

15. Churchill Falls A

This station was updated in CRA (2015). The updated IDF curve from CRA (2015) is reproduced below, with the addition of the 20-year return period.

This IDF curve was updated using 6-hr data from two nearby stations: Churchill Falls and Churchill Falls A. The IDF curve generally increased during the update (Table 15.1).

Table 15.1 Differences Between IDF Curves for Churchill Falls A

Percent Difference in Precipitation Amount (%) (Difference in Precipitation Amount (mm))						
Duration	Return Period (years)					
	2	5	10	25	50	100
5-min	N/A	N/A	N/A	N/A	N/A	N/A
10-min	N/A	N/A	N/A	N/A	N/A	N/A
15-min	N/A	N/A	N/A	N/A	N/A	N/A
30-min	N/A	N/A	N/A	N/A	N/A	N/A
1-hr	N/A	N/A	N/A	N/A	N/A	N/A
2-hr	N/A	N/A	N/A	N/A	N/A	N/A
6-hr	2.1 (0.4)	4.2 (1.1)	5.2 (1.5)	6.1 (2.1)	6.6 (2.5)	7.0 (2.9)
12-hr	4.3 (1.2)	2.1 (0.7)	1.1 (0.4)	0.1 (0.0)	-0.5 (-0.3)	-1.0 (-0.5)
24-hr	3.1 (1.1)	2.6 (1.1)	2.4 (1.2)	2.2 (1.2)	2.1 (1.2)	2.0 (1.3)
Notes: Red numbers indicate that the updated IDF curve is lower than the EC-IDF V2.3 IDF curve for that duration and return period. Bold numbers indicate changes greater than 5 percent.						

Office of Climate Change and Energy Efficiency

Short Duration Rainfall Intensity-Duration-Frequency Data
Données sur l'intensité, la durée et la fréquence des chutes
de pluie de courte durée

Gumbel - Method of moments/Méthode des moments

2015/10/30

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CHURCHILL FALLS A                               NL      8501132
Updated with 6-hr data measured at Churchill Falls (8501130): 1994 - 2011
Updated with 6-hr data measured at Churchill Falls A (8501131): 2012 - 2013
Latitude: 53 33'N   Longitude: 64 6'W   Elevation/Altitude: 439      m
Years/Années : 1969 - 2013      # Years/Années : 23
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Table 1 : Annual Maximum (mm)/Maximum annuel (mm)
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	Year Année	5 min	10 min	15 min	30 min	1 h	2 h	6 h	12 h	24 h
EC-IDF	1969	6.6	7.9	8.4	8.4	9.7	16.0	33.8	44.4	49.3
EC-IDF	1970	3.0	6.1	7.1	9.1	10.2	12.2	21.6	27.9	29.5
EC-IDF	1971	3.0	4.6	5.8	7.1	8.9	10.2	13.5	20.6	28.2
EC-IDF	1972	4.8	5.6	5.8	6.6	10.7	17.5	26.4	31.0	32.8
EC-IDF	1973	4.6	8.4	10.7	12.2	13.7	14.0	21.8	30.7	35.1
EC-IDF	1974	3.8	5.6	5.8	6.1	7.1	9.7	12.7	18.8	29.5
EC-IDF	1975	4.3	5.1	5.3	6.1	9.1	16.5	35.8	53.3	59.9
EC-IDF	1976	5.1	7.4	8.1	9.4	11.2	11.7	19.6	30.7	38.1
EC-IDF	1978	3.7	5.3	5.8	5.8	8.2	12.4	21.9	38.4	48.7
EC-IDF	1979	5.9	6.1	7.3	10.2	11.8	16.5	29.0	33.7	36.8
EC-IDF	1980	2.9	5.2	7.9	13.3	16.0	18.7	20.0	25.6	29.7
EC-IDF	1981	5.8	7.7	10.1	14.3	14.4	16.1	16.9	25.4	39.4
EC-IDF	1982	3.4	3.6	5.1	8.6	14.3	18.4	20.4	24.2	38.6
EC-IDF	1983	3.7	3.7	3.7	6.7	8.6	10.3	18.3	20.7	22.7
EC-IDF	1984	4.9	6.2	8.1	10.3	11.0	13.7	23.7	32.4	43.6
EC-IDF	1985	4.4	4.8	5.1	7.5	8.1	11.5	14.2	22.3	30.9
EC-IDF	1986	8.3	11.7	13.5	14.7	15.0	15.2	23.9	28.2	48.5
EC-IDF	1987	9.6	15.7	18.4	20.2	20.2	21.2	26.0	27.6	33.1
EC-IDF	1988	3.7	3.9	4.8	6.8	7.5	9.7	15.3	24.2	34.6
EC-IDF	1989	6.3	8.0	12.0	16.0	17.2	17.4	18.4	24.7	29.3
EC-IDF	1990	8.6	10.1	10.6	13.3	13.3	13.3	16.5	26.1	36.3
EC-IDF	1991	2.1	3.6	5.1	7.4	9.8	16.4	29.8	34.8	34.8
EC-IDF	1992	2.0	2.5	3.3	3.8	5.1	8.9	16.6	20.1	25.5
UPDATE	1994	NM	NM	NM	NM	NM	NM	-99.9	29.0	36.0
UPDATE	1995	NM	NM	NM	NM	NM	NM	41.0	45.0	66.0
UPDATE	1996	NM	NM	NM	NM	NM	NM	35.0	35.0	38.0
UPDATE	1997	NM	NM	NM	NM	NM	NM	24.0	34.0	41.0
UPDATE	1998	NM	NM	NM	NM	NM	NM	22.0	26.0	29.0
UPDATE	1999	NM	NM	NM	NM	NM	NM	28.0	31.0	35.0
UPDATE	2000	NM	NM	NM	NM	NM	NM	13.0	19.0	29.0
UPDATE	2001	NM	NM	NM	NM	NM	NM	20.0	35.0	36.6
UPDATE	2002	NM	NM	NM	NM	NM	NM	15.0	28.0	30.0
UPDATE	2003	NM	NM	NM	NM	NM	NM	25.0	29.0	36.0
UPDATE	2005	NM	NM	NM	NM	NM	NM	29.0	38.0	40.0
UPDATE	2006	NM	NM	NM	NM	NM	NM	25.0	41.0	48.0
UPDATE	2007	NM	NM	NM	NM	NM	NM	17.0	30.0	37.0
UPDATE	2008	NM	NM	NM	NM	NM	NM	13.0	22.0	33.0
UPDATE	2009	NM	NM	NM	NM	NM	NM	13.0	21.0	31.0
UPDATE	2011	NM	NM	NM	NM	NM	NM	28.0	38.0	50.0
UPDATE	2012	NM	NM	NM	NM	NM	NM	19.0	32.0	38.8
UPDATE	2013	NM	NM	NM	NM	NM	NM	-99.9	33.0	43.5

# Yrs. Années	23	23	23	23	23	23	39	41	41
Mean Moyenne	4.8	6.5	7.7	9.7	11.4	14.2	22.1	30.0	37.4
Std. Dev. Écart-type	2.0	3.0	3.5	4.0	3.7	3.4	7.0	7.6	8.9
Skew. Dissymétrie	0.91	1.55	1.43	0.95	0.63	0.12	0.72	0.84	1.24
Kurtosis	3.65	6.31	5.68	3.83	3.41	2.45	3.29	4.10	5.14

*-99.9 Indicates Missing Data/Données manquantes

* NM Indicates No Measurements/Aucunes mesures

Warning: annual maximum amount greater than 100-yr return period amount

Avertissement : la quantité maximale annuelle excède la quantité

pour une période de retour de 100 ans

Year/Année	Duration/Durée	Data/Données	100-yr/ans
1995	24 h	66.0	65.2

Table 2a : Return Period Rainfall Amounts (mm)
Quantité de pluie (mm) par période de retour

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	20 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
EC-IDF 5 min	4.5	6.3	7.4	8.6	8.9	10.0	11.1	23
EC-IDF 10 min	6.0	8.6	10.4	12.0	12.6	14.2	15.8	23

EC-IDF	15 min	7.1	10.3	12.3	14.3	15.0	16.9	18.8	23
EC-IDF	30 min	9.1	12.6	15.0	17.2	17.9	20.1	22.3	23
EC-IDF	1 h	10.8	14.0	16.1	18.2	18.8	20.8	22.8	23
EC-IDF	2 h	13.7	16.7	18.7	20.6	21.2	23.0	24.9	23
UPDATE	6 h	21.0	27.2	31.3	35.2	36.5	40.3	44.2	39
UPDATE	12 h	28.8	35.5	40.0	44.3	45.6	49.8	54.0	41
UPDATE	24 h	35.9	43.8	49.0	54.0	55.5	60.4	65.2	41
* 6-hr data were used for the update: shorter durations were not updated									

Table 2b :

Return Period Rainfall Rates (mm/h) - 95% Confidence limits
Intensité de la pluie (mm/h) par période de retour - Limites de confiance de 95%

Duration/Durée		2	5	10	20	25	50	100	#Years
		yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	Années
EC-IDF	5 min	53.7	75.1	89.3	102.9	107.2	120.5	133.7	23
		+/- 9.1	+/- 15.3	+/- 20.7	+/- 26.1	+/- 27.9	+/- 33.4	+/- 38.9	23
EC-IDF	10 min	35.9	51.7	62.2	72.2	75.4	85.2	95.0	23
		+/- 6.7	+/- 11.3	+/- 15.3	+/- 19.3	+/- 20.6	+/- 24.6	+/- 28.7	23
EC-IDF	15 min	28.6	41.1	49.4	57.3	59.8	67.6	75.3	23
		+/- 5.3	+/- 8.9	+/- 12.1	+/- 15.3	+/- 16.3	+/- 19.5	+/- 22.7	23
EC-IDF	30 min	18.2	25.2	29.9	34.4	35.8	40.2	44.6	23
		+/- 3.0	+/- 5.1	+/- 6.8	+/- 8.6	+/- 9.2	+/- 11.0	+/- 12.8	23
EC-IDF	1 h	10.8	14.0	16.1	18.2	18.8	20.8	22.8	23
		+/- 1.4	+/- 2.3	+/- 3.1	+/- 3.9	+/- 4.2	+/- 5.0	+/- 5.9	23
EC-IDF	2 h	6.8	8.3	9.3	10.3	10.6	11.5	12.4	23
		+/- 0.6	+/- 1.1	+/- 1.4	+/- 1.8	+/- 2.0	+/- 2.3	+/- 2.7	23
UPDATE	6 h	3.5	4.5	5.2	5.9	6.1	6.7	7.4	39
		+/- 0.3	+/- 0.6	+/- 0.8	+/- 1.0	+/- 1.0	+/- 1.2	+/- 1.4	39
UPDATE	12 h	2.4	3.0	3.3	3.7	3.8	4.2	4.5	41
		+/- 0.2	+/- 0.3	+/- 0.4	+/- 0.5	+/- 0.5	+/- 0.7	+/- 0.8	41
UPDATE	24 h	1.5	1.8	2.0	2.2	2.3	2.5	2.7	41
		+/- 0.1	+/- 0.2	+/- 0.2	+/- 0.3	+/- 0.3	+/- 0.4	+/- 0.4	41
* 6-hr data were used for the update: shorter durations were not updated									

Table 3 : Interpolation Equation / Équation d'interpolation: $R = A \cdot T^B$

R = Interpolated Rainfall rate (mm/h)/Intensité interpolée de la pluie (mm/h)

RR = Rainfall rate (mm/h) / Intensité de la pluie (mm/h)

T = Rainfall duration (h) / Durée de la pluie (h)

Statistics/Statistiques	2	5	10	20	25	50	100
	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans
Mean of RR/Moyenne de RR	17.9	25.0	29.6	34.1	35.5	39.9	44.3
Std. Dev. /Écart-type (RR)	18.1	25.8	30.9	35.8	37.4	42.2	47.0
Std. Error/Erreur-type	0.8	2.2	3.2	4.1	4.4	5.3	6.2
Coefficient (A)	11.3	15.0	17.4	19.8	20.5	22.8	25.0
Exponent/Exposant (B)	-0.639	-0.669	-0.683	-0.692	-0.695	-0.702	-0.708
Mean % Error/% erreur moyenne	3.4	5.5	6.6	7.4	7.7	8.3	8.8

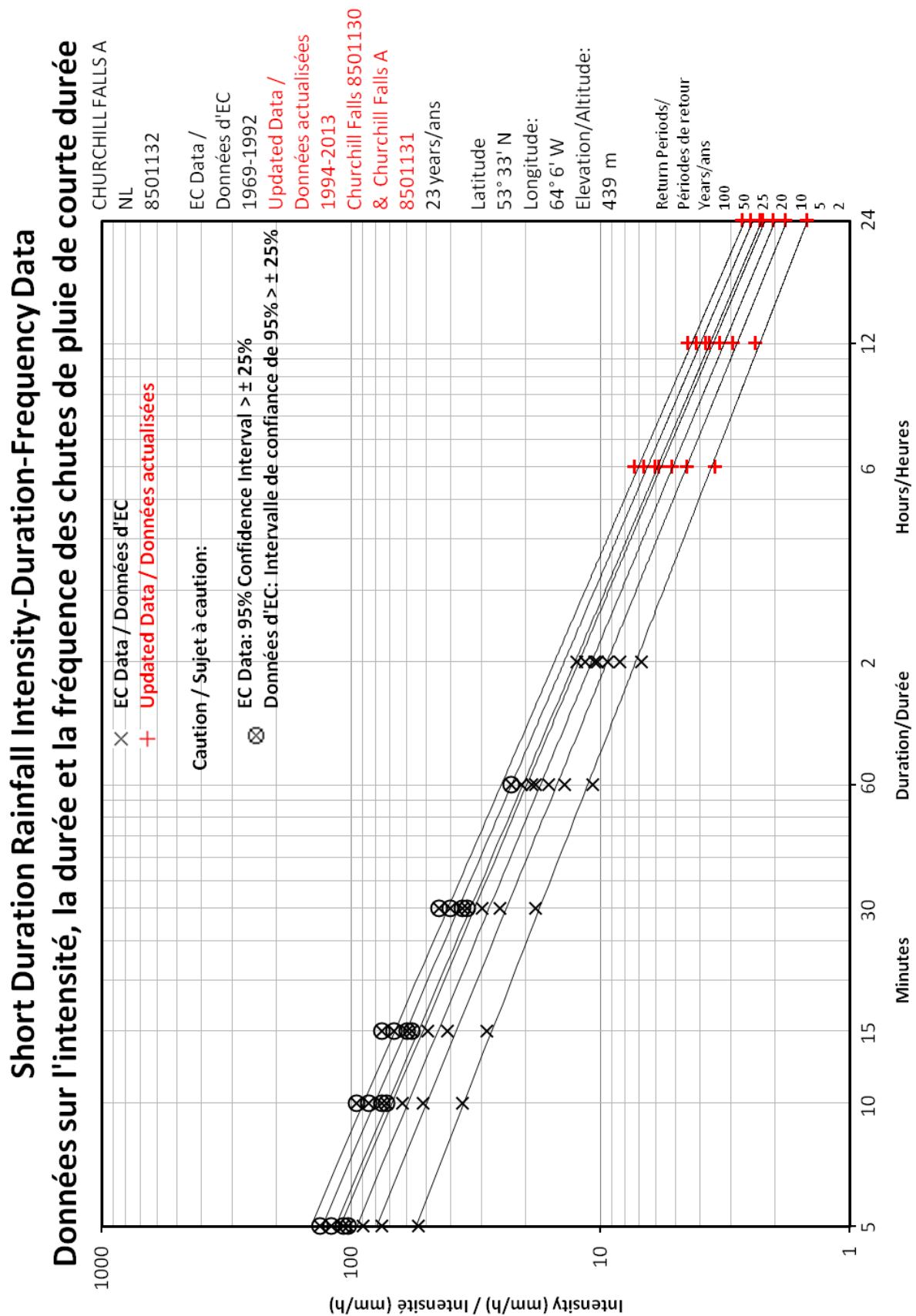


Figure 15.1 Churchill Falls A IDF Curve – Updated

Quantile-Quantile : CHURCHILL FALLS A, NL 8501132

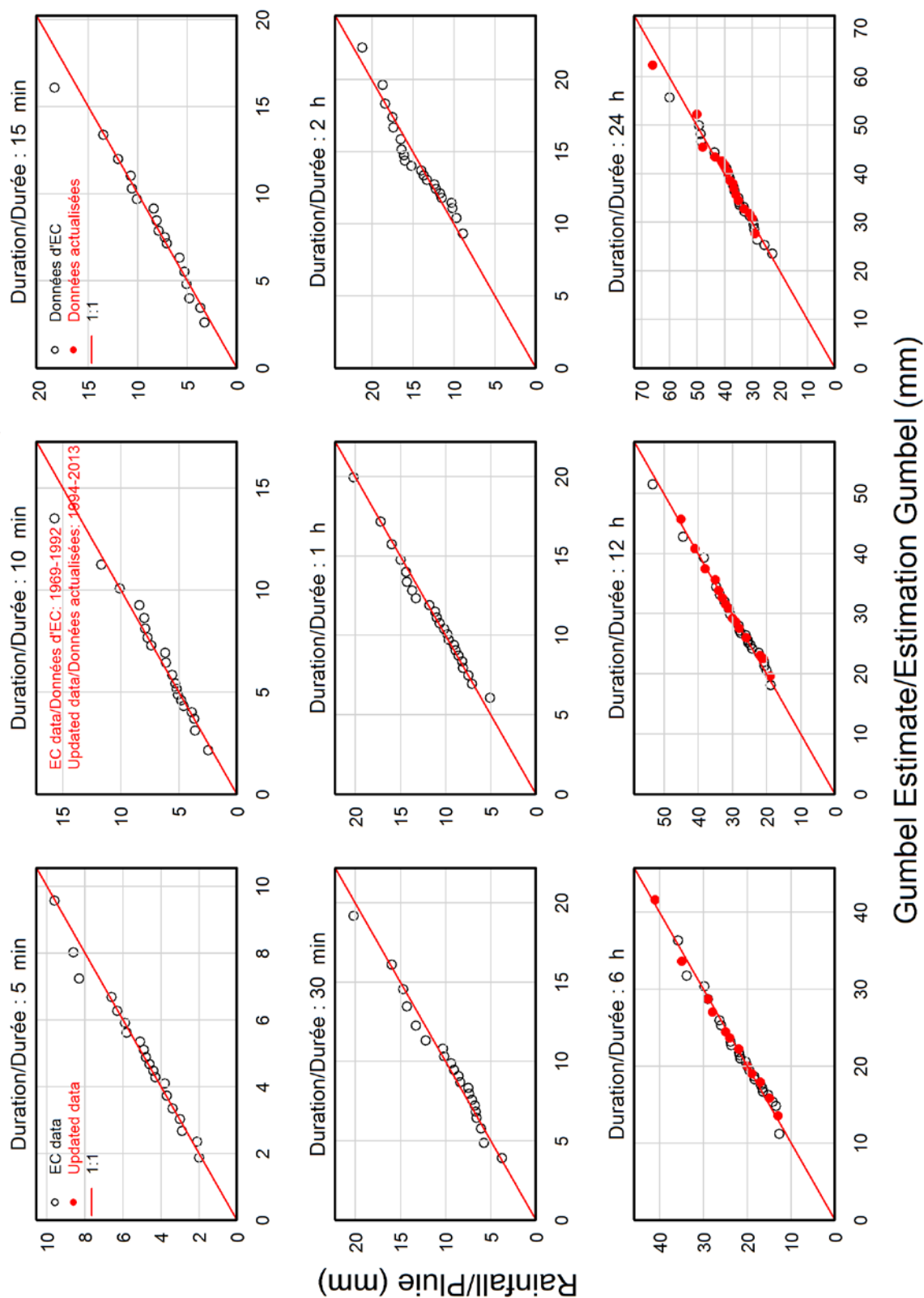
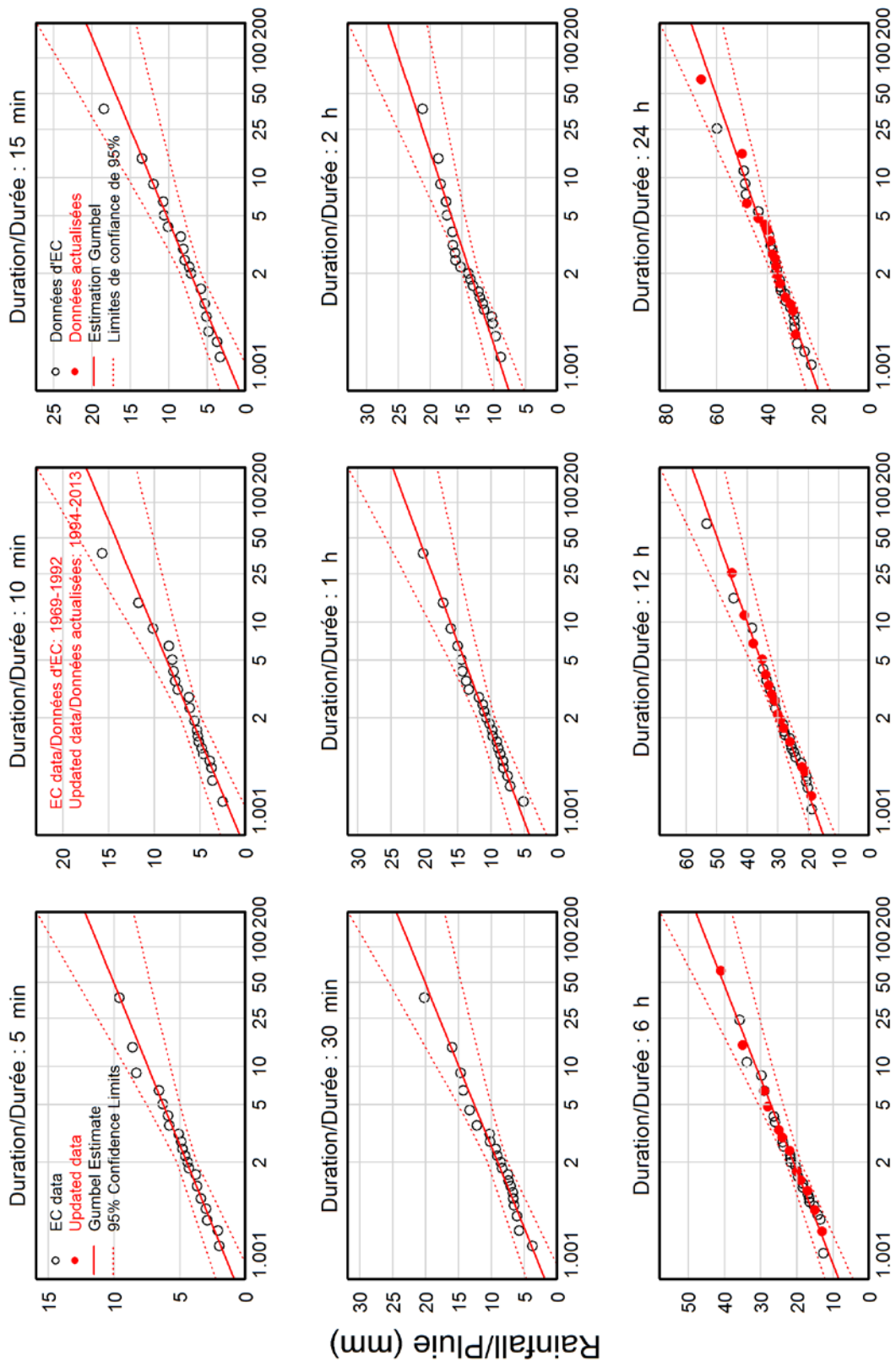


Figure 15.2 Churchill Falls A Quantile-Quantile Plot – Updated

Return Level/Niveau de retour : CHURCHILL FALLS A, NL 8501132



Return Period/Période de retour (years/années)

Figure 15.3 Churchill Falls A Return Level Plot – Updated

Trend/Tendance : CHURCHILL FALLS A, NL 8501132

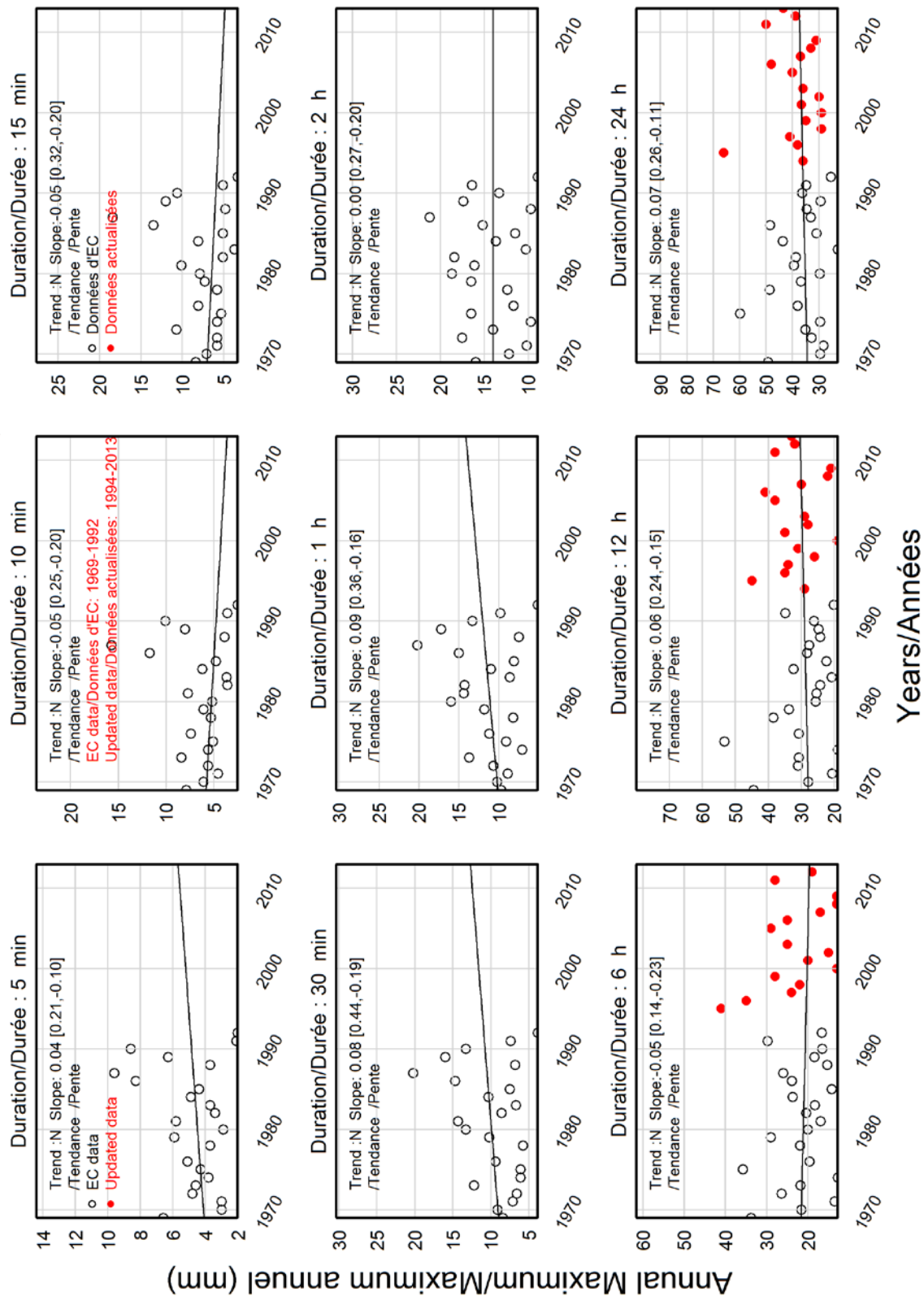


Figure 15.4 Churchill Falls A Trend Plot - Updated