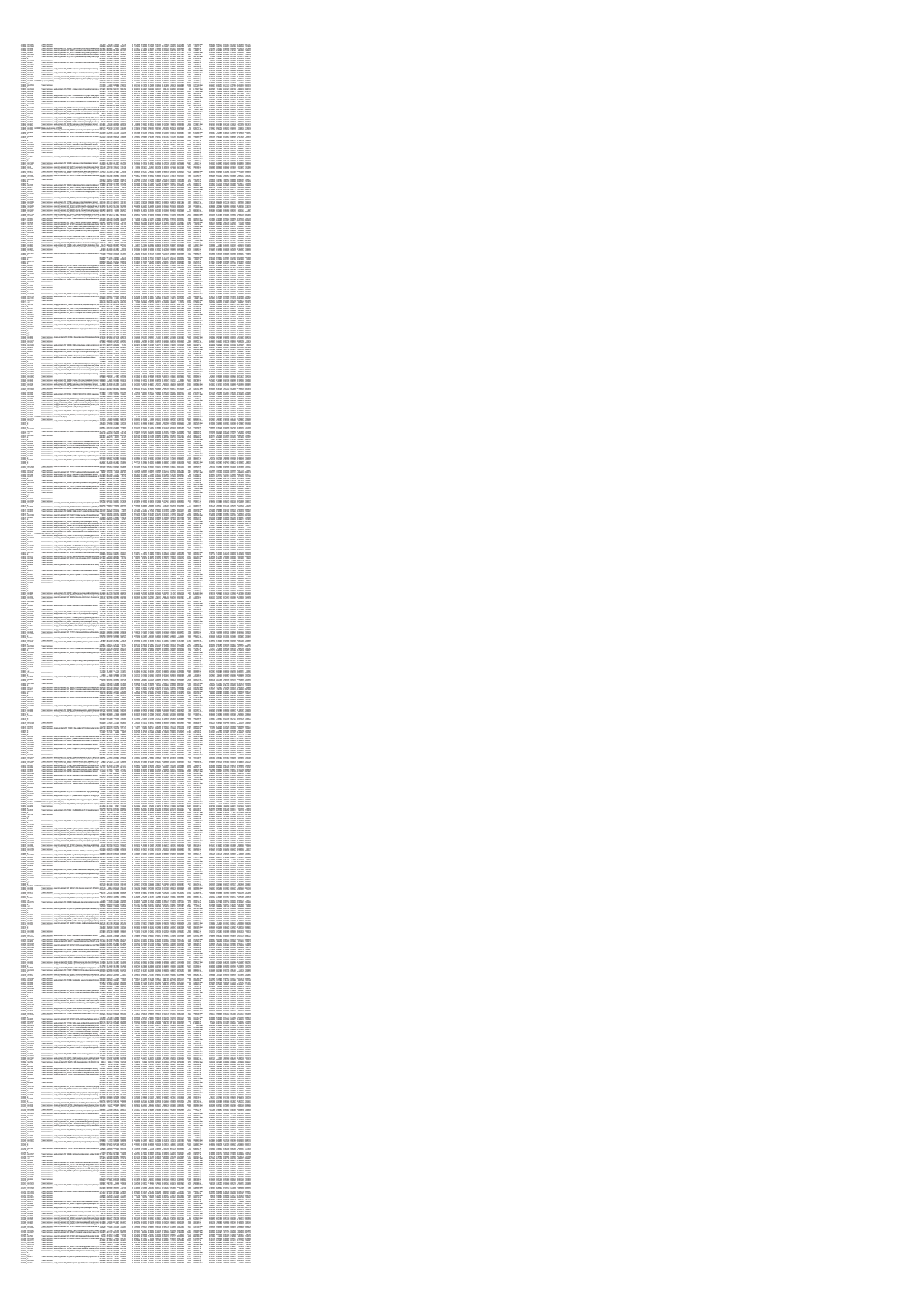


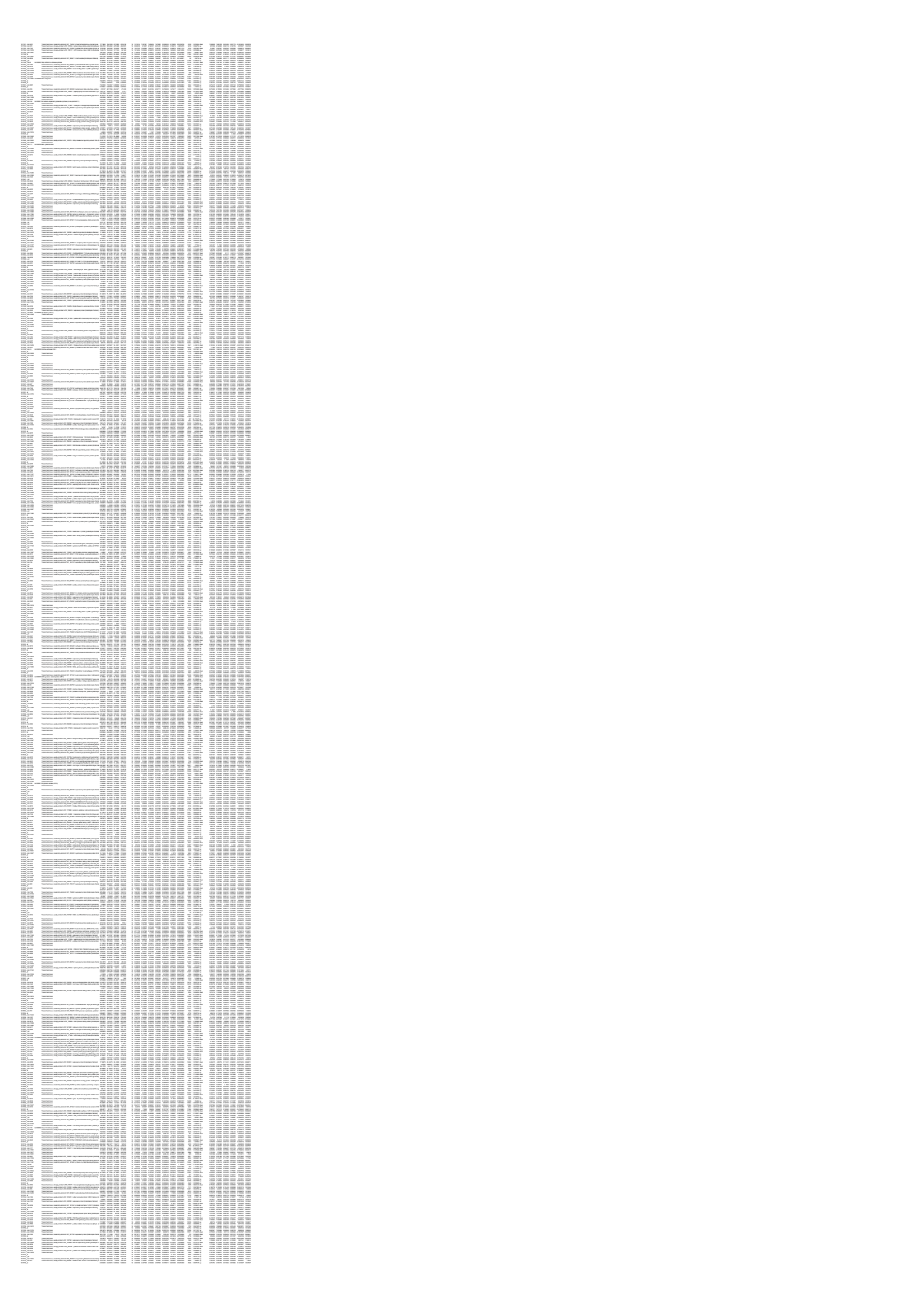


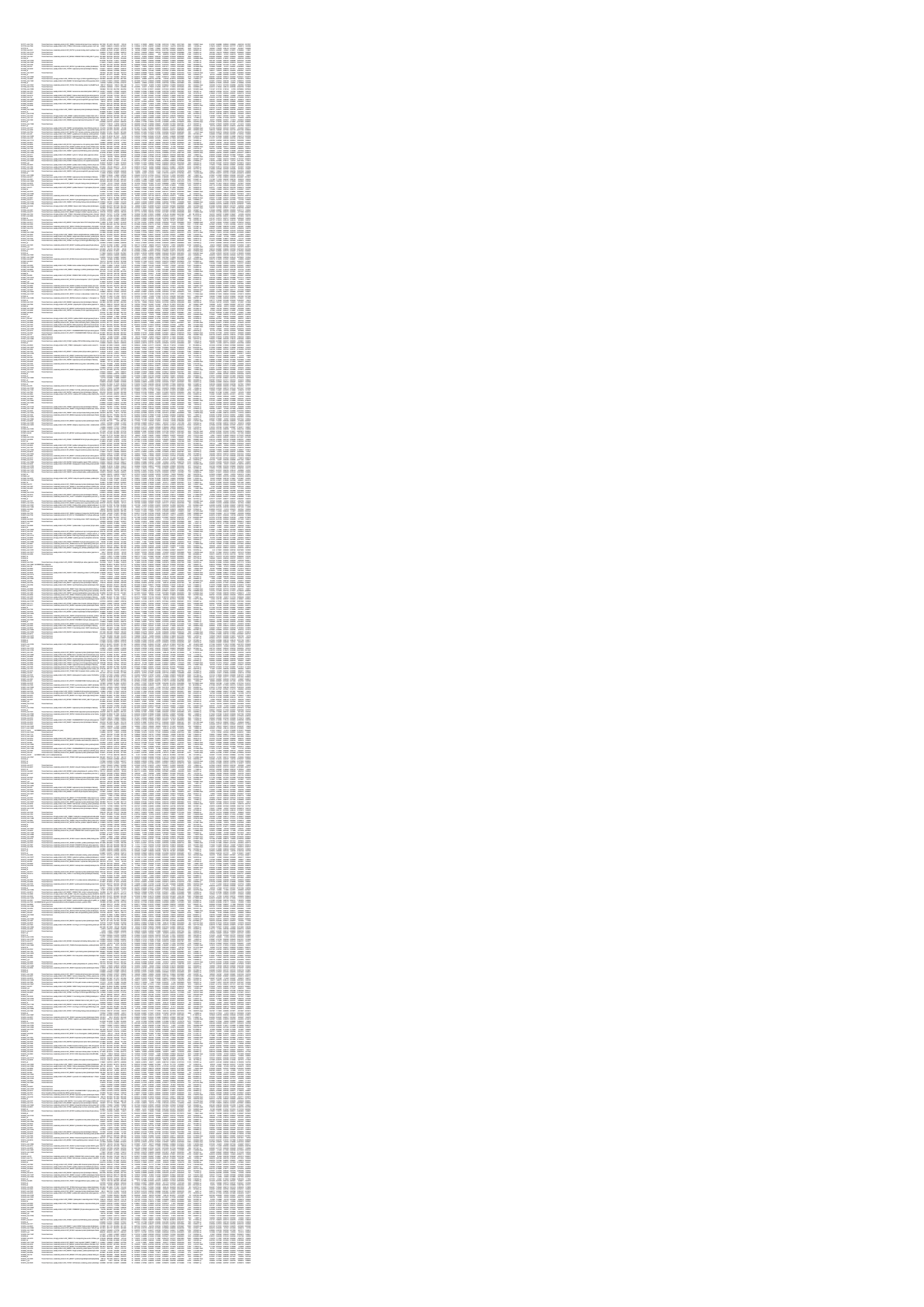


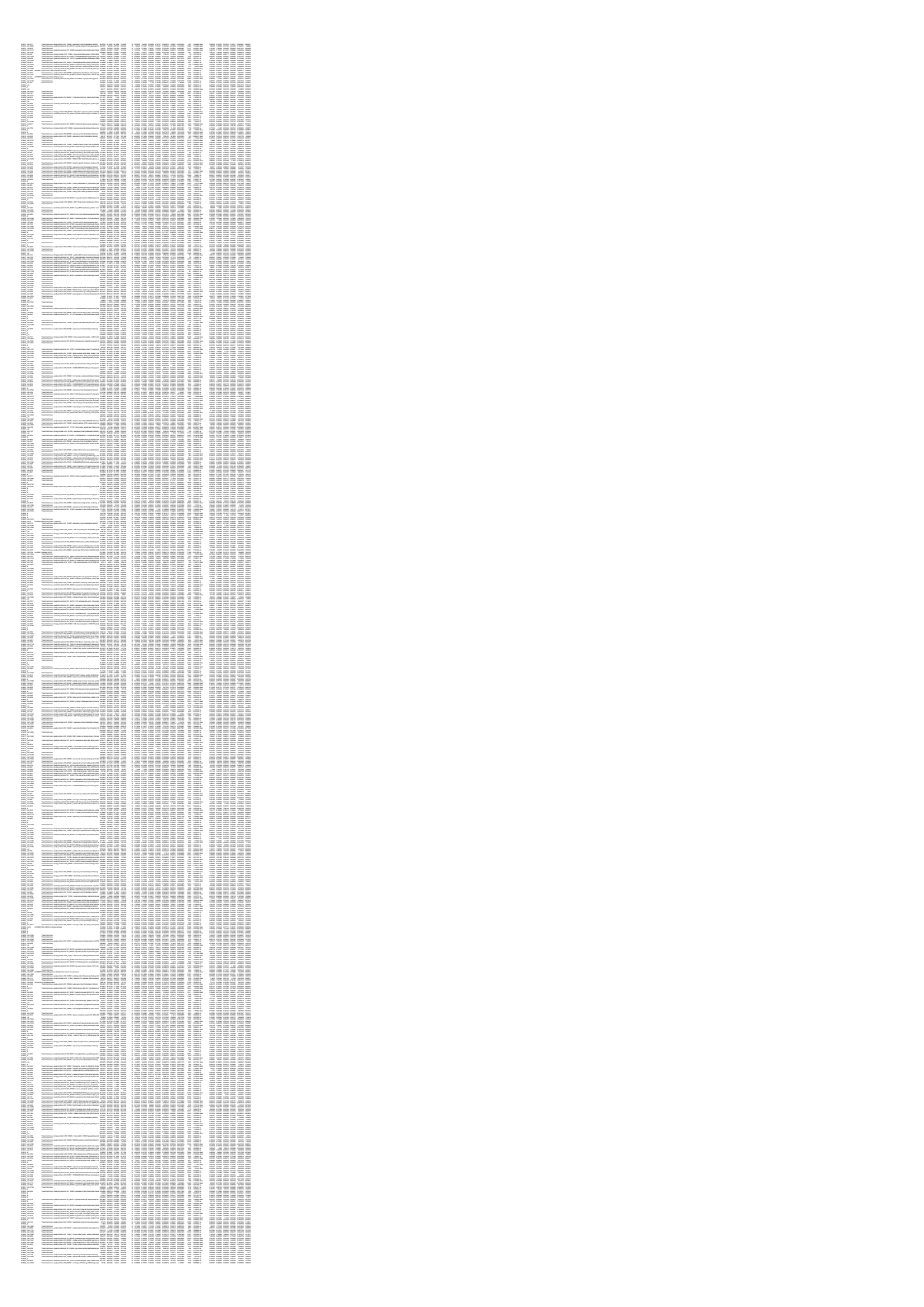


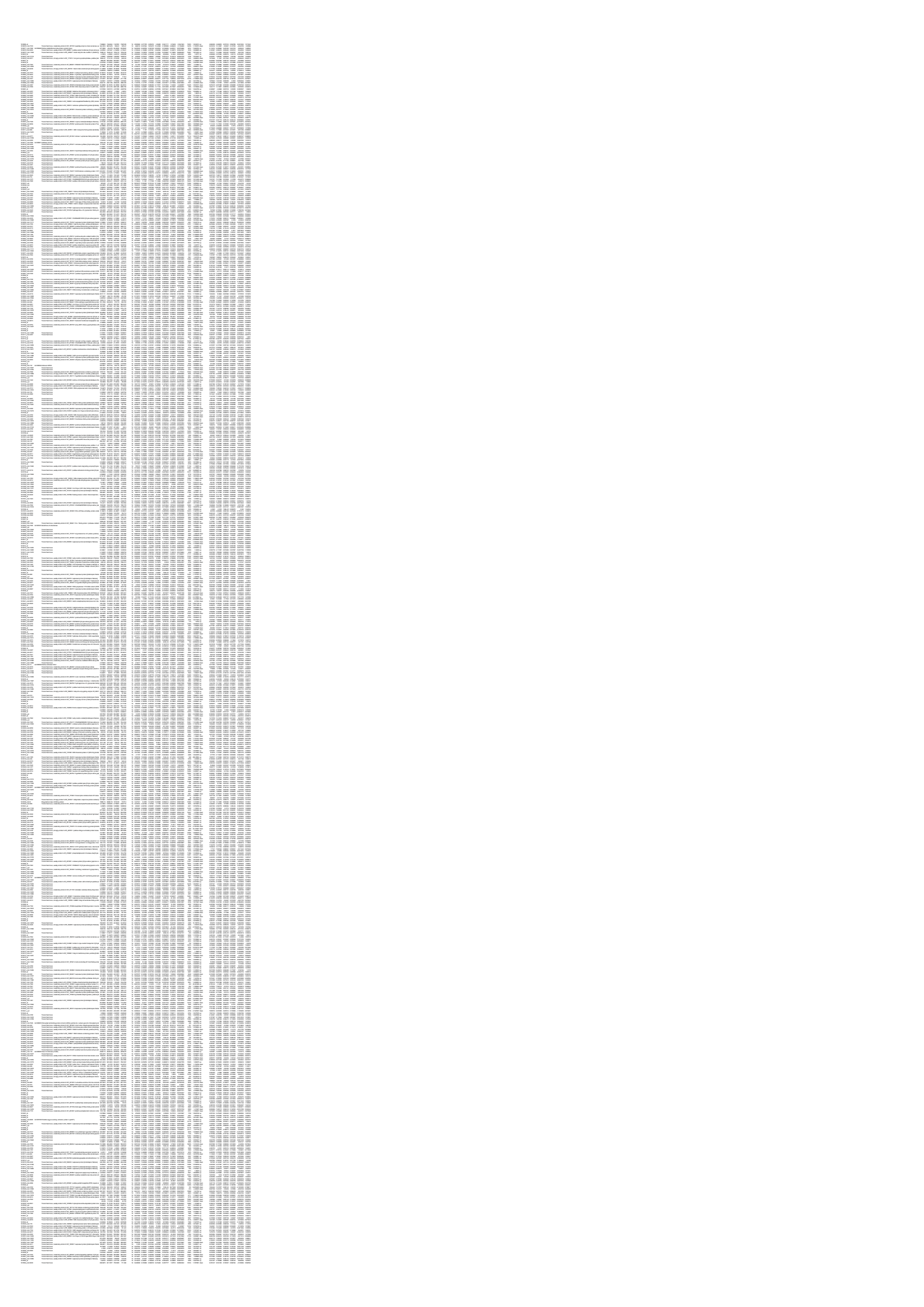


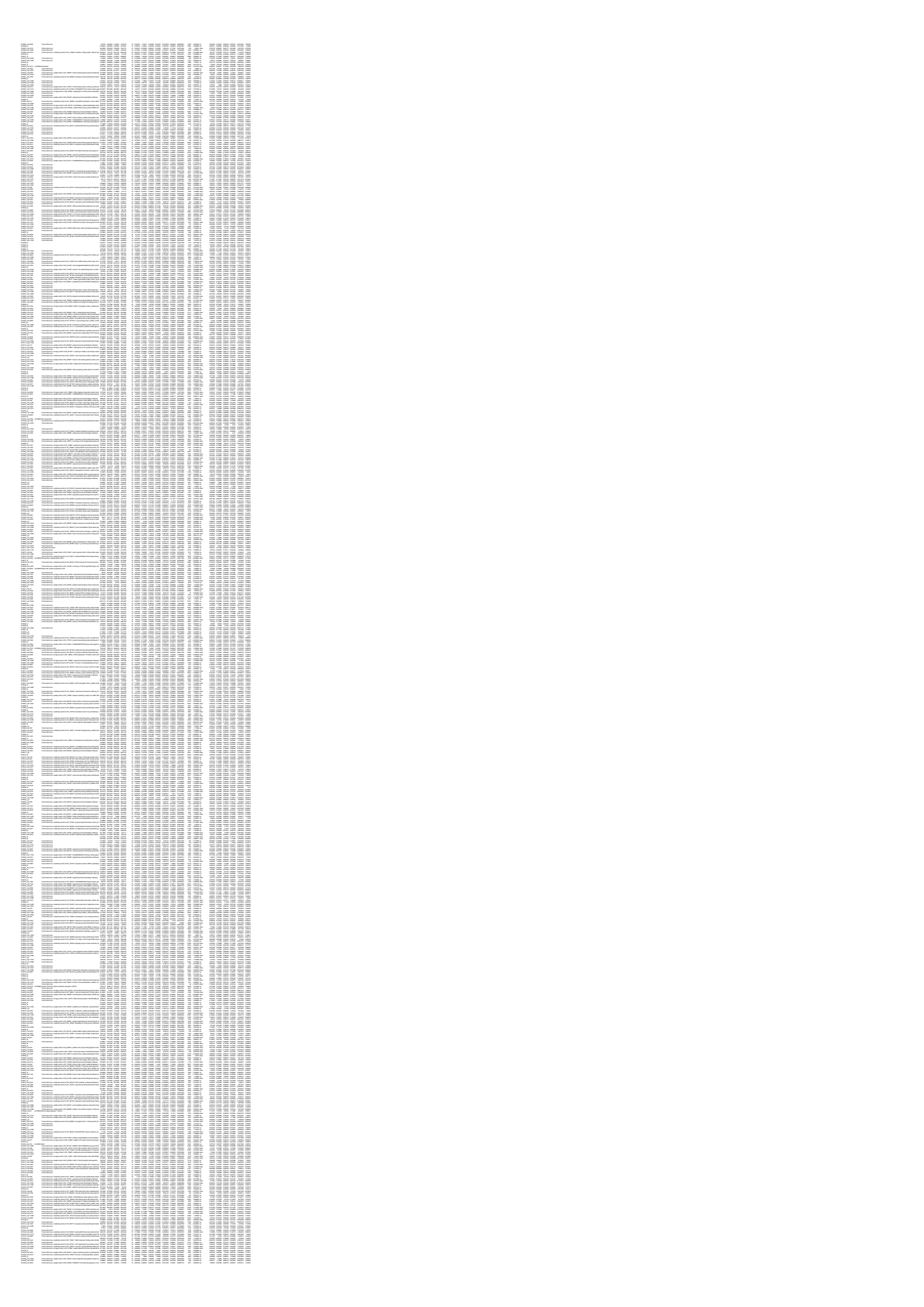


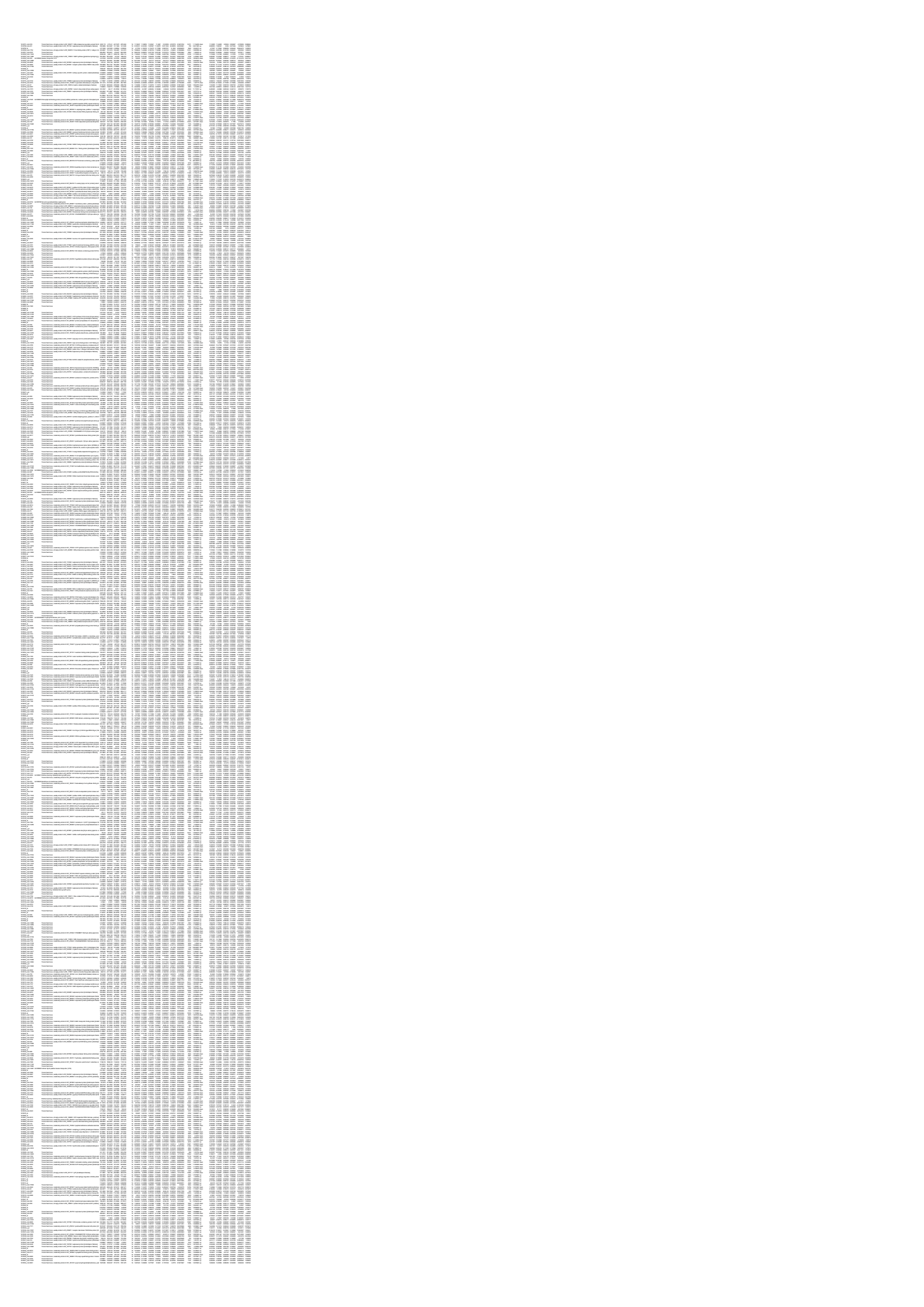


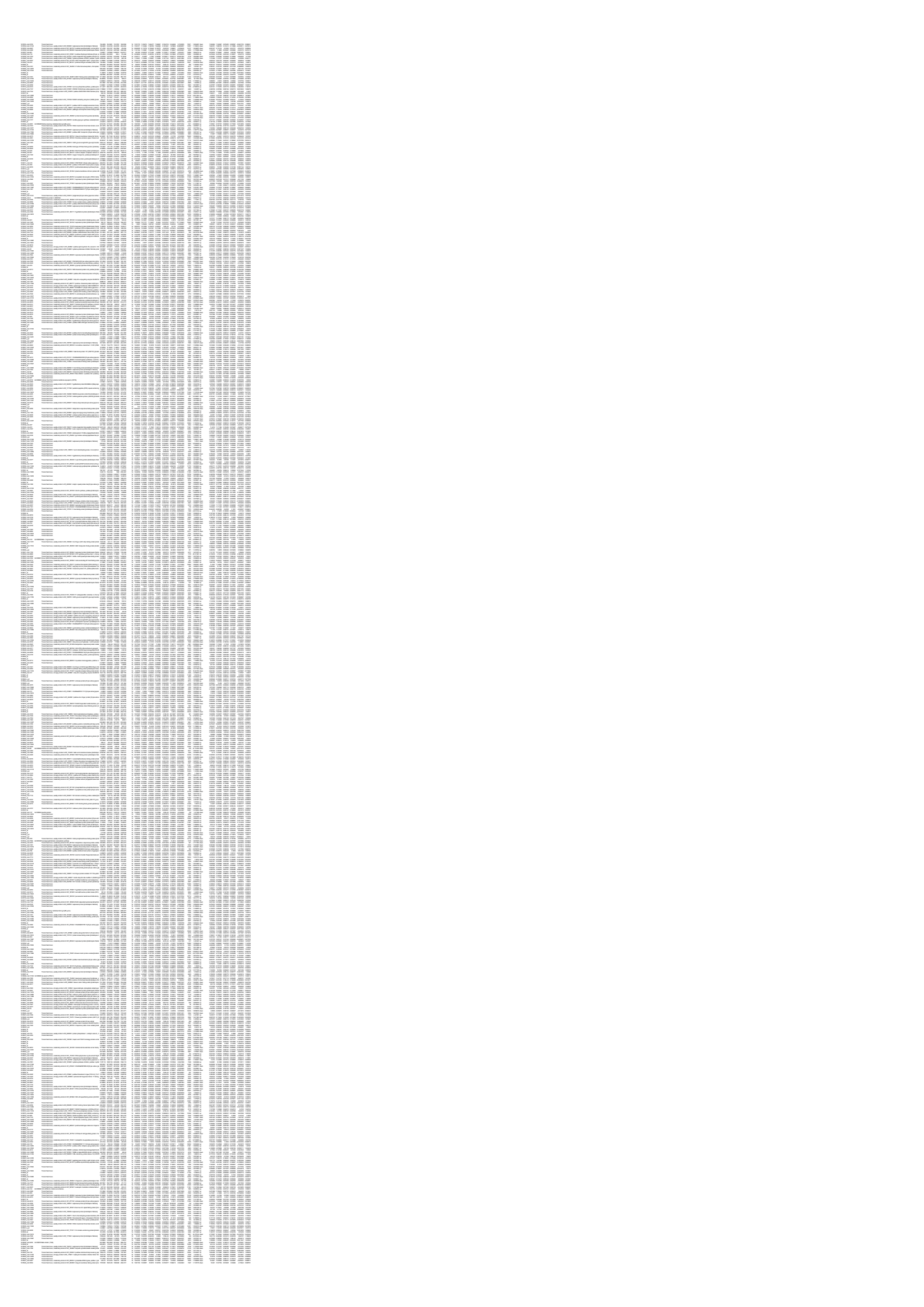


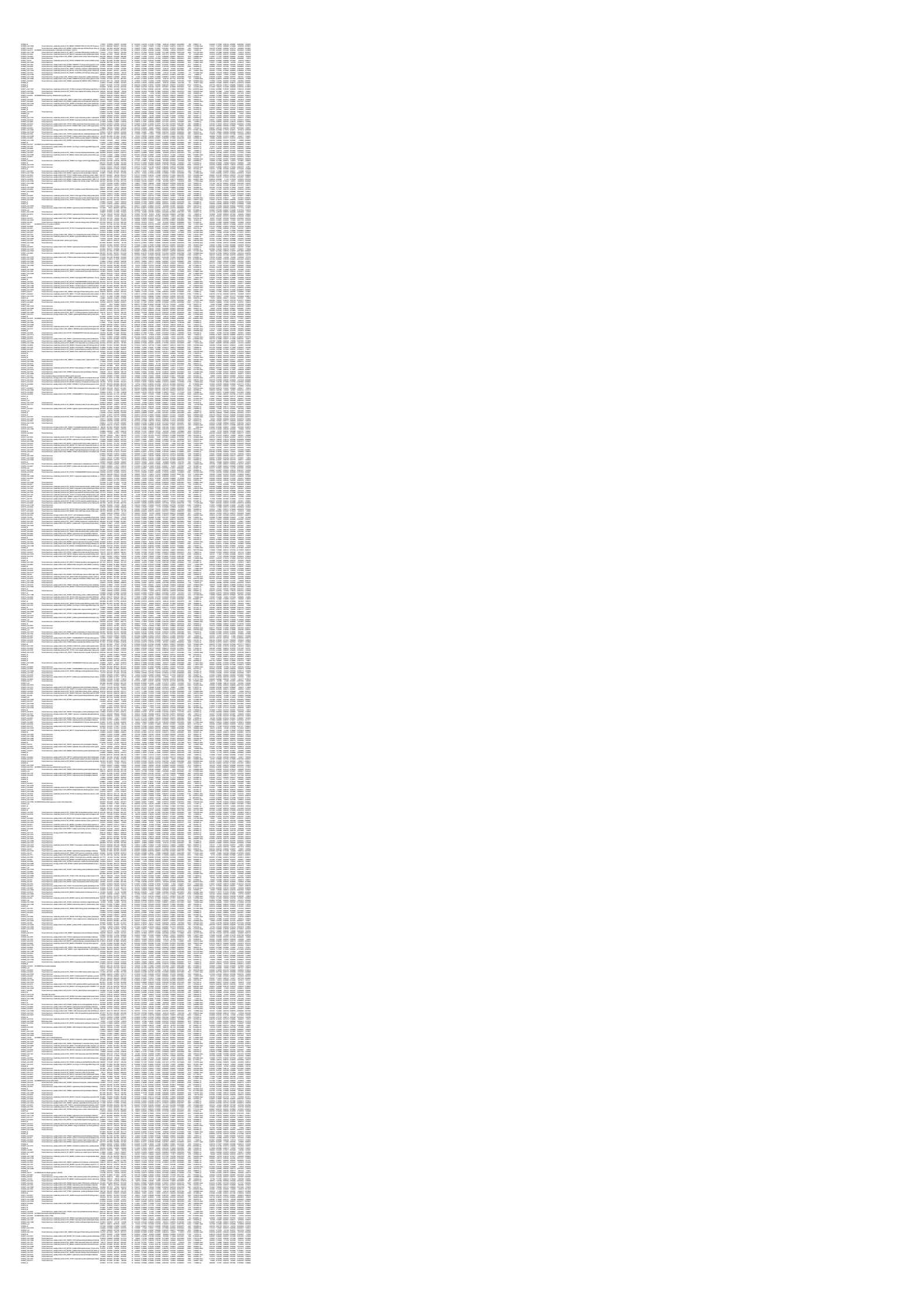


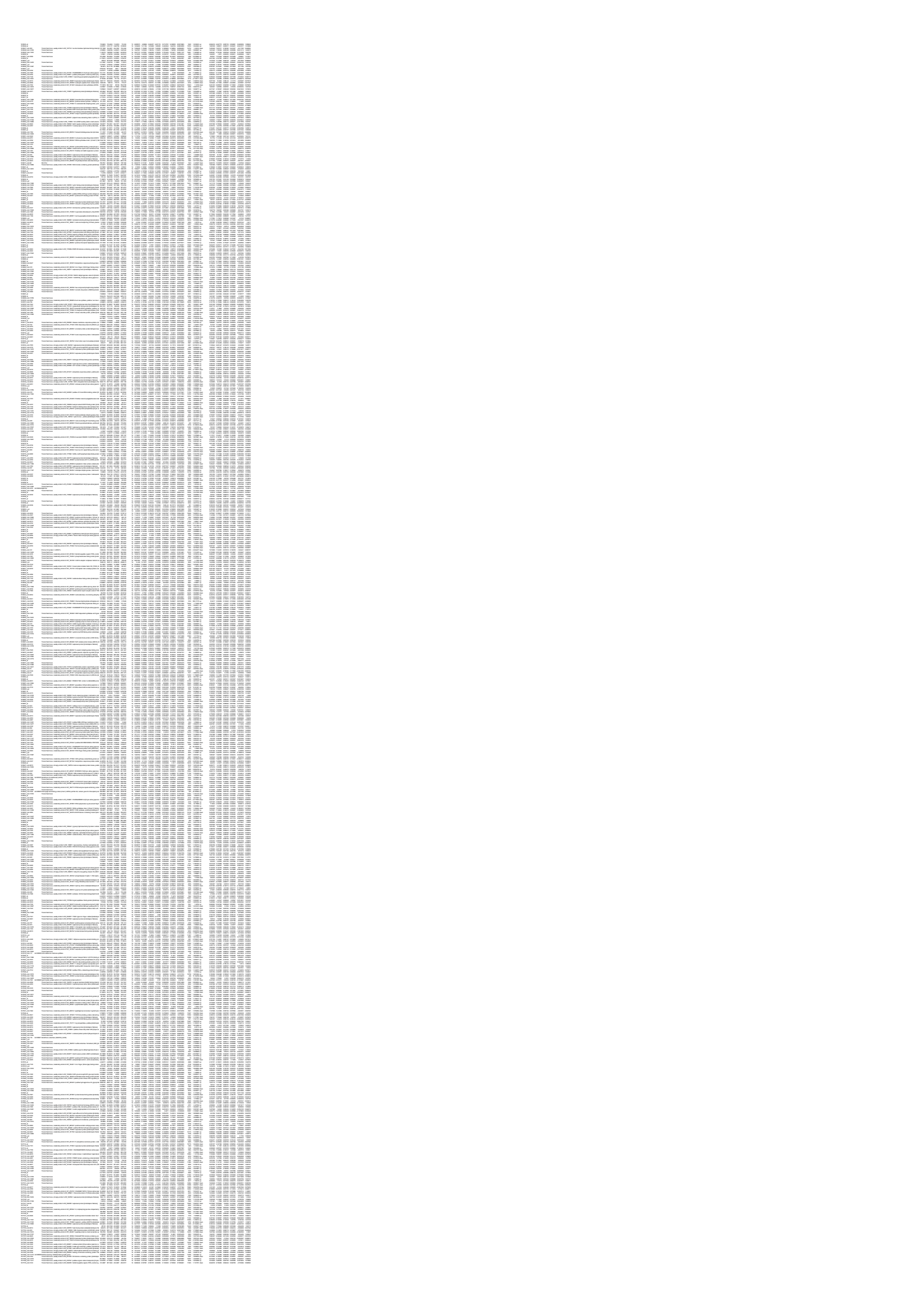


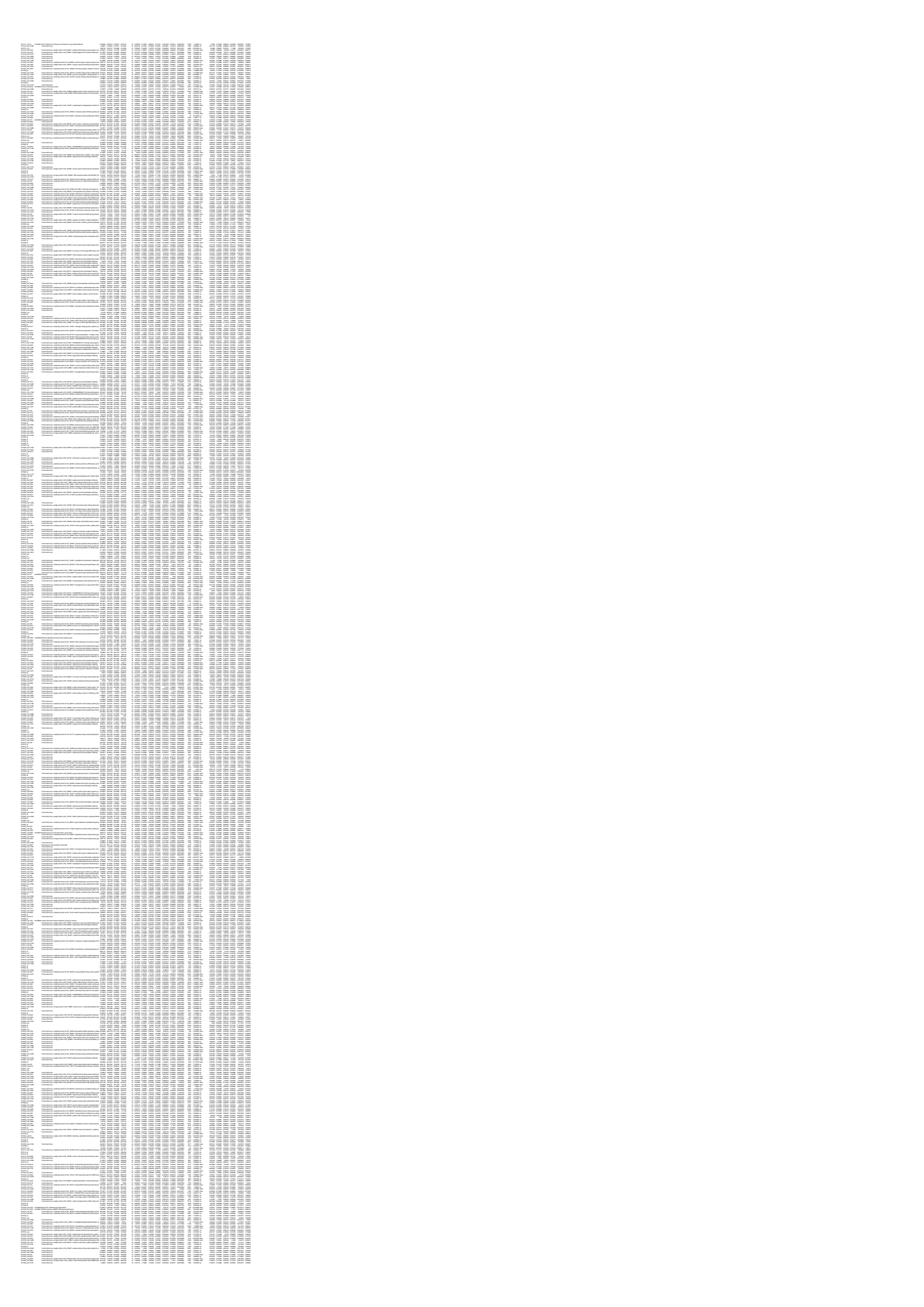


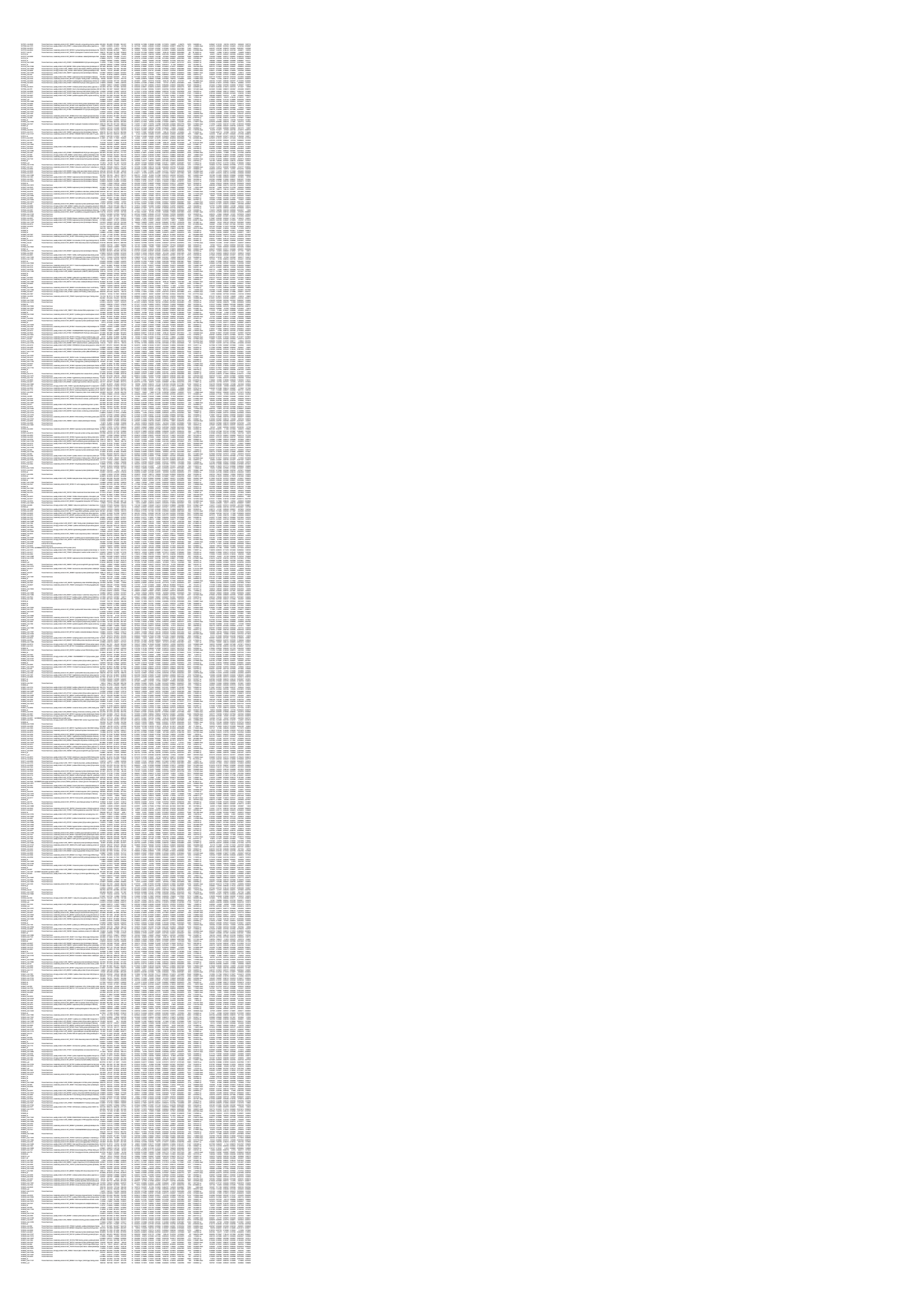


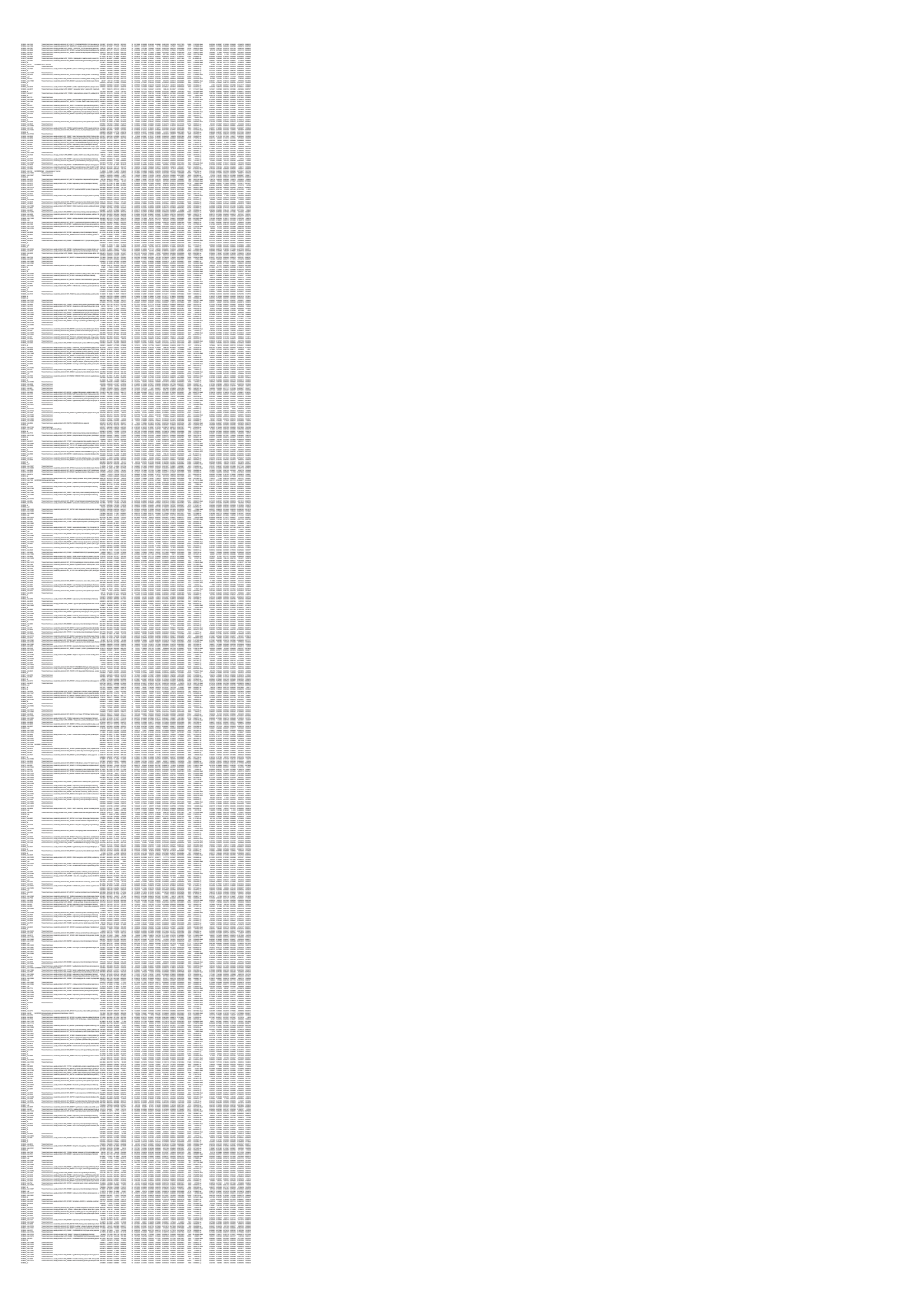


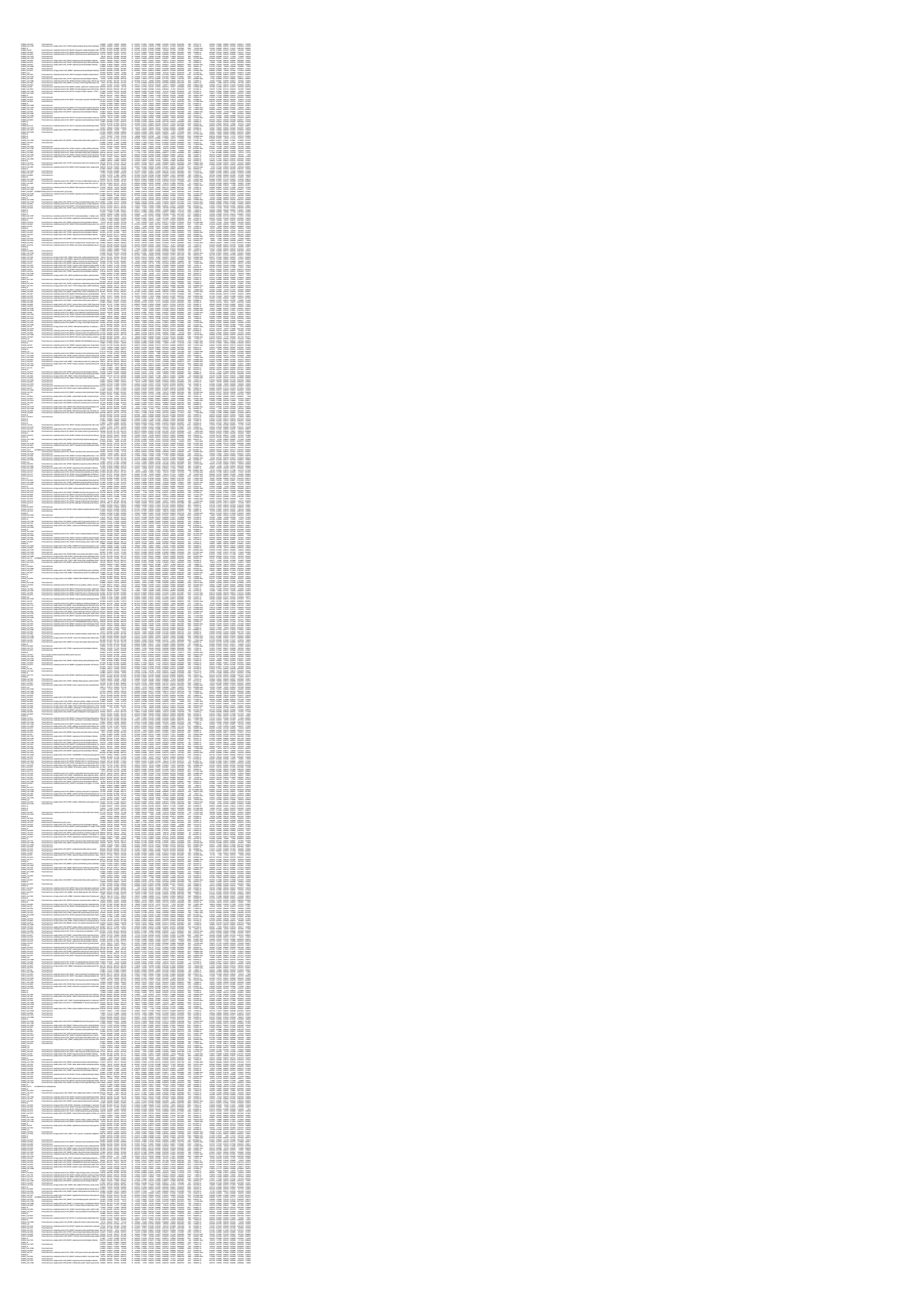


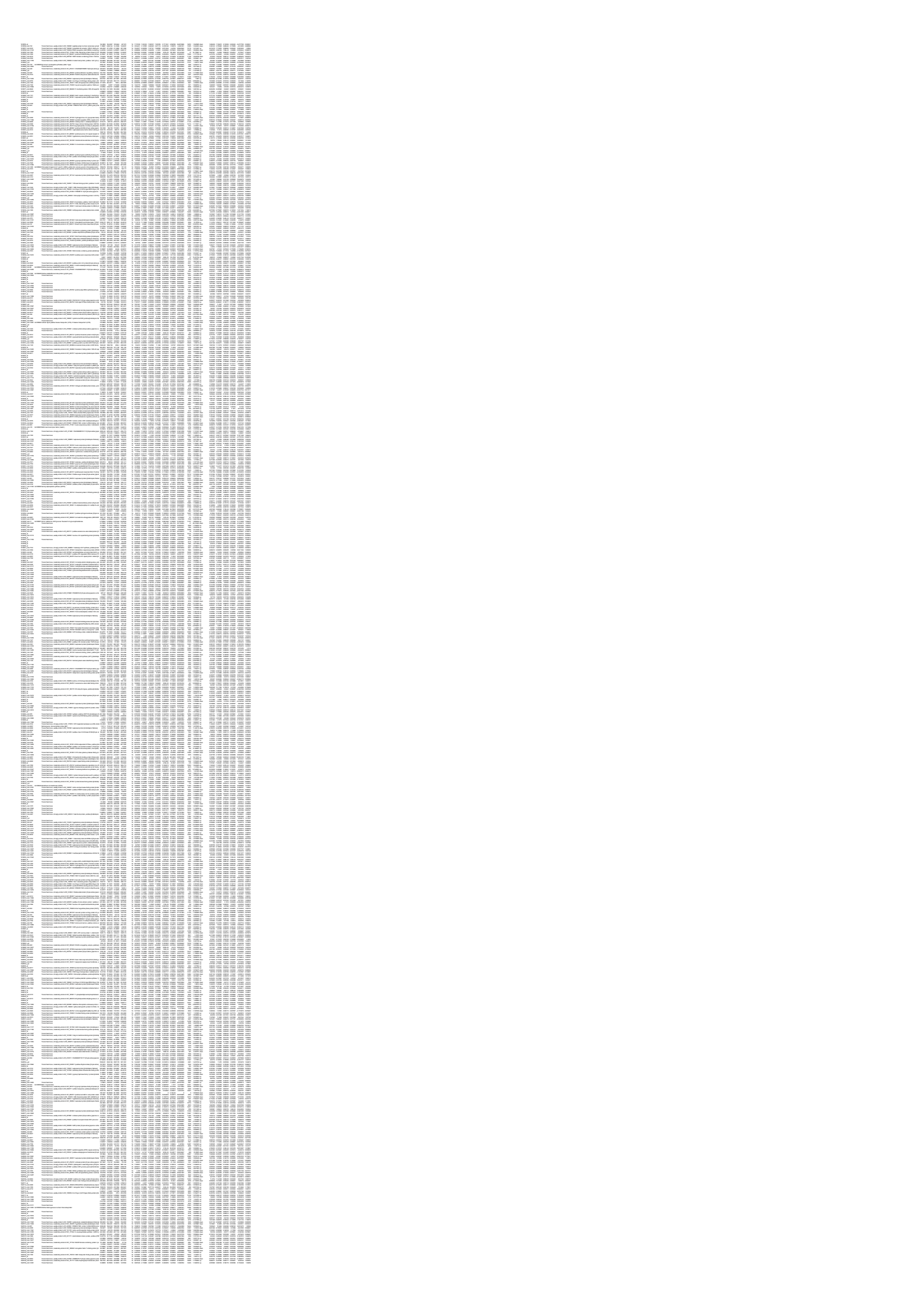


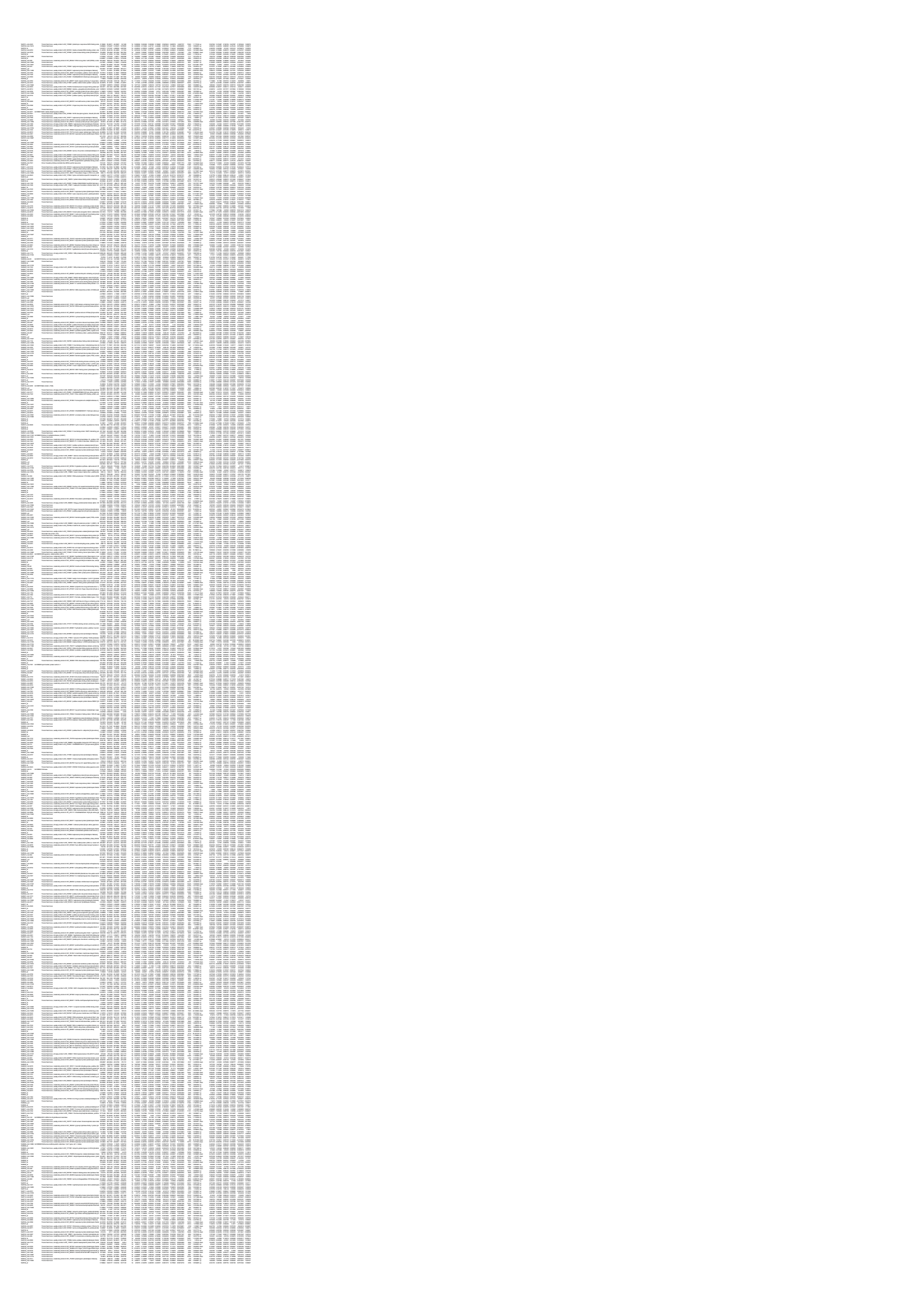


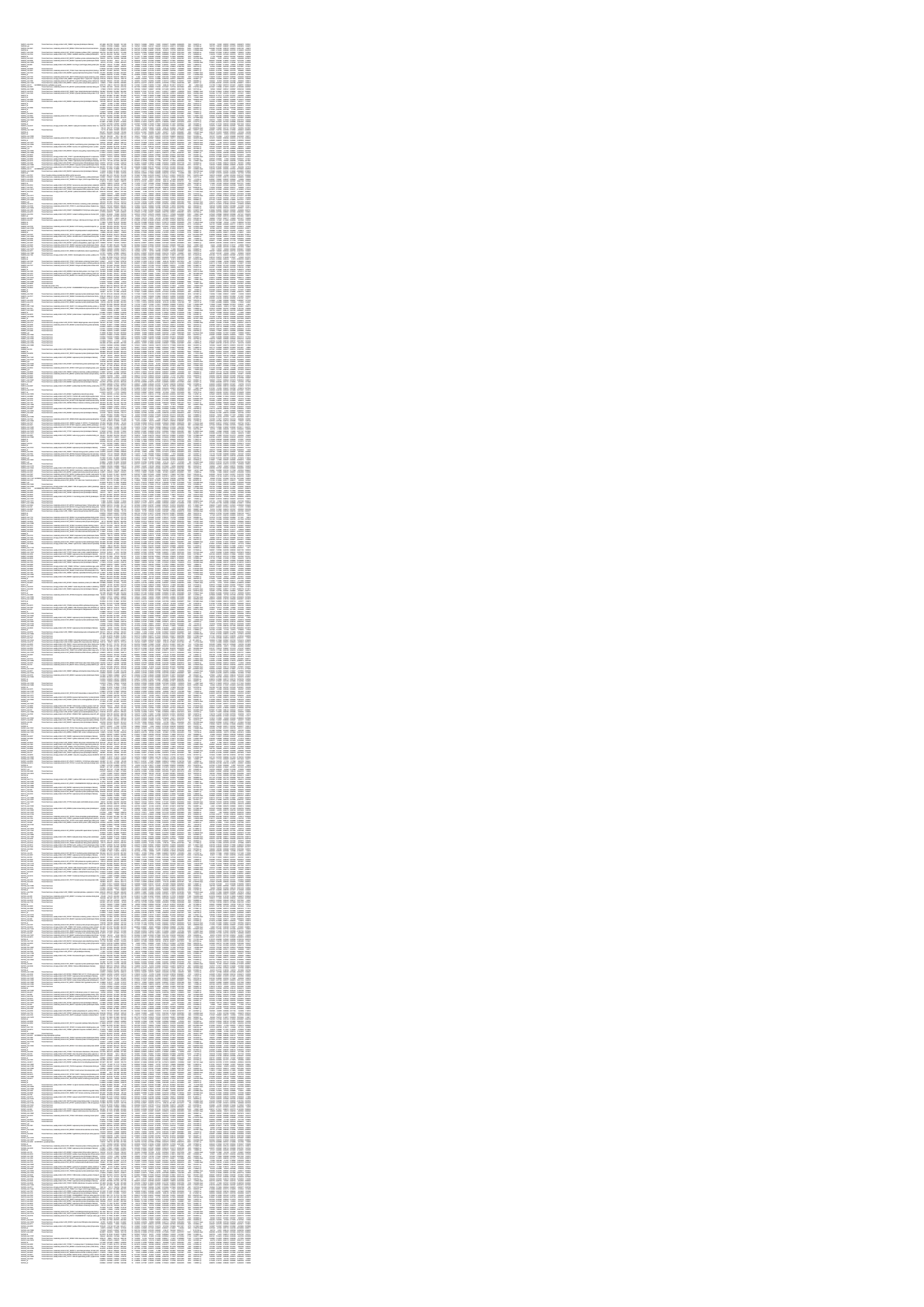


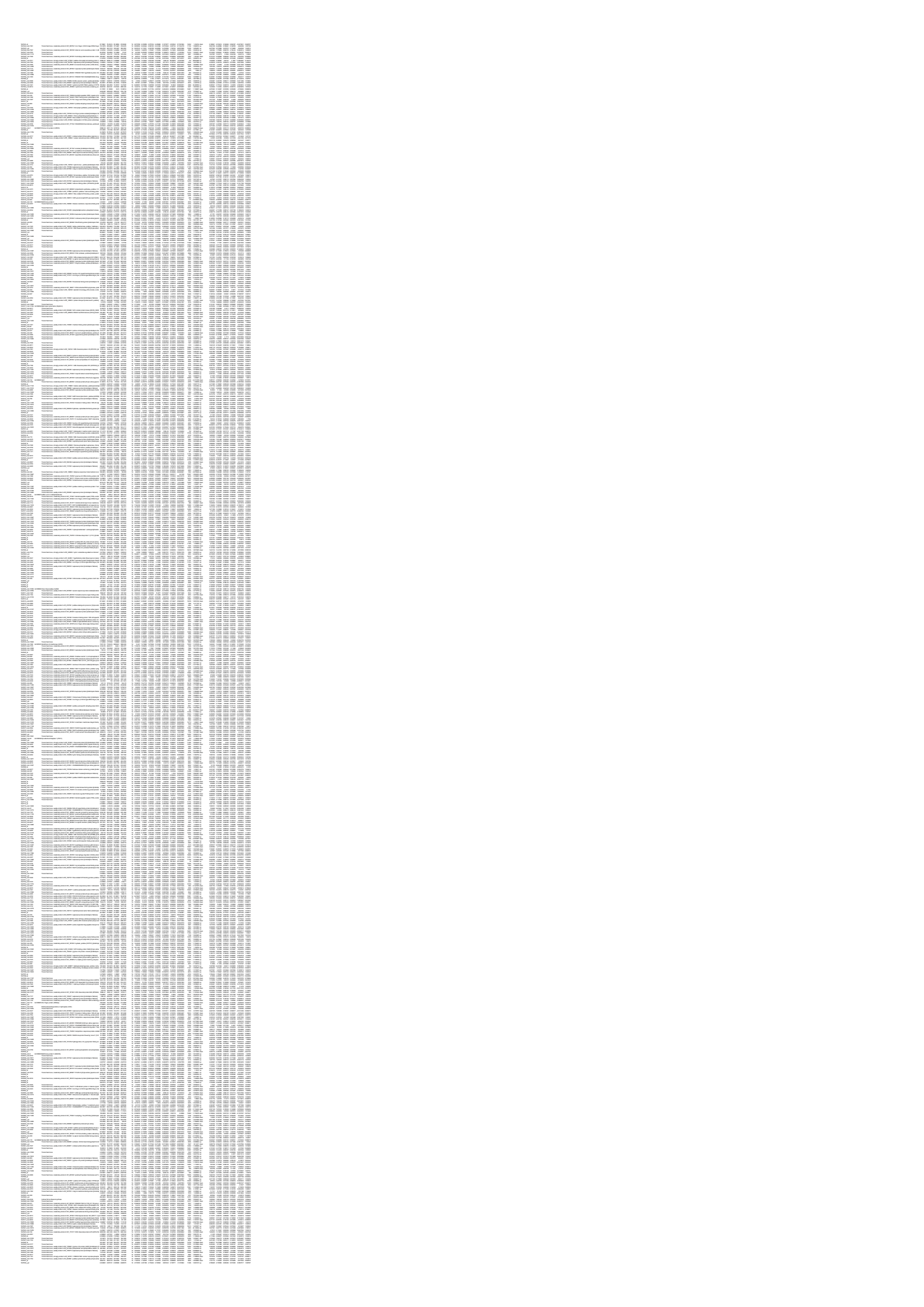


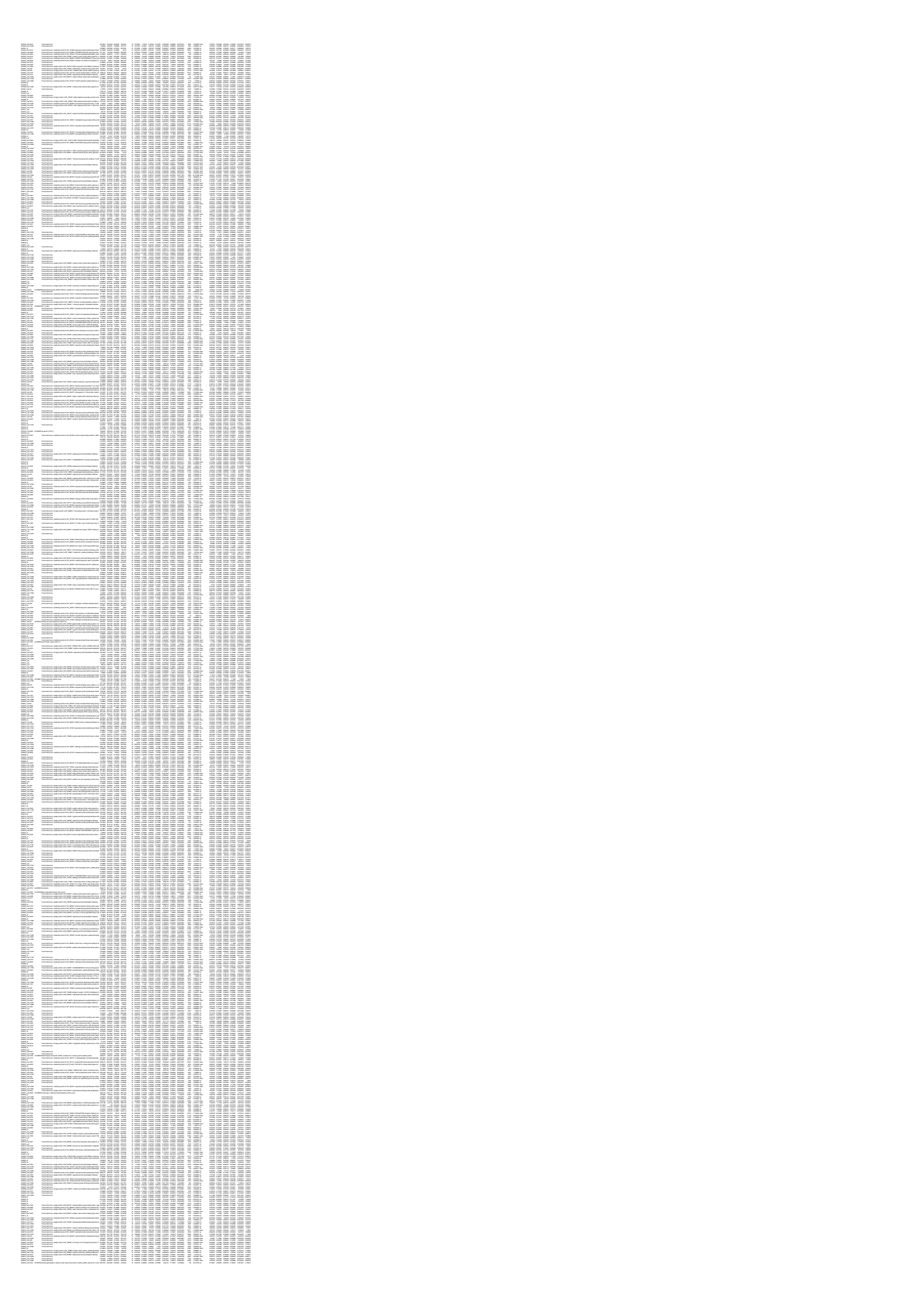


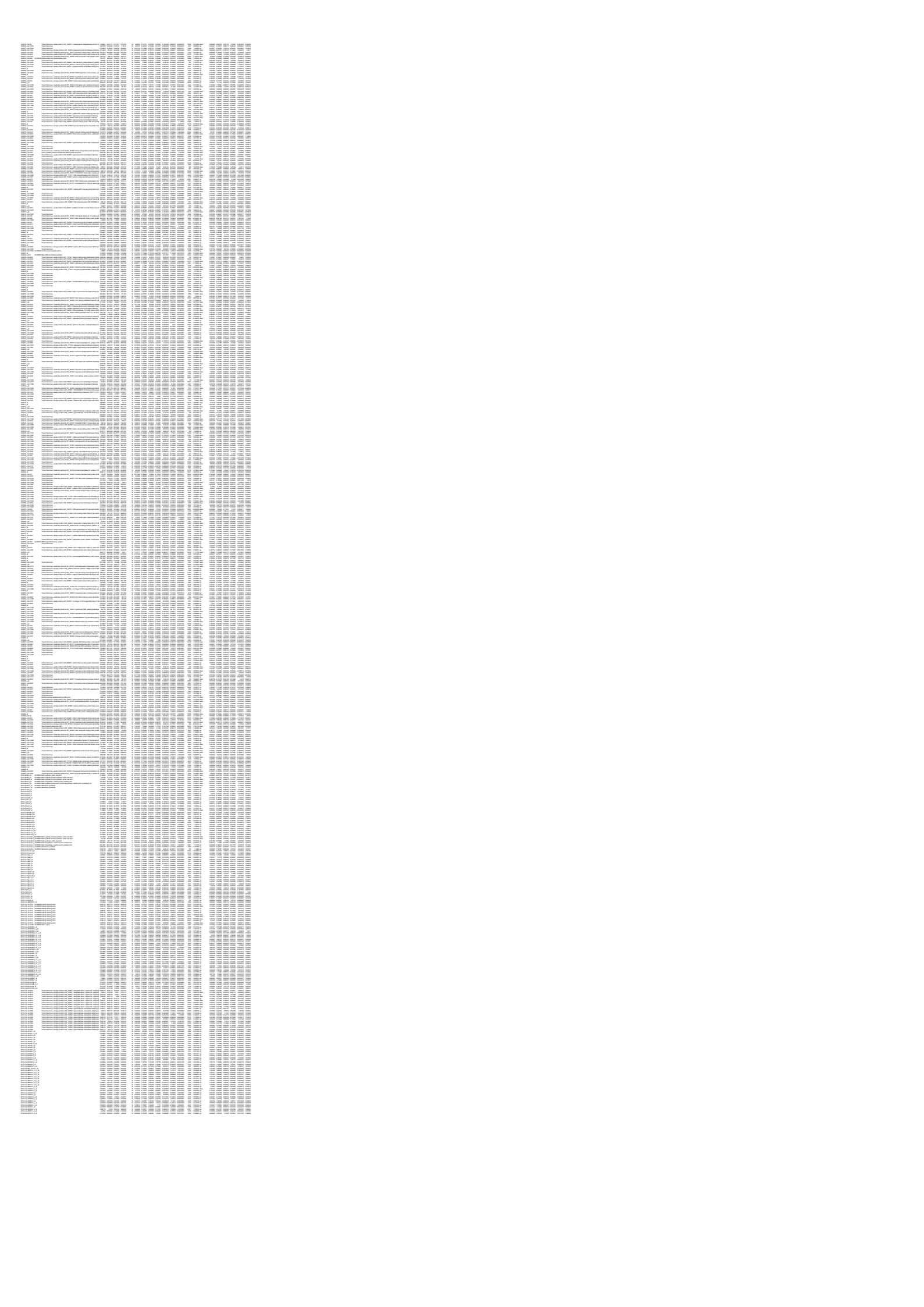












APPENDIX 5B

Supplementary results for Chapter 5 (Molecular mechanisms of flavonol biosynthesis)

Testing potential transcription factor candidate genes by RT-PCR expression analysis

To further investigate the expression pattern of candidate genes TC10 and TC12 (and compare it to *VvFLS1* expression) cDNA from the Shiraz and Chardonnay light induction series and the Shiraz hourly induction series as described in **Chapter 4** was used in RT-PCR expression analysis (**Figure 5B.1** & **5B.2**). Both candidates gene expression was lower in the shaded fruit compared to the exposed fruit and expression was increased in light induced samples. However, there was a difference in the magnitude of expression different between the candidates, where TC12 expression was greater. These results suggest these two putative transcription regulators (TC candidate 10 and 12) may be involved in the regulation of *VvFLS1* expression (based on expression patterns) and subsequently warrants further investigation.

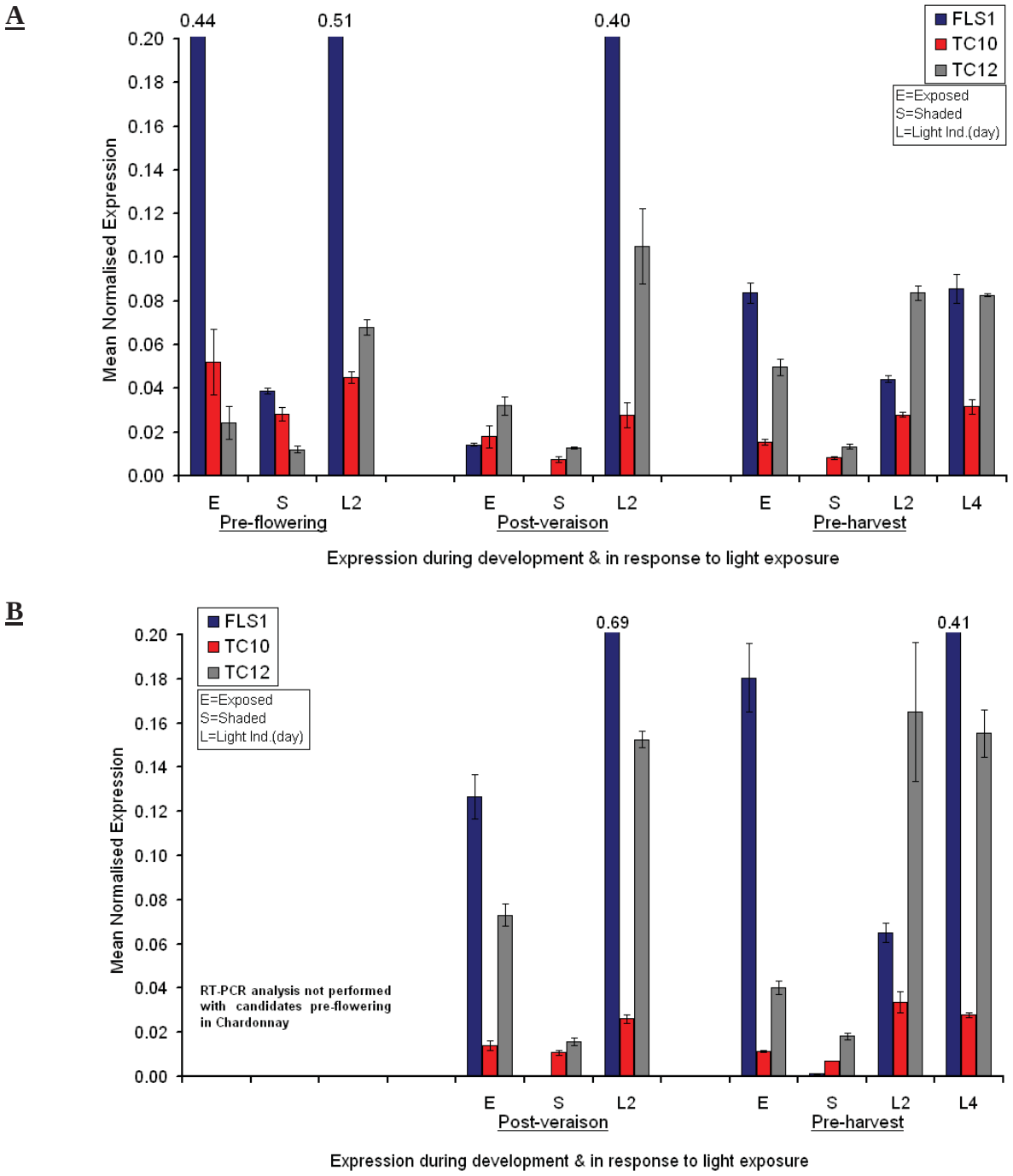


Figure 5B.1 RT-PCR expression pattern for candidate genes (TC10 & TC12) in Shiraz & Chardonnay fruit.
A Expression of *VvFLS1* & candidate genes (TC10 (TC43962) & TC12 (TC49275) during development in Shiraz skins, pre-flowering (12/11/03), post-veraison (2/2/04) & pre-harvest (23/2/04). At each time-point, on day 0, shaded fruit (S) & exposed fruit (E) was sampled. The boxes were removed & light induced fruit (L) was sampled on either day 2 (L2) or day 4 (L4) (as described in **Chapter 4**). Data is expressed relative to the expression of *VvUBIQ1*. Error bars represent the standard error (±SEM) for three analytical replicates.

B Expression of *VvFLS1* & candidate genes (TC10 (TC43962) & TC12 (TC49275) during development in Chardonnay skins, post-veraison (2/2/04) & pre-harvest (23/2/04). At each time-point, on day 0, shaded fruit (S) & exposed fruit (E) was sampled. The boxes were removed & light induced fruit (L) was sampled on either day 2 (L2) or day 4 (L4) (as described in **Chapter 4**). Data is expressed relative to the expression of *VvUBIQ1*. Error bars represent the standard error (±SEM) for three analytical replicates.

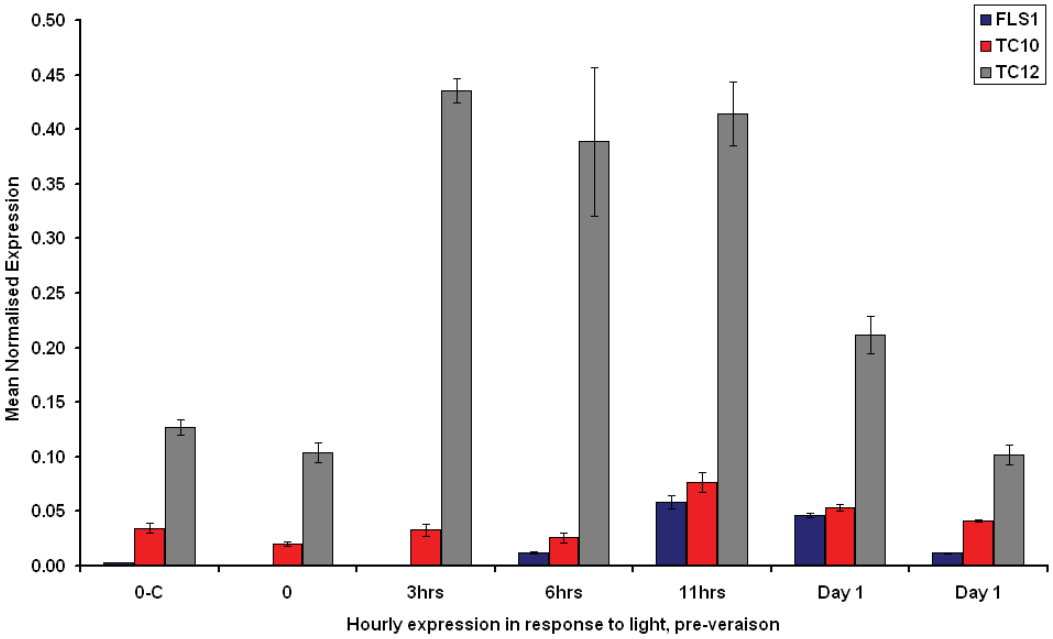


Figure 5B.2 RT-PCR expression pattern for candidate genes (TC10 & TC12) in Shiraz (hourly induction). Expression of *VvFLS1* & candidate genes (TC10 (TC43962, TC12 (TC49275) in Shiraz skins, pre-veraison (9/1/05). Boxes were removed on Day 0 & berry skins sampled (along with exposed controls (0-C). Berries continued to be sampled 3, 6 11 hrs & on day 1 & 2 (as described in **Chapter 4**). Data is expressed relative to the expression of *VvUBIQ1*. Error bars represent the standard error (±SEM) for three analytical replicates.

APPENDIX 5C

Supplementary results for Chapter 5 (Molecular mechanisms of flavonol biosynthesis)

Nucleotide sequence alignment of grapevine *VvFLS1* genomic sequences (On CD)

FILE ON CD: Appendix 5C FLS nucleotide alignment ***(Provided as Microsoft Word document)***

Sequences aligned included: *VvFLS1* promoter1 (Coding sequence AY257978, genomic sequence (this investigation), *VvFLS4cs* (AB092591), *VvFLS1pn* (unpublished), VvTC46143. Full-length genomic sequences were aligned using ClustralW (http://www.ebi.ac.uk/clustralW/ (Thompson et al. 1994) and displayed by GenDoc (http://www.psc.edu/biomed/genedoc). Dashes indicate introduced gaps. Shading represents the degree of sequence identity at each nucleotide position: nucleotides conserved between sequences are shaded in black and dark grey shading indicates conserved nucleotides in two out of three of the sequences.

KEY:

- 2Kb and 1.5Kb mark in the upstream genomic sequence (from the start codon (ATG))
- Start codon (ATG)
- Start and end of intron sequence
- Primers used to isolate the *VvFLS1* promoter sequence(s)
- A Key DNA binding motifs/elements

APPENDIX 5C

Supplementary results for Chapter 5 (Molecular mechanisms of flavonol biosynthesis)

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Sequences aligned included: *VvFLS1* promoter1 (Coding sequence AY257978, genomic sequence (this investigation), *VvFLS4cs* (AB092591), *VvFLS1pn* (unpublished), VvTC46143. Full-length genomic sequences were aligned using ClustralW (http://www.ebi.ac.uk/clustralW/ (Thompson et al. 1994) and displayed by GenDoc (http://www.psc.edu/biomed/genedoc). Dashes indicate introduced gaps. Shading represents the degree of sequence identity at each nucleotide position: nucleotides conserved between sequences are shaded in black and dark grey shading indicates conserved nucleotides in two out of three of the sequences.

KEY:

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- Start codon (ATG)
- Start and end of intron sequence
- Primers used to isolate the *VvFLS1* promoter sequence(s)
- A Key DNA binding motifs/elements

```
                    *        20         *        40         *        60
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : ATTGTTATAATTATGCTTGAATATTTGCACCTTCGTGTTTCAACTTTCAACACTACCATT :   60
VvFLS1   : ------------------------------------------------------------ :    -

                    *        80         *       100         *       120
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TCAAATTATTGAAAGGAGCGGAAACAACTATGAGATGAGGGTGGAAGTATAAATTTGTAT :  120
VvFLS1   : ------------------------------------------------------------ :    -

                    *       140         *       160         *       180
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : ATAAGAAATAAAATATTTGTTAAGCTTTGTATTTTCTCGACATATTCAAGCTACTATCAA :  180
VvFLS1   : ------------------------------------------------------------ :    -

                    *       200         *       220         *       240
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : GTTTTGACATGATTTTTTATCGAACTCCATTGTTATTTTGTCTTGCTCATGGCATATCGC :  240
VvFLS1   : ------------------------------------------------------------ :    -

                    *       260         *       280         *       300
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TCTGGTACTCATATTTGAAAGATGTTGCCATATAATGTTTTATTATCGTATCATGTATGT :  300
VvFLS1   : ------------------------------------------------------------ :    -

                    *       320         *       340         *       360
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : CAAGGTGTTAACAAGCCACCCCTGTCAAAATGAAGATTGATGAAATAATAGAAAAGTTCA :  360
VvFLS1   : ------------------------------------------------------------ :    -

                    *       380         *       400         *       420
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : ACAAAACAGTGGGTTTTAACTCACTAATTTGAAAAAATTTAATAATAGCATATATTTTAA :  420
VvFLS1   : ------------------------------------------------------------ :    -

                    *       440         *       460         *       480
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : AATATTTATAAATGGATAATCATAAAAATGATTTATAAAAATTGGTTTTTTTTTTAAWAT :  480
VvFLS1   : ------------------------------------------------------------ :    -

                    *       500         *       520         *       540
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TTTTTCAAATTAGTGAGTCTTAACTAGGTATTAGAATTATAAAAAATGACAATAGTCTAG :  540
VvFLS1   : ------------------------------------------------------------ :    -

                    *       560         *       580         *       600
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : CAATTATCCAATCACACTATATTGAAAAGATATTAAAAAAAAAATTAATCACTATAATTG :  600
VvFLS1   : ------------------------------------------------------------ :    -
```

```
                    *       620         *       640         *       660
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TAAGCTGGTATATGCACCTTTTGACTCAAACGTAAGGTTATATTTTGATATTGAAAAGAC :  660
VvFLS1   : ------------------------------------------------------------ :    -

                    *       680         *       700         *       720
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : AGTACCTCAATTAGAATAGGGAGAATTGTGTTTTGGGCCCAAAAATTAACATTTAGTCAT :  720
VvFLS1   : ------------------------------------------------------------ :    -

                    *       740         *       760         *       780
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : CCAACCATCCATATTTAAGCTCAGGACCCAAACAAAGTATGAAAATTAAGATGAAGGATA :  780
VvFLS1   : ------------------------------------------------------------ :    -

                    *       800         *       820         *       840
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TTGTCTTCCATTAATTCCTAAAATACCCTTATCCCTTATATGCCTACAAGTGAGCGTGAA :  840
VvFLS1   : ------------------------------------------------------------ :    -

                    *       860         *       880         *       900
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TTTTAATTTTTTTTGTATTTTTTTTTCCTTTTCTATTTTCTATTAAATATTACTCATTTC :  900
VvFLS1   : ------------------------------------------------------------ :    -

                    *       920         *       940         *       960
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TAACTTTTTTTTTCTTTTTATTCCAATATATATTTCTATTTTATGTCAAATAAAAAACAA :  960
VvFLS1   : ------------------------------------------------------------ :    -

                    *       980         *      1000         *      1020
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TAATATTTTTTTATTTTTCATTTTTAAAGATATTGAATCTTTTTGCTCTTATTAAAAGCA : 1020
VvFLS1   : ------------------------------------------------------------ :    -

                    *      1040         *      1060         *      1080
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : ATGATAAAAATTTTGGGATTTTTCATCTAAATATTTTTTATCTTTTTGTATTTACCTTTT : 1080
VvFLS1   : ------------------------------------------------------------ :    -

                    *      1100         *      1120         *      1140
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : AGTTTAATTTTCATTTTTTATTTTAAATTTATACTACCCTTTCATCTACATTTTTCTCTT : 1140
VvFLS1   : ------------------------------------------------------------ :    -

                    *      1160         *      1180         *      1200
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : ATTTTTAATTATTTTTGATATTTTCTACATTAACCATATTTTAAAAAATTTTAAAATTAC : 1200
VvFLS1   : ------------------------------------------------------------ :    -
```

```
                    *      1220         *      1240         *      1260
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : CTATCACTTCACTTTATTATATATATATATATATATATCTTTTTGGATTTTTAATTTTTA : 1260
VvFLS1   : ------------------------------------------------------------ :    -

                    *      1280         *      1300         *      1320
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : ATGTTTTTATTTTAAAATTTTTAAAAAGATAAATTTGTTGAAAAAAAAAAAACTAAGATAT : 1320
VvFLS1   : ------------------------------------------------------------ :    -

                    *      1340         *      1360         *      1380
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : GAATTTCTAATATTATATTAATAATTTTTCTTATCTAGATAGACTAATGCAAAGTATTTT : 1380
VvFLS1   : ------------------------------------------------------------ :    -

                    *      1400         *      1420         *      1440
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : GACCCATAACAAGAAAATTGTCAATACATTTTTTTAGTTAAACTTTAAAAATTAAGTTTC : 1440
VvFLS1   : ------------------------------------------------------------ :    -

                    *      1460         *      1480         *      1500
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : AAATAAAATATATTATATAAAATTTTATCTAGAAATTATTGAAAGTGGTATTTAATTTTT : 1500
VvFLS1   : ------------------------------------------------------------ :    -

                    *      1520         *      1540         *      1560
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TTATTTATTGACTTTGAAACTTATCTAATTTTTTACTTGAAAGGTAATAGAACATGTTTA : 1560
VvFLS1   : ------------------------------------------------------------ :    -

                    *      1580         *      1600         *      1620
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : CAAAAAAATAAAATAAATAGTTTCTCAGTTTTTAAATAAATGAGTATAAATATATTAAGA : 1620
VvFLS1   : ------------------------------------------------------------ :    -

                    *      1640         *      1660         *      1680
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : GAATTAAAGATAATCTTAGTAAAAATTTTGATAAATATGATTATAATTTTAAATATAGAT : 1680
VvFLS1   : ------------------------------------------------------------ :    -

                    *      1700         *      1720         *      1740
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TCATTTGGATAAAATTTCACAAAAAAAAAAATATAGTGAAAAGAAATAACATTGATAAAA : 1740
VvFLS1   : ------------------------------------------------------------ :    -

                    *      1760         *      1780         *      1800
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : CTACAAAAACAAAATATGCAATTACAAATTTTTGATGATGAAATTTAAAAATGAAATTCG : 1800
VvFLS1   : ------------------------------------------------------------ :    -
```

```
                    *      1820         *      1840         *      1860
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : AAACAATTCTTGAGTGAGAGAATTTGAGTGGGGGAAAAATCTTTGAGTGGAAAAAAATAG : 1860
VvFLS1   : ------------------------------------------------------------ :    -

                    *      1880         *      1900         *      1920
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : GAAAATTTTTCAAAATCACTTGAAATCCTTAACAAAAAGTAGTCTTGTACACCCTTGTAT : 1920
VvFLS1   : ------------------------------------------------------------ :    -

                    *      1940         *      1960         *      1980
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : AATTAGTAAATTTGTCTTGTATAGTTAGTGTAATACCTTGTATAATAACTCAAATAACTC : 1980
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2000         *      2020         *      2040
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : AAAATTTTATTTCTTATGTGTTAATTTTTGTAGGGAATGTCTTAATGAAATAGTTTGGTA : 2040
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2060         *      2080         *      2100
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : AAAAAAAGAAAAAAAAACTATCAATAATCGTCTTAATATCAAATTCAAGTTGTTTAAAAA : 2100
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2120         *      2140         *      2160
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TCGTACAAAACCTATTAGGAGCCTTGTACACCCTTGTACACTTAACACATTTCCCTTGTA : 2160
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2180         *      2200         *      2220
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : CAATTAGTATAATACCTTTGTACAATGACATAAATTTCATATTTGTCATAACTTAAACGT : 2220
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2240         *      2260         *      2280
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : ATTTTCAAAAAGAGGCAATATAGAAAATAAAAATAAAAACTAGAAAAATATTTTAAAACC : 2280
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2300         *      2320         *      2340
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : AAACTCAAATATAATCTATRTAATTTTTAGTTACTTGTTTTCATCTAAAACAAGTAAATA : 2340
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2360         *      2380         *      2400
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TACCTTTCRACCCTTTTATATATATAAAAAAATCAATCTCTACTATGTATTGATATAATC : 2400
VvFLS1   : ------------------------------------------------------------ :    -
```

```
                    *      2420         *      2440         *      2460
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : CACTTCTAAAATTAGGTCATATGAAAACATTTTAATTGAGTACTTAAAATAAAAACTCTC : 2460
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2480         *      2500         *      2520
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : CATCCATTCTYATTTTAATYGAGTACTTAAAATAAAAACTCTCAATCCATCCCCYTTCTT : 2520
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2540         *      2560         *      2580
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TATTTTTCYTTTTCTTATTTTAATAAATTTTCAATTMATTCAAATCATTAAAAAAAATCC : 2580
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2600         *      2620         *      2640
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TTAATAAACAAATTTGTAGCATTTCATATAACTTATTACTAAAAGTCATGTTCAAAAAGT : 2640
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2660         *      2680         *      2700
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TGTTAAAWTARGGAAGGAAGAAGATTAAAAAAAAAAAAAATTGAACCTTTTATTTTATAAT : 2700
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2720         *      2740         *      2760
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : AGTAAAAAAAAACTTTAAAATACTTTTTACTATAAAAATAAAATAAAATAGGGAATATAT : 2760
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2780         *      2800         *      2820
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TTATTTTAAATGGTATTTTAATCATTAAATTATTTACTTCTAAAATGTAAACGATAAAAA : 2820
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2840         *      2860         *      2880
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TAAATATAAAAGATAATTTTTATTTATTTAAATTAATATTTTTTTAAAAAGTATTTCTAA : 2880
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2900         *      2920         *      2940
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : AATAGTCTTTGAATCATTAATATAATTTTTGTWTATTTATAATTTAAAAWTAAAAAATAA : 2940
VvFLS1   : ------------------------------------------------------------ :    -

                    *      2960         *      2980         *      3000
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TGTAAATTTTCAATTATTTATAAAAGAGTTTTAAAAAAWTGAAAAATCCAAAAWTGTTAA : 3000
VvFLS1   : ------------------------------------------------------------ :    -
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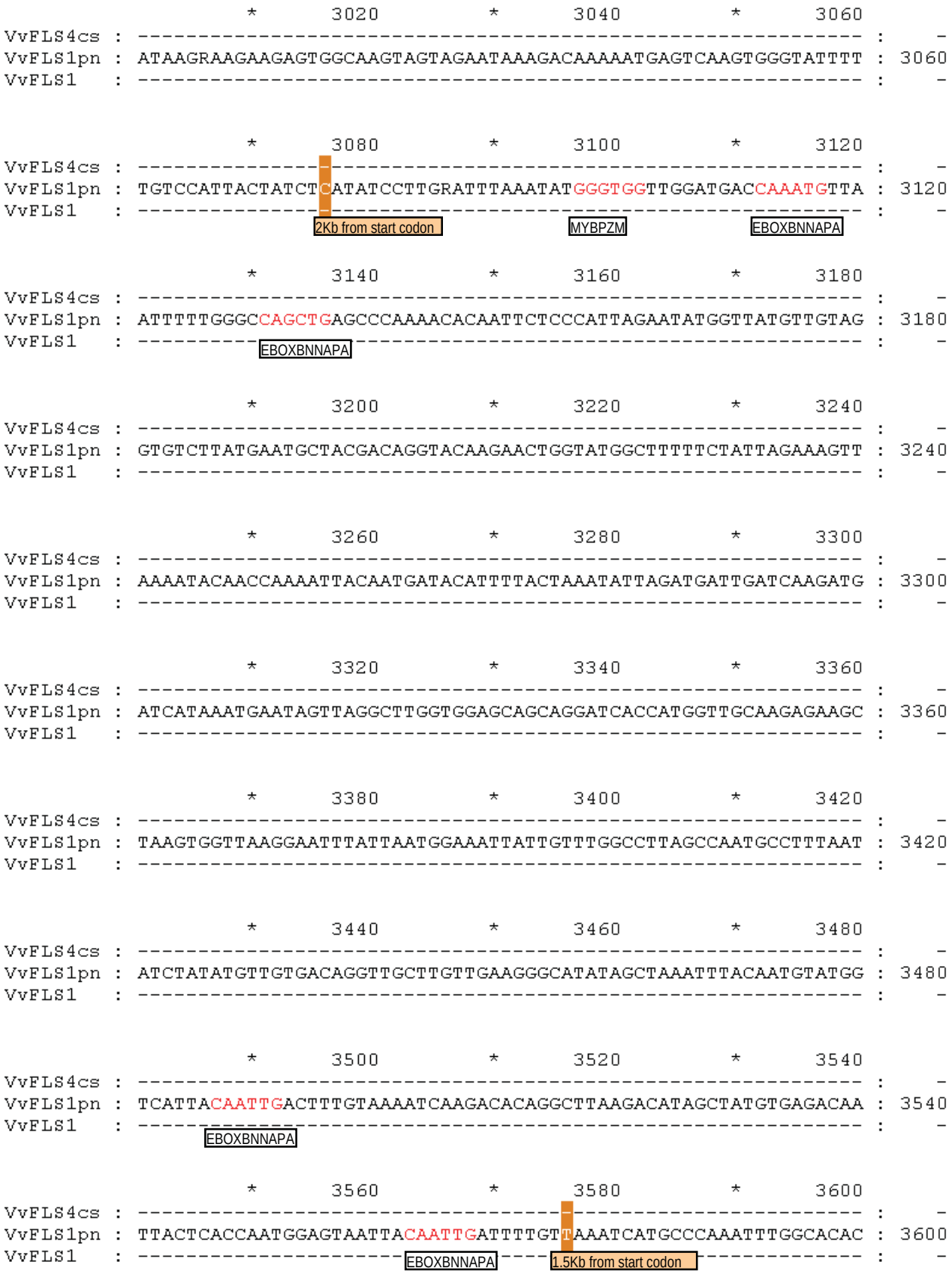
* 3020 * 3040 * 3060
VvFLS4cs : - :
VvFLS1pn : ATAAGRAAGAAGAGTGGCAAGTAGTAGAATAAAGACAAAAATGAGTCAAGTGGGTATTTT : 3060
VvFLS1 : - :
* 3080 * 3100 * 3120
VvFLS4cs : - :
VvFLS1pn : TGTCCATTACTATCTCATATCCTTGRATTTAAATATGGGTGGTTGGATGACCAAATGTTA : 3120
VvFLS1 : - :
2Kb from start codon
MYBPZM
EBOXBNNAPA
* 3140 * 3160 * 3180
VvFLS4cs : - :
VvFLS1pn : ATTTTTGGGCCAGCTGAGCCCAAAACACAATTCTCCCATTAGAATATGGTTATGTTGTAG : 3180
VvFLS1 : - :
EBOXBNNAPA
* 3200 * 3220 * 3240
VvFLS4cs : - :
VvFLS1pn : GTGTCTTATGAATGCTACGACAGGTACAAGAACTGGTATGGCTTTTTCTATTAGAAAGTT : 3240
VvFLS1 : - :
* 3260 * 3280 * 3300
VvFLS4cs : - :
VvFLS1pn : AAAATACAACCAAAATTACAATGATACATTTTACTAAATATTAGATGATTGATCAAGATG : 3300
VvFLS1 : - :
* 3320 * 3340 * 3360
VvFLS4cs : - :
VvFLS1pn : ATCATAAATGAATAGTTAGGCTTGGTGGAGCAGCAGGATCACCATGGTTGCAAGAGAAGC : 3360
VvFLS1 : - :
* 3380 * 3400 * 3420
VvFLS4cs : - :
VvFLS1pn : TAAGTGGTTAAGGAATTTATTAATGGAAATTATTGTTTGGCCTTAGCCAATGCCTTTAAT : 3420
VvFLS1 : - :
* 3440 * 3460 * 3480
VvFLS4cs : - :
VvFLS1pn : ATCTATATGTTGTGACAGGTTGCTTGTTGAAGGGCATATAGCTAAATTTACAATGTATGG : 3480
VvFLS1 : - :
* 3500 * 3520 * 3540
VvFLS4cs : - :
VvFLS1pn : TCATTACAATTGACTTTGTAAAATCAAGACACAGGCTTAAGACATAGCTATGTGAGACAA : 3540
VvFLS1 : - :
EBOXBNNAPA
* 3560 * 3580 * 3600
VvFLS4cs : - :
VvFLS1pn : TTACTCACCAATGGAGTAATTACAATTGATTTTGTTAAATCATGCCCAAATTTGGCACAC : 3600
VvFLS1 : - :
EBOXBNNAPA
1.5Kb from start codon

```
                    *      3620         *      3640         *      3660
VvFLS4cs  : ------------------------------------------------------------ :     -
VvFLS1pn  : CCCTAGATGAAAAGCCTTGCTAGGGATTTAGTATGGAAAATATAAAGAAGAATGAGACTA : 3660
VvFLS1    : ------------------------------------------------------------ :     -

                    *      3680         *      3700         *      3720
VvFLS4cs  : ------------------------------------------------------------ :     -
VvFLS1pn  : AAGCCAACATCTATTATATCACCGATAATGGAACCTTAACCTAATGCTTGAAATATCACA : 3720
VvFLS1    : ------------------------------------LREBOXIPCCHS1------------ :     -

                    *      3740         *      3760         *      3780
VvFLS4cs  : ------------------------------------------------------------ :     -
VvFLS1pn  : TCCTTAGGTTCAAGGAGTAAAAGTATAACATATGTTGTGATTGCAAGCGCTATAATATTA : 3780
VvFLS1    : ---LREBOXIPCCHS1----------------EBOXBNNAPA------------------ :     -

                    *      3800         *      3820         *      3840
VvFLS4cs  : ------------------------------------------------------------ :     -
VvFLS1pn  : ATGACATGTMTCAAAAGTAAAAGGGCTYGATACCTGTAATGTGAAGGTTAATAGTTTTAC : 3840
VvFLS1    : ------------------------------------------------------------ :     -

                    *      3860         *      3880         *      3900
VvFLS4cs  : ------------------------------------------------------------ :     -
VvFLS1pn  : AACCTATTTATGTTGGAATATTGTGATAACTAGAGGGTCGACATTCTTGATAAGCCTACC : 3900
VvFLS1    : ----------------------------------------------IBOXCORE-MYBPZM : -

                    *      3920         *      3940         *      3960
VvFLS4cs  : ------------------------------------------------------------ :     -
VvFLS1pn  : CATGTGAGTGTAGGGAATTAGAAAGATGTCTTTCTAAAGATATATAGGACCTTACATAAA : 3960
VvFLS1    : ------------------------------------------------------------ :     -
            EBOXBNNAPA

                    *      3980         *      4000         *      4020
VvFLS4cs  : ------------------------------------------------------------ :     -
VvFLS1pn  : TGGGTATGTAATAACGTGATGCGACCCAAATTGAACGAGTGTGATGTCCAAAAAATGCAA : 4020
VvFLS1    : ----------ACE SITE ---------------------------------------- :     -

                    *      4040         *      4060         *      4080
VvFLS4cs  : ------------------------------------------------------------ :     -
VvFLS1pn  : CCTTAGATTAAAATGTGCTTTGAAATCTTTAAAAGAGGGCCGAGGGGTGACCATTGCATT : 4080
VvFLS1    : ------------------------------------------------------------ :     -

                    *      4100         *      4120         *      4140
VvFLS4cs  : ------------------------------------------------------------ :     -
VvFLS1pn  : CATTCATTCAACCATCAAATTCTTCGATTCTTTCCATCATTTCACAACTTTTAGCATTAT : 4140
VvFLS1    : ------------------------------------------------------------ :     -

                    *      4160         *      4180         *      4200
VvFLS4cs  : ------------------------------------------------------------ :     -
VvFLS1pn  : ATTTTCTTCATGAATCAAAATTTTTATATACTTTTATTGTAAAAAAACATTACAAATATT : 4200
VvFLS1    : ------------------------------------------------------------ :     -
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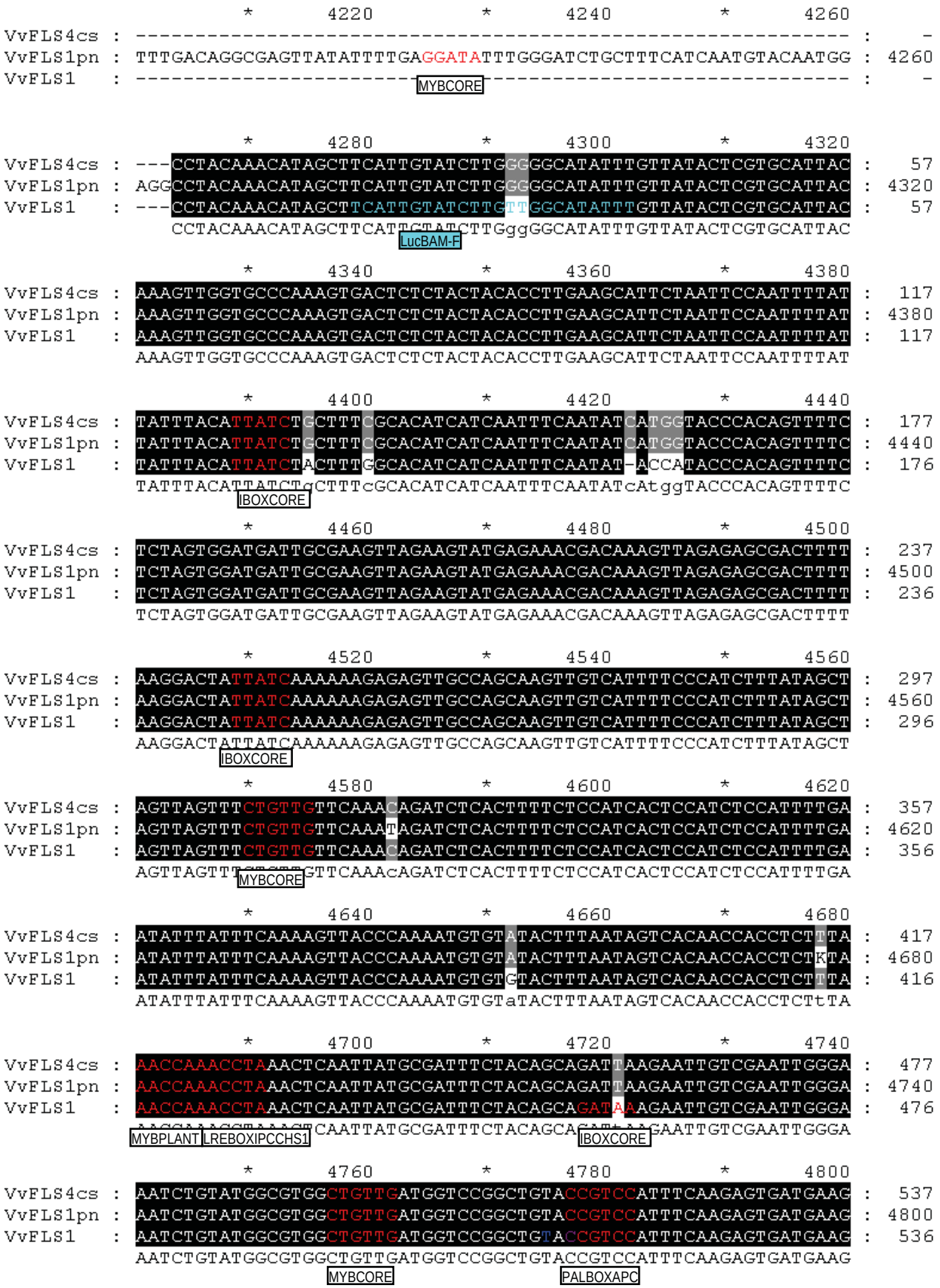
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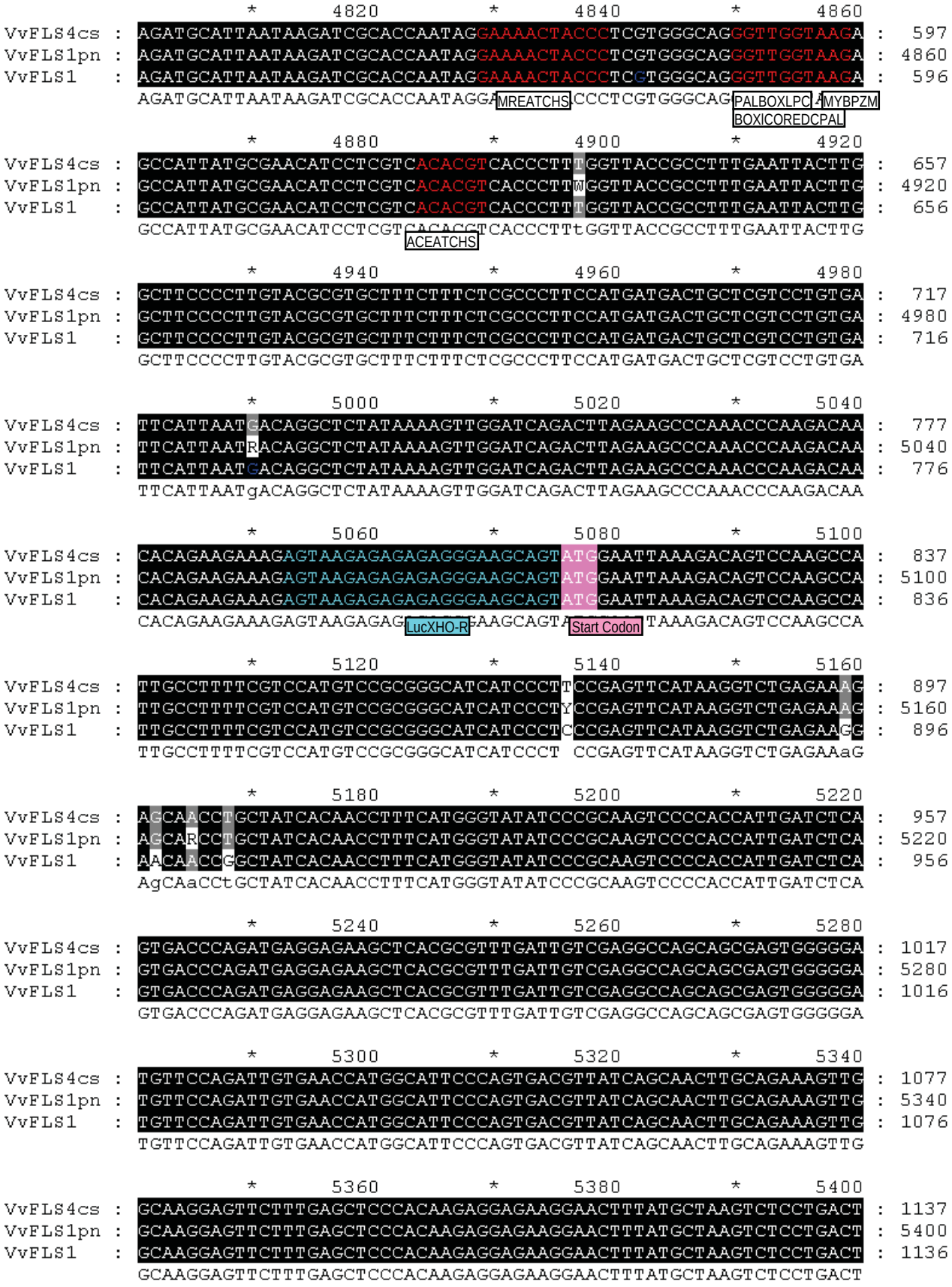
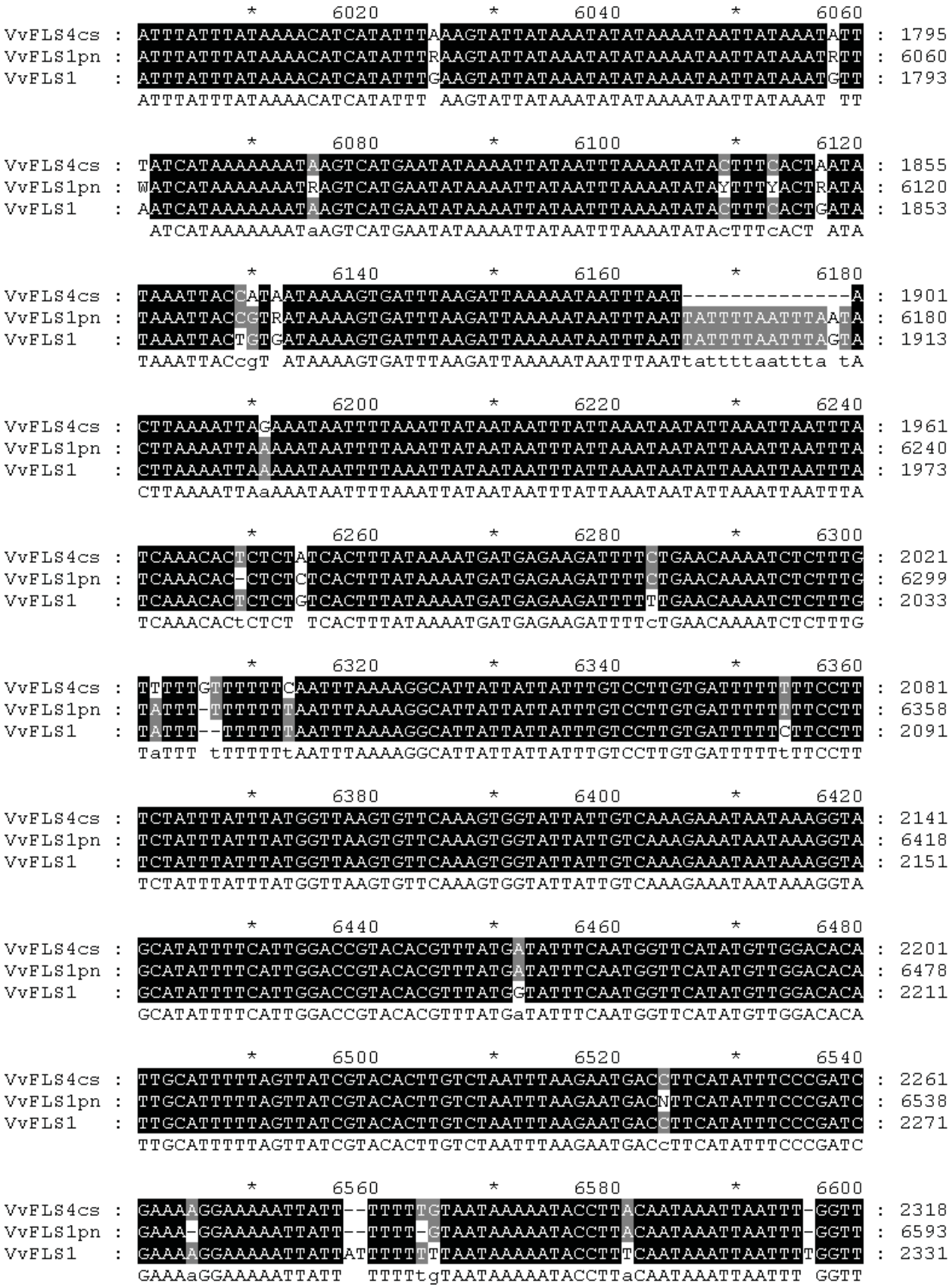
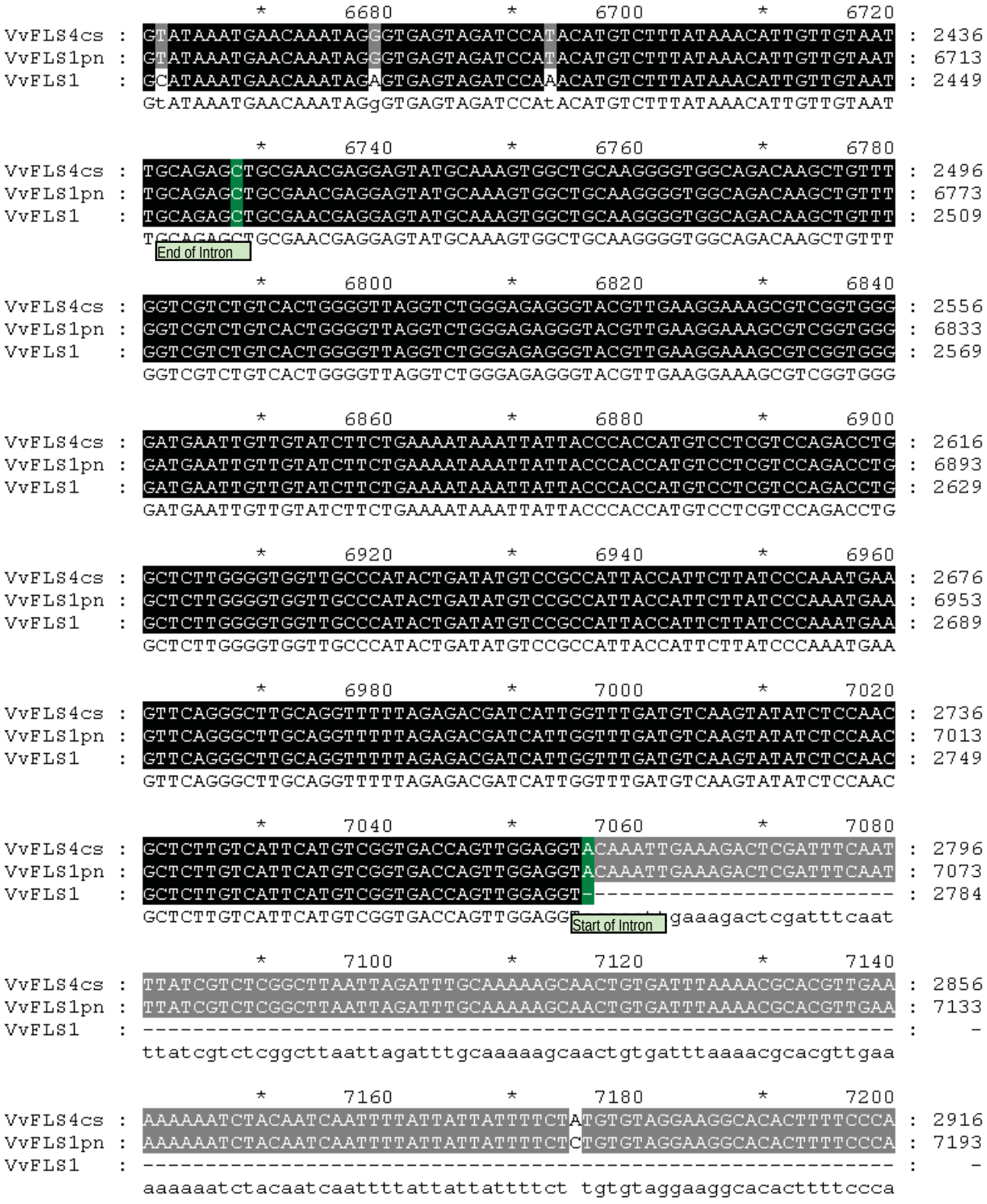
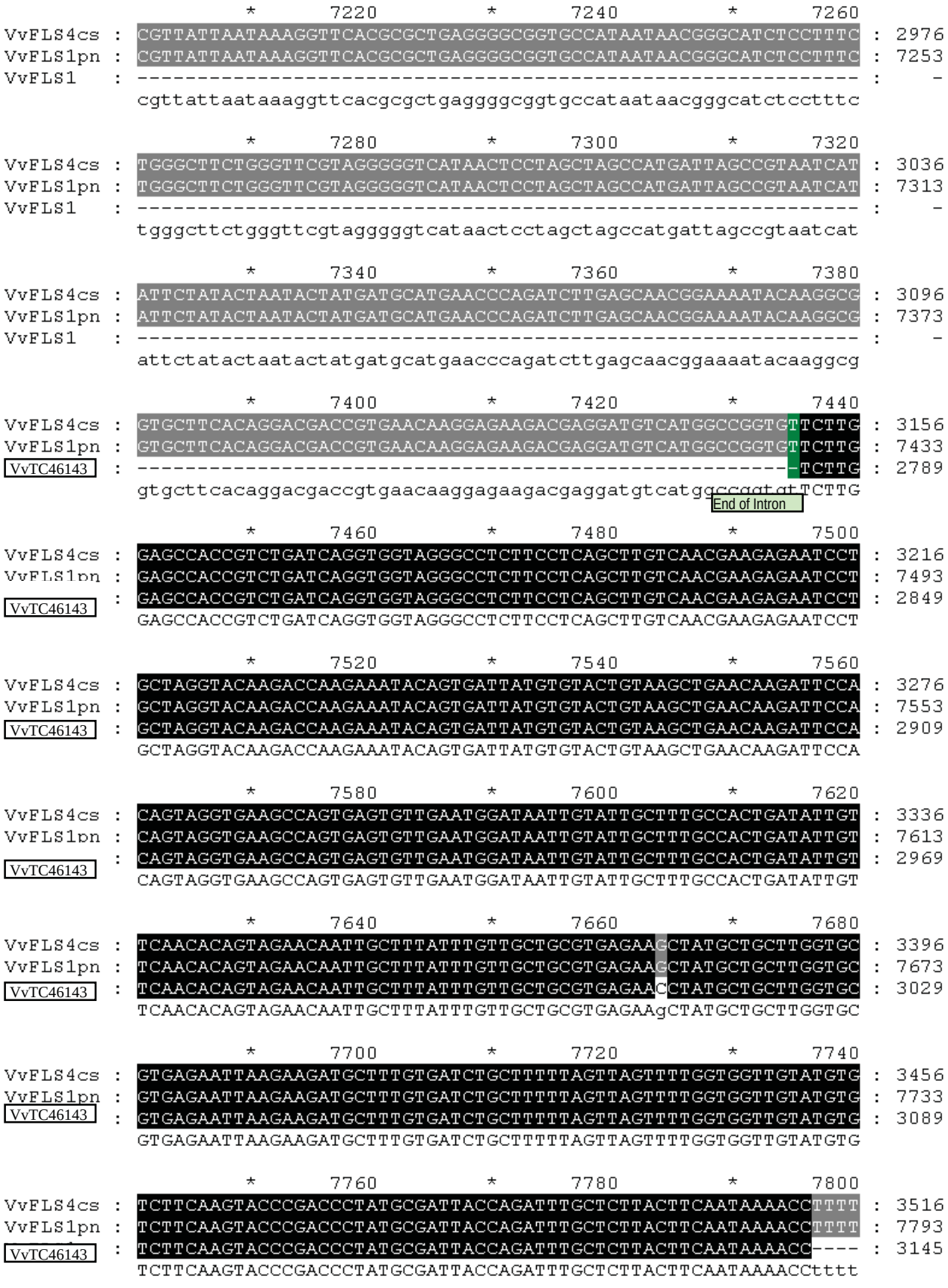

MREATCHS
PALBOXLPC
MYBPZM
BOXICOREDCPAL
ACEATCHS
LucXHO-R
Start Codon


5420
5440
5460
VvFLS4cs : CCAAGTCTATTCAAGGCTATGGAAGCAAGCTTCAAAAAGAAGTGGAGGGCAAGAAAGCTT : 1197
VvFLS1pn : CCAAGTCTATTCAAGGCTATGGAAGCAAGCTTCAAAAAGAAGTGGAGGGCAAGAAAGCTT : 5460
VvFLS1 : CCAAGTCTATTCAAGGCTATGGAAGCAAGCTTCAAAAAGAAGTGGAGGGCAAGAAAGCTT : 1196
CCAAGTCTATTCAAGGCTATGGAAGCAAGCTTCAAAAAGAAGTGGAGGGCAAGAAAGCTT
5480
5500
5520
VvFLS4cs : GGGTCGATCACCTCTTCCATAACATCTGGCCTCCTCCTGCCATTGACTATCAGTTCTGGC : 1257
VvFLS1pn : GGGTCGATCACCTCTTCCATAACATCTGGCCTCCTCCTGCCATTGACTATCAGTTCTGGC : 5520
VvFLS1 : GGGTCGATCACCTCTTCCATAACATCTGGCCTCCTCCTGCCATTGACTATCAGTTCTGGC : 1256
GGGTCGATCACCTCTTCCATAACATCTGGCCTCCTCCTGCCATTGACTATCAGTTCTGGC
5540
5560
5580
VvFLS4cs : CTAAAAAACCACCTACTTACAGGTTTGAAACATTCGTTAACGTAGCTATTTTTTTCCTTT : 1317
VvFLS1pn : CTAAAAAACCACCTACTTACAGGTTTGAAACATTCGTTAACGTAGCTATTTTTTTCCTTT : 5580
VvFLS1 : CTAAGAAACCACCTACTTACAGGTTTGAAACATTCGTCAACGTAGCTATTTTTTTCCTTT : 1316
CTAAaAAACCACCTACTTACAG Start of Intron CATTCGTtAACGTAGCTATTTTTTTCCTTT
5600
5620
5640
VvFLS4cs : TTTTTGAAAAAAAAAAAAAAAAA-GCTGATTAACACACGTCTCACACTCACAGGGTTAAG : 1376
VvFLS1pn : TTTTTGAAAAAAAAAAAAAAAAAAGCTGATTAACACACGTCTCACACTCACAGGGTTAAG : 5640
VvFLS1 : TTTTTGAAAAAAAAAAAAAAAA--GCTGATTAACACACGTCTCACACTCACAGGGTTAAG : 1374
TTTTTGAAAAAAAAAAAAAAAAa GCTGATTAACACACGTCTCACACTCACAGGGTTAAG
5660
5680
5700
VvFLS4cs : TAATATTAATGTACAAGTCTTAACGTCTTCAATATAACGTGAGAGTAGGCATGATATATA : 1436
VvFLS1pn : TAATATTAATGTACAAGTCTTAACGTCTTCAATATAAYGTGAGAGTAGGCATGATATATA : 5700
VvFLS1 : TAATATTAATGTACAAGTCTTAACGTCT-CAATATAACGTGAGAGTAGGCATGATATATA : 1433
TAATATTAATGTACAAGTCTTAACGTCTtCAATATAAcGTGAGAGTAGGCATGATATATA
5720
5740
5760
VvFLS4cs : TAGAACATTTGGAGATCAGCTTTTTAAAATCCTGTTGGATATGCGTAGGAGACCCAAAAA : 1496
VvFLS1pn : TAGAACATTTGGAGATCAGCTTTTTAAAATCCTGTTGGATATGCGTAGGAGACCCAAAAA : 5760
VvFLS1 : TAGAACATTTGGAGATCAGCTTTTTAAAATCCTGTTGGATATGCGTAGGAGACCCAAAAA : 1493
TAGAACATTTGGAGATCAGCTTTTTAAAATCCTGTTGGATATGCGTAGGAGACCCAAAAA
5780
5800
5820
VvFLS4cs : GGATCTCAAAATGTAAAATTAAATAAAAAATTACACTGAAATATAAATATGAGATAGATG : 1556
VvFLS1pn : GGATCTCAAAATGTAAAATTAAATAAAAAATTACACTGAAATATAAATATGAGATAGATG : 5820
VvFLS1 : GGATCTCAAAATGTAAAATTAAATAAAAAATTACACTGAAATATAAATATGAGACAGATG : 1553
GGATCTCAAAATGTAAAATTAAATAAAAAATTACACTGAAATATAAATATGAGAtAGATG
5840
5860
5880
VvFLS4cs : GTGTTTGATAAAATTTAATAATTAAATTTAAGTTAAATTATATTTAATATGTTTGATTTA : 1616
VvFLS1pn : GTGTTTGATAAAATTTAATAATTAAATTTAWGTTAAATTATATTTAATATGTTTGATTTA : 5880
VvFLS1 : GTGTTTGATAAAATTTAATAATTAAATTTAAGTTAAATTATATTTAATATGTTTGATTTA : 1613
GTGTTTGATAAAATTTAATAATTAAATTTAaGTTAAATTATATTTAATATGTTTGATTTA
5900
5920
5940
VvFLS4cs : ATATTTATTATTTAATTTTTTAAAGTAAAATTAATTTAAAATTGATTTTAAATCATTCAA : 1676
VvFLS1pn : ATATTTATTATTTAATTTTTTWAAAGTAAAATTAATTTAAAATTGATTTTAAATCATTCAA : 5940
VvFLS1 : ATATTTATTATTTAATTTTTTTAAAATAAAATTAATTTAAAATTGATTTTAAATCATTCAA : 1673
ATATTTATTATTTAATTTTTTtAAAgTAAAATTAATTTAAAATTGATTTTAAATCATTCAA
5960
5980
6000
VvFLS4cs : TTGATATATTTATTTTAATTGATTTAACTAGTATTTATATTTTTTAATTTTAAAAAATA- : 1735
VvFLS1pn : TTGATATATTTATTTTAATTGATTTAACTAGTATTTAYATTTTTTAATTTTAAAAAATAT : 6000
VvFLS1 : TTGATATATTTATTTTAATTGATTTAACTAGTATTTACATTTTTTAATTTTAAAAAATAT : 1733
TTGATATATTTATTTTAATTGATTTAACTAGTATTTA ATTTTTTAATTTTAAAAAATAt


* 6020 * 6040 * 6060
VvFLS4cs : ATTTATTTATAAAACATCATATTTAAAGTATTATAAATATATAAAATAATTATAAATATT : 1795
VvFLS1pn : ATTTATTTATAAAACATCATATTTRAAGTATTATAAATATATAAAATAATTATAAATRTT : 6060
VvFLS1 : ATTTATTTATAAAACATCATATTTGAAGTATTATAAATATATAAAATAATTATAAATGTT : 1793
ATTTATTTATAAAACATCATATTT AAGTATTATAAATATATAAAATAATTATAAAT TT
* 6080 * 6100 * 6120
VvFLS4cs : TATCATAAAAAAATAAGTCATGAATATAAAATTATAATTTAAAATATACTTTCACTAATA : 1855
VvFLS1pn : WATCATAAAAAAATRAGTCATGAATATAAAATTATAATTTAAAATATAYTTTYACTRATA : 6120
VvFLS1 : AATCATAAAAAAATAAGTCATGAATATAAAATTATAATTTAAAATATACTTTCACTGATA : 1853
ATCATAAAAAAATaAGTCATGAATATAAAATTATAATTTAAAATATAcTTTcACT ATA
* 6140 * 6160 * 6180
VvFLS4cs : TAAATTACCATAATAAAAGTGATTTAAGATTAAAAATAATTTAAT--------------A : 1901
VvFLS1pn : TAAATTACCGTRATAAAAGTGATTTAAGATTAAAAATAATTTAATTATTTTAATTTAATA : 6180
VvFLS1 : TAAATTACTGTGATAAAAGTGATTTAAGATTAAAAATAATTTAATTATTTTAATTTAGTA : 1913
TAAATTACCgT ATAAAAGTGATTTAAGATTAAAAATAATTTAATtattttaattta tA
* 6200 * 6220 * 6240
VvFLS4cs : CTTAAAATTAGAAATAATTTTAAATTATAATAATTTATTAAATAATATTAAATTAATTTA : 1961
VvFLS1pn : CTTAAAATTAAAAATAATTTTAAATTATAATAATTTATTAAATAATATTAAATTAATTTA : 6240
VvFLS1 : CTTAAAATTAAAAATAATTTTAAATTATAATAATTTATTAAATAATATTAAATTAATTTA : 1973
CTTAAAATTAaAAATAATTTTAAATTATAATAATTTATTAAATAATATTAAATTAATTTA
* 6260 * 6280 * 6300
VvFLS4cs : TCAAACACTCTCTATCACTTTATAAAATGATGAGAAGATTTTCTGAACAAAATCTCTTTG : 2021
VvFLS1pn : TCAAACAC-CTCTCTCACTTTATAAAATGATGAGAAGATTTTCTGAACAAAATCTCTTTG : 6299
VvFLS1 : TCAAACACTCTCTGTCACTTTATAAAATGATGAGAAGATTTTTTGAACAAAATCTCTTTG : 2033
TCAAACACtCTCT TCACTTTATAAAATGATGAGAAGATTTTcTGAACAAAATCTCTTTG
* 6320 * 6340 * 6360
VvFLS4cs : TTTTTGTTTTTTCAATTTAAAAGGCATTATTATTATTTGTCCTTGTGATTTTTTTTCCTT : 2081
VvFLS1pn : TATTT-TTTTTTTAATTTAAAAGGCATTATTATTATTTGTCCTTGTGATTTTTTTTCCTT : 6358
VvFLS1 : TATTT--TTTTTTAATTTAAAAGGCATTATTATTATTTGTCCTTGTGATTTTTCTTCCTT : 2091
TaTTT tTTTTTtAATTTAAAAGGCATTATTATTATTTGTCCTTGTGATTTTTtTTCCTT
* 6380 * 6400 * 6420
VvFLS4cs : TCTATTTATTTATGGTTAAGTGTTCAAAGTGGTATTATTGTCAAAGAAATAATAAAGGTA : 2141
VvFLS1pn : TCTATTTATTTATGGTTAAGTGTTCAAAGTGGTATTATTGTCAAAGAAATAATAAAGGTA : 6418
VvFLS1 : TCTATTTATTTATGGTTAAGTGTTCAAAGTGGTATTATTGTCAAAGAAATAATAAAGGTA : 2151
TCTATTTATTTATGGTTAAGTGTTCAAAGTGGTATTATTGTCAAAGAAATAATAAAGGTA
* 6440 * 6460 * 6480
VvFLS4cs : GCATATTTTCATTGGACCGTACACGTTTATGATATTTCAATGGTTCATATGTTGGACACA : 2201
VvFLS1pn : GCATATTTTCATTGGACCGTACACGTTTATGATATTTCAATGGTTCATATGTTGGACACA : 6478
VvFLS1 : GCATATTTTCATTGGACCGTACACGTTTATGGTATTTCAATGGTTCATATGTTGGACACA : 2211
GCATATTTTCATTGGACCGTACACGTTTATGaTATTTCAATGGTTCATATGTTGGACACA
* 6500 * 6520 * 6540
VvFLS4cs : TTGCATTTTTAGTTATCGTACACTTGTCTAATTTAAGAATGACCTTCATATTTCCCGATC : 2261
VvFLS1pn : TTGCATTTTTAGTTATCGTACACTTGTCTAATTTAAGAATGACNTTCATATTTCCCGATC : 6538
VvFLS1 : TTGCATTTTTAGTTATCGTACACTTGTCTAATTTAAGAATGACCTTCATATTTCCCGATC : 2271
TTGCATTTTTAGTTATCGTACACTTGTCTAATTTAAGAATGACcTTCATATTTCCCGATC
* 6560 * 6580 * 6600
VvFLS4cs : GAAAAGGAAAAATTATT--TTTTTGTAATAAAAATACCTTACAATAAATTAATTT-GGTT : 2318
VvFLS1pn : GAAA-GGAAAAATTATT--TTTT-GTAATAAAAATACCTTACAATAAATTAATTT-GGTT : 6593
VvFLS1 : GAAAAGGAAAAATTATTATTTTTTTAATAAAAATACCTTTCAATAAATTAATTTTGGTT : 2331
GAAAaGGAAAAATTATT TTTTtgTAATAAAAATACCTTaCAATAAATTAATTT GGTT


6680
6700
6720
VvFLS4cs : GTATAAATGAACAAATAGGGTGAGTAGATCCATACATGTCTTTATAAACATTGTTGTAAT : 2436
VvFLS1pn : GTATAAATGAACAAATAGGGTGAGTAGATCCATACATGTCTTTATAAACATTGTTGTAAT : 6713
VvFLS1 : GCATAAATGAACAAATAGAGTGAGTAGATCCAAACATGTCTTTATAAACATTGTTGTAAT : 2449
GtATAAATGAACAAATAGgGTGAGTAGATCCAtACATGTCTTTATAAACATTGTTGTAAT
6740
6760
6780
VvFLS4cs : TGCAGAGCTGCGAACGAGGAGTATGCAAAGTGGCTGCAAGGGGTGGCAGACAAGCTGTTT : 2496
VvFLS1pn : TGCAGAGCTGCGAACGAGGAGTATGCAAAGTGGCTGCAAGGGGTGGCAGACAAGCTGTTT : 6773
VvFLS1 : TGCAGAGCTGCGAACGAGGAGTATGCAAAGTGGCTGCAAGGGGTGGCAGACAAGCTGTTT : 2509
TGCAGAGCTGCGAACGAGGAGTATGCAAAGTGGCTGCAAGGGGTGGCAGACAAGCTGTTT
End of Intron
6800
6820
6840
VvFLS4cs : GGTCGTCTGTCACTGGGGTTAGGTCTGGGAGAGGGTACGTTGAAGGAAAGCGTCGGTGGG : 2556
VvFLS1pn : GGTCGTCTGTCACTGGGGTTAGGTCTGGGAGAGGGTACGTTGAAGGAAAGCGTCGGTGGG : 6833
VvFLS1 : GGTCGTCTGTCACTGGGGTTAGGTCTGGGAGAGGGTACGTTGAAGGAAAGCGTCGGTGGG : 2569
GGTCGTCTGTCACTGGGGTTAGGTCTGGGAGAGGGTACGTTGAAGGAAAGCGTCGGTGGG
6860
6880
6900
VvFLS4cs : GATGAATTGTTGTATCTTCTGAAAATAAATTATTACCCACCATGTCCTCGTCCAGACCTG : 2616
VvFLS1pn : GATGAATTGTTGTATCTTCTGAAAATAAATTATTACCCACCATGTCCTCGTCCAGACCTG : 6893
VvFLS1 : GATGAATTGTTGTATCTTCTGAAAATAAATTATTACCCACCATGTCCTCGTCCAGACCTG : 2629
GATGAATTGTTGTATCTTCTGAAAATAAATTATTACCCACCATGTCCTCGTCCAGACCTG
6920
6940
6960
VvFLS4cs : GCTCTTGGGGTGGTTGCCCATACTGATATGTCCGCCATTACCATTCTTATCCCAAATGAA : 2676
VvFLS1pn : GCTCTTGGGGTGGTTGCCCATACTGATATGTCCGCCATTACCATTCTTATCCCAAATGAA : 6953
VvFLS1 : GCTCTTGGGGTGGTTGCCCATACTGATATGTCCGCCATTACCATTCTTATCCCAAATGAA : 2689
GCTCTTGGGGTGGTTGCCCATACTGATATGTCCGCCATTACCATTCTTATCCCAAATGAA
6980
7000
7020
VvFLS4cs : GTTCAGGGCTTGCAGGTTTTTAGAGACGATCATTGGTTTGATGTCAAGTATATCTCCAAC : 2736
VvFLS1pn : GTTCAGGGCTTGCAGGTTTTTAGAGACGATCATTGGTTTGATGTCAAGTATATCTCCAAC : 7013
VvFLS1 : GTTCAGGGCTTGCAGGTTTTTAGAGACGATCATTGGTTTGATGTCAAGTATATCTCCAAC : 2749
GTTCAGGGCTTGCAGGTTTTTAGAGACGATCATTGGTTTGATGTCAAGTATATCTCCAAC
7040
7060
7080
VvFLS4cs : GCTCTTGTCATTCATGTCGGTGACCAGTTGGAGGTACAAATTGAAAGACTCGATTTCAAT : 2796
VvFLS1pn : GCTCTTGTCATTCATGTCGGTGACCAGTTGGAGGTACAAATTGAAAGACTCGATTTCAAT : 7073
VvFLS1 : GCTCTTGTCATTCATGTCGGTGACCAGTTGGAGGT---------- : 2784
GCTCTTGTCATTCATGTCGGTGACCAGTTGGAGG
Start of Intron
gaaagactcgatttcaat
7100
7120
7140
VvFLS4cs : TTATCGTCTCGGCTTAATTAGATTTGCAAAAAGCAACTGTGATTTAAAACGCACGTTGAA : 2856
VvFLS1pn : TTATCGTCTCGGCTTAATTAGATTTGCAAAAAGCAACTGTGATTTAAAACGCACGTTGAA : 7133
VvFLS1 : ---------- : -
ttatcgtctcggcttaattagatttgcaaaaagcaactgtgatttaaaacgcacgttgaa
7160
7180
7200
VvFLS4cs : AAAAAATCTACAATCAATTTTATTATTATTTTCTATGTGTAGGAAGGCACACTTTTCCCA : 2916
VvFLS1pn : AAAAAATCTACAATCAATTTTATTATTATTTTCTCTGTGTAGGAAGGCACACTTTTCCCA : 7193
VvFLS1 : ---------- : -
aaaaaatctacaatcaattttattattattttct tgtgtaggaaggcacacttttccca


7220
7240
7260
VvFLS4cs : CGTTATTAATAAAGGTTCACGCGCTGAGGGGCGGTGCCATAATAACGGGCATCTCCTTTC : 2976
VvFLS1pn : CGTTATTAATAAAGGTTCACGCGCTGAGGGGCGGTGCCATAATAACGGGCATCTCCTTTC : 7253
VvFLS1 : ---------- : -
cgttattaataaaggttcacgcgctgaggggcggtgccataataacgggcatctcctttc
7280
7300
7320
VvFLS4cs : TGGGCTTCTGGGTTCGTAGGGGGTCATAACTCCTAGCTAGCCATGATTAGCCGTAATCAT : 3036
VvFLS1pn : TGGGCTTCTGGGTTCGTAGGGGGTCATAACTCCTAGCTAGCCATGATTAGCCGTAATCAT : 7313
VvFLS1 : ---------- : -
tgggcttctgggttcgtaggggtcataactcctagctagccatgattagccgtaatcat
7340
7360
7380
VvFLS4cs : ATTCTATACTAATACTATGATGCATGAACCCAGATCTTGAGCAACGGAAAATACAAGGCG : 3096
VvFLS1pn : ATTCTATACTAATACTATGATGCATGAACCCAGATCTTGAGCAACGGAAAATACAAGGCG : 7373
VvFLS1 : ---------- : -
attctatactaatactatgatgcatgaacccagatcttgagcaacggaaaatacaaggcg
7400
7420
7440
VvFLS4cs : GTGCTTCACAGGACGACCGTGAACAAGGAGAAGACGAGGATGTCATGGCCGGTGTTCTTG : 3156
VvFLS1pn : GTGCTTCACAGGACGACCGTGAACAAGGAGAAGACGAGGATGTCATGGCCGGTGTTCTTG : 7433
VvTC46143 : ----------TCTTG : 2789
gtgcttcacaggacgaccgtgaacaaggagaagacgaggatgtcatggccggtgTTCTTG
End of Intron
7460
7480
7500
VvFLS4cs : GAGCCACCGTCTGATCAGGTGGTAGGGCCTCTTCCTCAGCTTGTCAACGAAGAGAATCCT : 3216
VvFLS1pn : GAGCCACCGTCTGATCAGGTGGTAGGGCCTCTTCCTCAGCTTGTCAACGAAGAGAATCCT : 7493
VvTC46143 : GAGCCACCGTCTGATCAGGTGGTAGGGCCTCTTCCTCAGCTTGTCAACGAAGAGAATCCT : 2849
GAGCCACCGTCTGATCAGGTGGTAGGGCCTCTTCCTCAGCTTGTCAACGAAGAGAATCCT
7520
7540
7560
VvFLS4cs : GCTAGGTACAAGACCAAGAAATACAGTGATTATGTGTACTGTAAGCTGAACAAGATTCCA : 3276
VvFLS1pn : GCTAGGTACAAGACCAAGAAATACAGTGATTATGTGTACTGTAAGCTGAACAAGATTCCA : 7553
VvTC46143 : GCTAGGTACAAGACCAAGAAATACAGTGATTATGTGTACTGTAAGCTGAACAAGATTCCA : 2909
GCTAGGTACAAGACCAAGAAATACAGTGATTATGTGTACTGTAAGCTGAACAAGATTCCA
7580
7600
7620
VvFLS4cs : CAGTAGGTGAAGCCAGTGAGTGTTGAATGGATAATTGTATTGCTTTGCCACTGATATTGT : 3336
VvFLS1pn : CAGTAGGTGAAGCCAGTGAGTGTTGAATGGATAATTGTATTGCTTTGCCACTGATATTGT : 7613
VvTC46143 : CAGTAGGTGAAGCCAGTGAGTGTTGAATGGATAATTGTATTGCTTTGCCACTGATATTGT : 2969
CAGTAGGTGAAGCCAGTGAGTGTTGAATGGATAATTGTATTGCTTTGCCACTGATATTGT
7640
7660
7680
VvFLS4cs : TCAACACAGTAGAACAATTGCTTTATTTGTTGCTGCGTGAGAAGCTATGCTGCTTGGTGC : 3396
VvFLS1pn : TCAACACAGTAGAACAATTGCTTTATTTGTTGCTGCGTGAGAAGCTATGCTGCTTGGTGC : 7673
VvTC46143 : TCAACACAGTAGAACAATTGCTTTATTTGTTGCTGCGTGAGAACCTATGCTGCTTGGTGC : 3029
TCAACACAGTAGAACAATTGCTTTATTTGTTGCTGCGTGAGAAgCTATGCTGCTTGGTGC
7700
7720
7740
VvFLS4cs : GTGAGAATTAAGAAGATGCTTTGTGATCTGCTTTTTAGTTAGTTTTGGTGGTTGTATGTG : 3456
VvFLS1pn : GTGAGAATTAAGAAGATGCTTTGTGATCTGCTTTTTAGTTAGTTTTGGTGGTTGTATGTG : 7733
VvTC46143 : GTGAGAATTAAGAAGATGCTTTGTGATCTGCTTTTTAGTTAGTTTTGGTGGTTGTATGTG : 3089
GTGAGAATTAAGAAGATGCTTTGTGATCTGCTTTTTAGTTAGTTTTGGTGGTTGTATGTG
7760
7780
7800
VvFLS4cs : TCTTCAAGTACCCGACCCTATGCGATTACCAGATTTGCTCTTACTTCAATAAAACCTTTT : 3516
VvFLS1pn : TCTTCAAGTACCCGACCCTATGCGATTACCAGATTTGCTCTTACTTCAATAAAACCTTTT : 7793
VvTC46143 : TCTTCAAGTACCCGACCCTATGCGATTACCAGATTTGCTCTTACTTCAATAAAACC---- : 3145
TCTTCAAGTACCCGACCCTATGCGATTACCAGATTTGCTCTTACTTCAATAAAACCtttt

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                  *      7820          *      7840          *      7860
VvFLS4cs :  ATCTGTTTGATTATCTTTACACGGCCTCATTATTAAAGAGTATAATATATATTTTAAATC : 3576
VvFLS1pn :  ATCTGTTTGATTATCTTTACACGGCCTCATTATTAAAGAGTATAATATATATTTTAAATC : 7853
VvFLS1   :  ------------------------------------------------------------ :    -
            atctgtttgattatctttacacggcctcattattaaagagtataatatatattttaaatc

                  *      7880          *      7900          *      7920
VvFLS4cs :  AAAATTTATATTTATTTATTTTTTTAAAAAAAAATGGTAATTCGATATAATATCATAAATT : 3636
VvFLS1pn :  AAAATTTATATTTATTTATTTTTAAAAAAAAATGGTAATTCGATATAATATCATAAATT : 7913
VvFLS1   :  ------------------------------------------------------------ :    -
            aaaatttatatttatttattttt  aaaaaaaatggtaattcgatataatatcataaatt

                  *      7940          *      7960          *      7980
VvFLS4cs :  CTTGACTTAGTGGAAATGGCCAAATGAAGTCGTTGAAGCAATAAATTCATCATTTAGGAT : 3696
VvFLS1pn :  CTTGACTTAGTGGAAATGGCCAAATGAAGTCGTTGAAGCAATAAATTCATCATTTAGGAT : 7973
VvFLS1   :  ------------------------------------------------------------ :    -
            cttgacttagtggaaatggccaaatgaagtcgttgaagcaataaattcatcatttaggat

                  *      8000          *      8020          *      8040
VvFLS4cs :  CAAGAAATGGGCCTGGCGTGGACGTGGAGAGAT-------------------------- : 3729
VvFLS1pn :  CAAGAAATGGGCCTGGCGTGGACGTGGAGAGATATYAAACACGCATTTTGCATGGTGTGA : 8033
VvFLS1   :  ------------------------------------------------------------ :    -
            caagaaatgggcctggcgtggacgtggagagat

                  *      8060          *      8080          *      8100
VvFLS4cs :  ------------------------------------------------------------ :    -
VvFLS1pn :  ATACATTTGATTTTGCCCTATGAATTGATGGAAGGAAATCATTTTCTCATATTTAATTAA : 8093
VvFLS1   :  ------------------------------------------------------------ :    -


                  *      8120          *      8140          *      8160
VvFLS4cs :  ------------------------------------------------------------ :    -
VvFLS1pn :  AATATAAAAATATTTAAAAATATTTTAAATTATGTAATTTTATATCAAAAAATTTAAATA : 8153
VvFLS1   :  ------------------------------------------------------------ :    -


                  *      8180          *      8200          *      8220
VvFLS4cs :  ------------------------------------------------------------ :    -
VvFLS1pn :  AATAAAACAAGTTTTAAATAATATAAATATAAAAATATTAATTTTAAAATTATTTTTTAT : 8213
VvFLS1   :  ------------------------------------------------------------ :    -


                  *      8240          *      8260          *      8280
VvFLS4cs :  ------------------------------------------------------------ :    -
VvFLS1pn :  TTCTTTCCATTCTCTTTTCCTTCAATTTTTTATATCATACATAATCTTACCTAATTTATA : 8273
VvFLS1   :  ------------------------------------------------------------ :    -


                  *      8300          *      8320          *      8340
VvFLS4cs :  ------------------------------------------------------------ :    -
VvFLS1pn :  CTAAGTGAAGTGTATTTTTCCACGTCACCCCTTCTGAAAAAGAATAATTATTACAAATAT : 8333
VvFLS1   :  ------------------------------------------------------------ :    -


                  *      8360          *      8380          *      8400
VvFLS4cs :  ------------------------------------------------------------ :    -
VvFLS1pn :  AATCATTTTTAAAAACTAATTAAAATATTATAGATCTTAAATTTTAAAATACAATGATAA : 8393
VvFLS1   :  ------------------------------------------------------------ :    -
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                    *      8420         *      8440         *      8460
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TTTATATATATATATGTATGTATTTTTATTTATTTATAAATAAATCTTATTTTATAATTA : 8453
VvFLS1   : ------------------------------------------------------------ :    -

                    *      8480         *      8500         *      8520
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TTTTAAGATTGGTTGGGWTTACCAAACAGTTAGGCCTTWGGAATTCTATGACTCTTCCAG : 8513
VvFLS1   : ------------------------------------------------------------ :    -

                    *      8540         *      8560         *      8580
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : CGGTCCTCTTCATCATTGTATTTGTACTCTTCTTCTATCTACTTGTACTCCGATTTTCCA : 8573
VvFLS1   : ------------------------------------------------------------ :    -

                    *      8600         *      8620         *      8640
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : AAAGGTTTTCTTTTTTAAATATAAAAATTAAATTAAATTAYTCATCCATTATCCTCAACC : 8633
VvFLS1   : ------------------------------------------------------------ :    -

                    *      8660         *      8680         *      8700
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : CCATAAATATTAGATTAWAAAAATATAAARAAATTAAATATAATTCAAATTAAATAAAAA : 8693
VvFLS1   : ------------------------------------------------------------ :    -

                    *      8720         *      8740         *      8760
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TTTATATATATTTAAATTATTTCATCTTTATACTAAATAATTAAAATAAATATTGATAAT : 8753
VvFLS1   : ------------------------------------------------------------ :    -

                    *      8780         *      8800         *      8820
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : AACATTATTAAAATATTTTTAAATAACTTACTATAAGTCTTTATYCATAAAATATTATAA : 8813
VvFLS1   : ------------------------------------------------------------ :    -

                    *      8840         *      8860         *      8880
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : TTGGTTTTTCAAATATTTAGAAGTACTTCTYAAATTTYATCAAAAACTTAATTTTCTTTA : 8873
VvFLS1   : ------------------------------------------------------------ :    -

                    *      8900         *      8920         *      8940
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : AAAAAATATTATCAAATGAACTTTAGTTAAAAAAAATTAAAAATAATATATAAAAATAAWT : 8933
VvFLS1   : ------------------------------------------------------------ :    -

                    *      8960         *      8980         *      9000
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : AAATTATTTTAAATATATTTTTAYTTTTTTCCCTTTTTATTTTTTCTATTTTTCCTCCCT : 8993
VvFLS1   : ------------------------------------------------------------ :    -
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                    *      9020         *      9040         *      9060
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : ATGCCCKTCATSTTTTTTYTTTYYTCTYTGGCCTTACTCCRTACCTTTCATTTACATTTC : 9053
VvFLS1   : ------------------------------------------------------------ :    -

                    *      9080         *      9100         *      9120
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : CATTTCCATATAACAAAATGTACTTATTTCTTTCTTAAATGCTATTTAATATTTATAATT : 9113
VvFLS1   : ------------------------------------------------------------ :    -

                    *      9140         *      9160         *      9180
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : ATTGGAAGTTAACGTRTCATCCTTCTATTAGAGCGAGCAATAACTTTTTATAATAATAAT : 9173
VvFLS1   : ------------------------------------------------------------ :    -

                    *      9200         *      9220         *      9240
VvFLS4cs : ------------------------------------------------------------ :    -
VvFLS1pn : GAACTCATTTTGTTAWAGGTTTGATTATAWAWGGTTGTATTTTCTAGAACACTGTTATTM : 9233
VvFLS1   : ------------------------------------------------------------ :    -

                    *      9260         *      9280         *
VvFLS4cs : ------------------------------------------------- :    -
VvFLS1pn : AGAACAYGATAATTAATTCSTTTTTCTAAAGAATGGTGTWTARTTCMAWA : 9283
VvFLS1   : ------------------------------------------------- :    -
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