



Remote Infrastructure Monitoring and Management

Polar Examples

National Science Foundation (NSF) Large Facilities Workshop

April 3, 2019



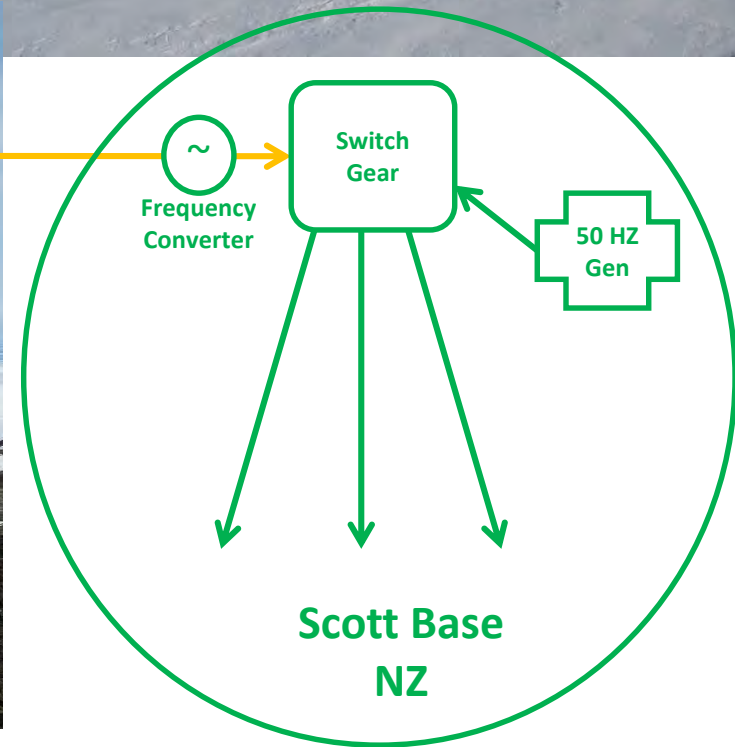
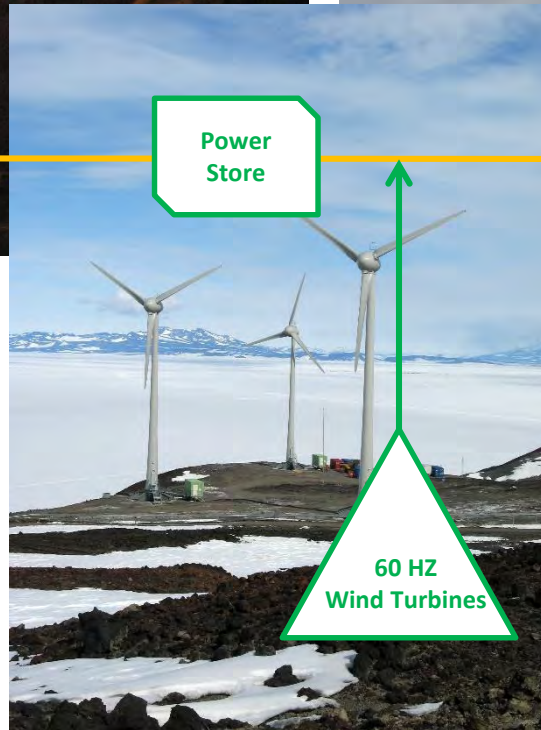
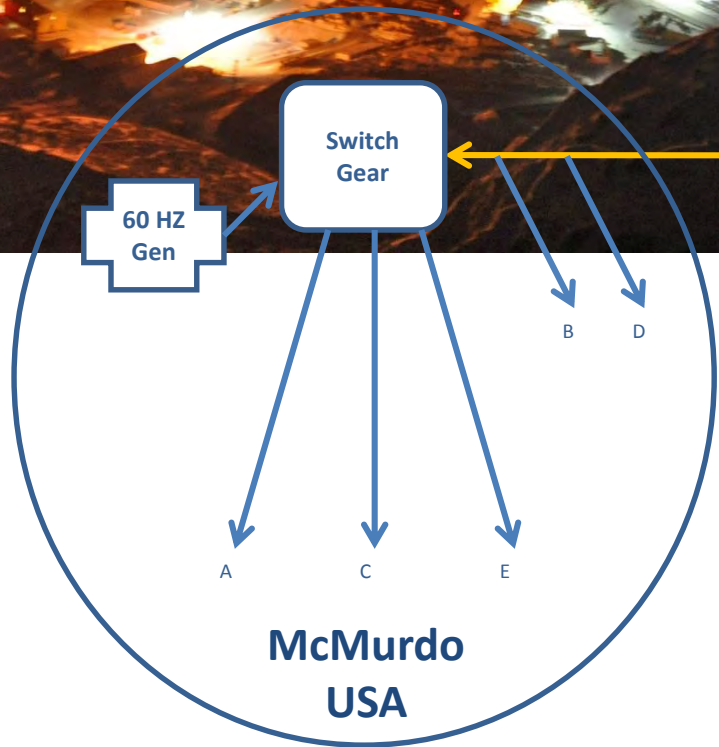
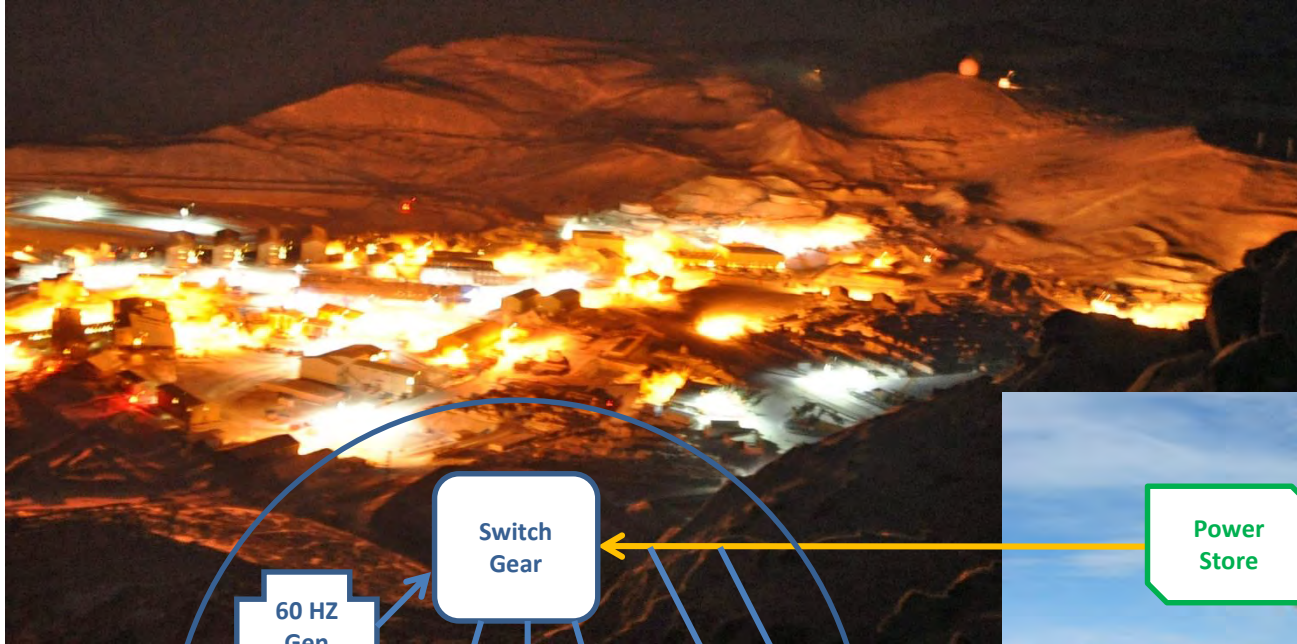
Remote Infrastructure Monitoring and Management

Basic Goals

- Observe facility's performance
- Monitor facility operator's performance
- Look for deviations from design assumptions
- Establish/modify performance metrics
- Predict changes in operations and maintenance costs
- Determine repair/rebuild/replace timelines
- Allow quick and accurate access for outside SME's
- Identify health/safety, risk and cost sensitivity factors

Example 1: Ross Island Power Grid

Issue: Efficient Power Generation



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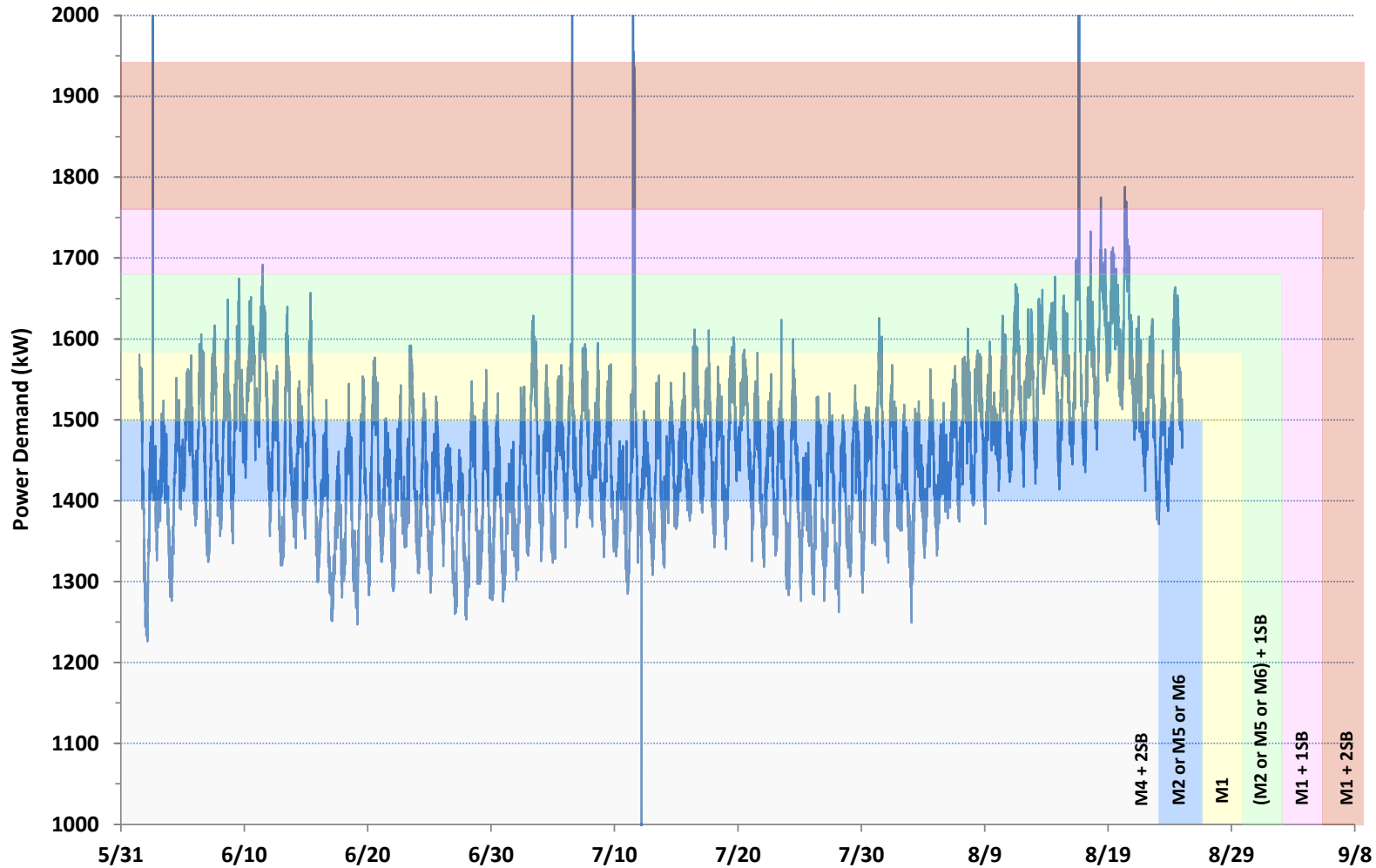
Generator	Location	Generator Rating (kW)	Generator Capacity, Continuous (kW)
M1	McMurdo Plant B	1580	1580
M2	McMurdo Plant B	1500	1500
M4	McMurdo Plant A	1300	1040
M5	McMurdo Plant A	1500	1500
M6	McMurdo Plant A	1500	1500
S1	Scott Base Upper	225	180
S2	Scott Base Upper	225	180
S3	Scott Base Lower	225	180

Example 1: Ross Island Power Grid

Issue: Efficient Power Generation

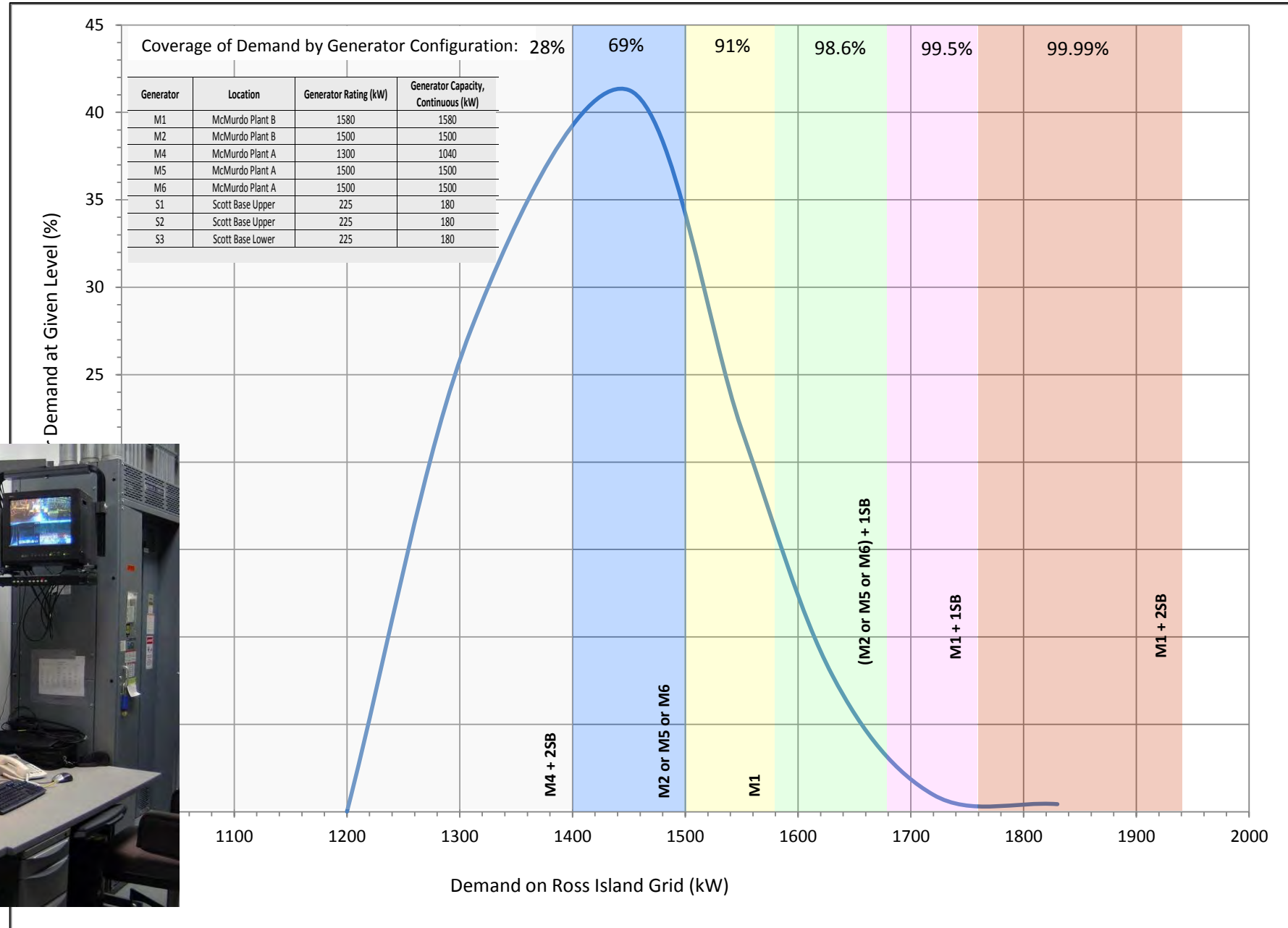


McMurdo Station Power Demand - Most Efficient Generators Configuration



Example 1: Ross Island Power Grid

Issue: Efficient Power Generation



Example 1: Ross Island Power Grid

Issue: Efficient Power Generation



Power Demand at McMurdo PP (kW)	Generators Running (most efficient)	Generators Running (1 st alternative)	Generators Running (2 nd alternative)
500-1040	M4 (1040)	M2, M5 or M6 (1500)	M1 (1580)
1040-1220	M4 + S1, S2 or S3 (1220)	M2, M5 or M6 (1500)	M1 (1580)
1220-1400	M4 + two of S1, S2, S3 (1400)	M2, M5 or M6 (1500)	M1 (1580)
1400-1500	M2, M5 or M6 (1500)	M1 (1580)	M4 + S1, S2 and S3 (1580)
1500-1580	M1 (1580)	M4 + S1, S2 and S3 (1580)	M2, M5 or M6 + S1, S2 or S3 (1680)
1580-1680	M2, M5 or M6 + S1, S2 or S3 (1680)	M1 + S1, S2 or S3 (1760)	M2, M5 or M6 + S1, S2 and S3 (2040)
1680-1760	M1 + S1, S2 or S3 (1760)	M2, M5 or M6 + S1, S2 and S3 (2040)	M2, M5 or M6 + M4 (2540)
1760-1940	M1 + two of S1, S2, S3 (1940)	M2, M5 or M6 + S1, S2 and S3 (2040)	M1 + S1, S2 and S3 (2120)
1940-2040	M2, M5 or M6 + S1, S2 and S3 (2040)	M1 + S1, S2 and S3 (2120)	M2, M5 or M6 + M4 (2540)
2040-2120	M1 + S1, S2 and S3 (2120)	M2, M5 or M6 + M4 (2540)	M1 + M4 (2620)
2040-2540	M2, M5 or M6 + M4 (2540)	M1 + M4 (2620)	Two of M2, M5, M6 (3000)
2540-2620	M1 + M4 (2620)	Two of M2, M5, M6 (3000)	M1 + M2, M5 or M6 (3080)
2620-3000	Two of M2, M5, M6 (3000)	M1 + M2, M5 or M6 (3080)	
3000-3080	M1 + M2, M5 or M6 (3080)	M2 + M5 + M6 (4500)	
3080-3260	M1 + M2, M5 or M6 + S1, S2 or S3 (3260)	M2 + M5 + M6 (4500)	
3260-3440	M1 + M2, M5 or M6 + two of S1, S2, S3 (3440)	M2 + M5 + M6 (4500)	

Example 2a: Summit Mobile Garage

Issue: Freeze-in of Sled Base



Example 2a: Summit Mobile Garage

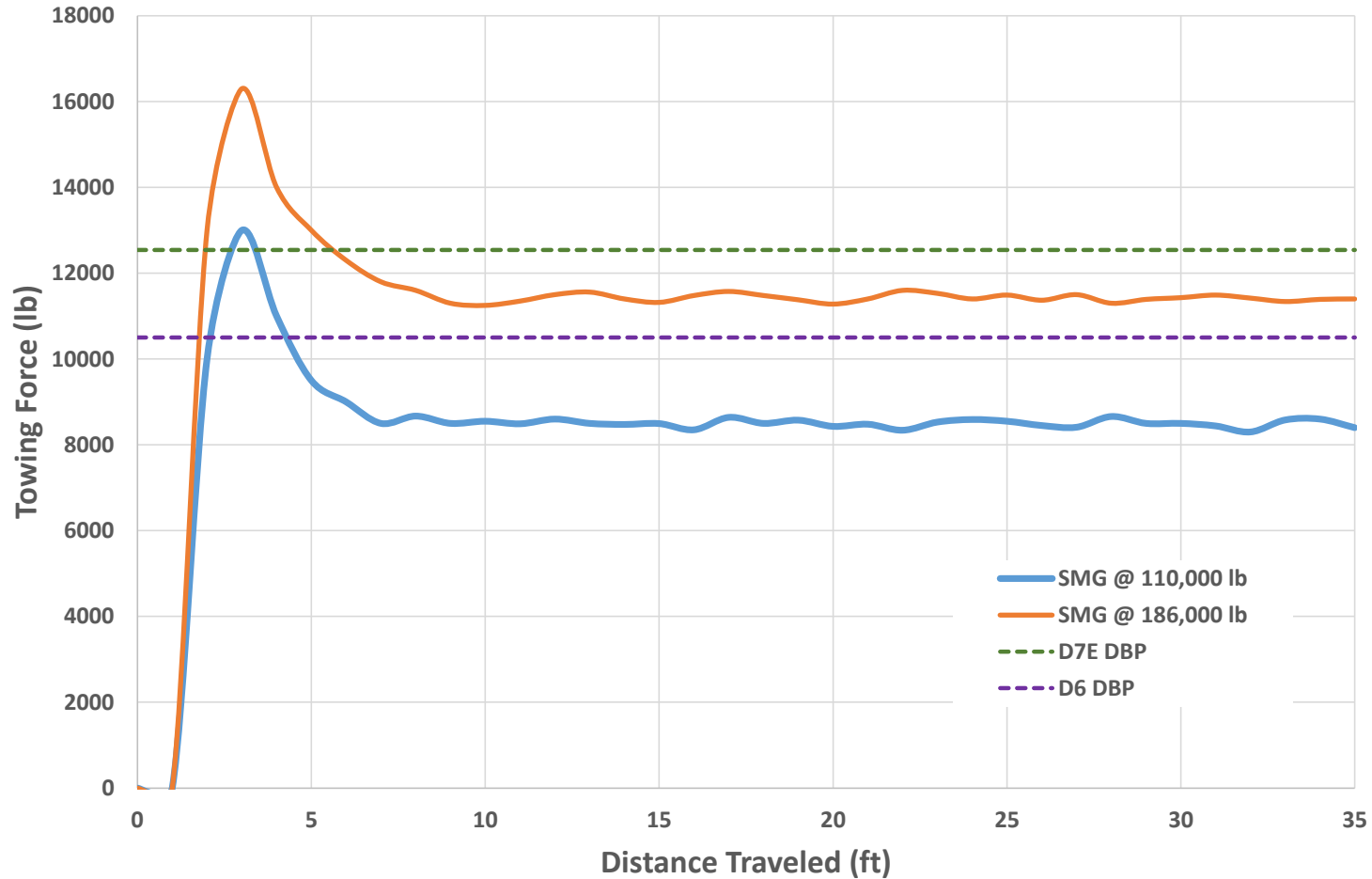
Issue: Freeze-in of Sled Base



Example 2a: Summit Mobile Garage

Issue: Freeze-in of Sled Base

Summit Mobile Garage Move
(level terrain)



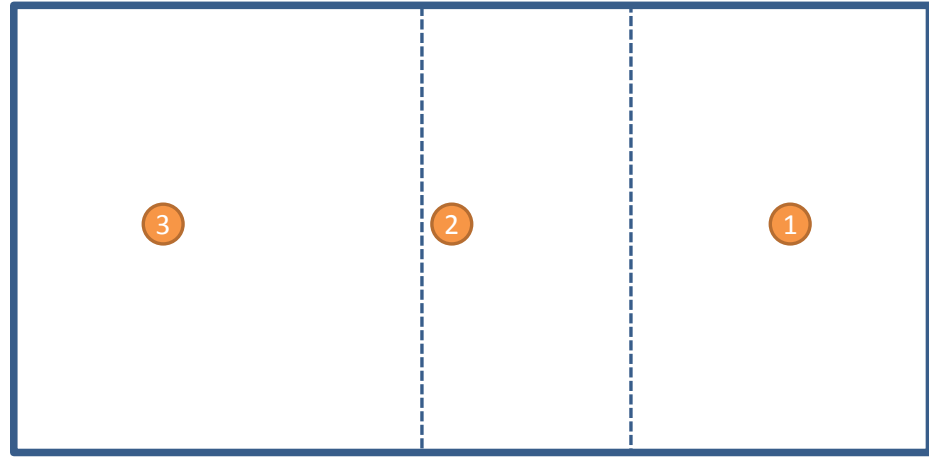
Example 2b: Summit Mobile Garage

Issue: Thermal Integrity of Floor



Example 2b: Summit Mobile Garage

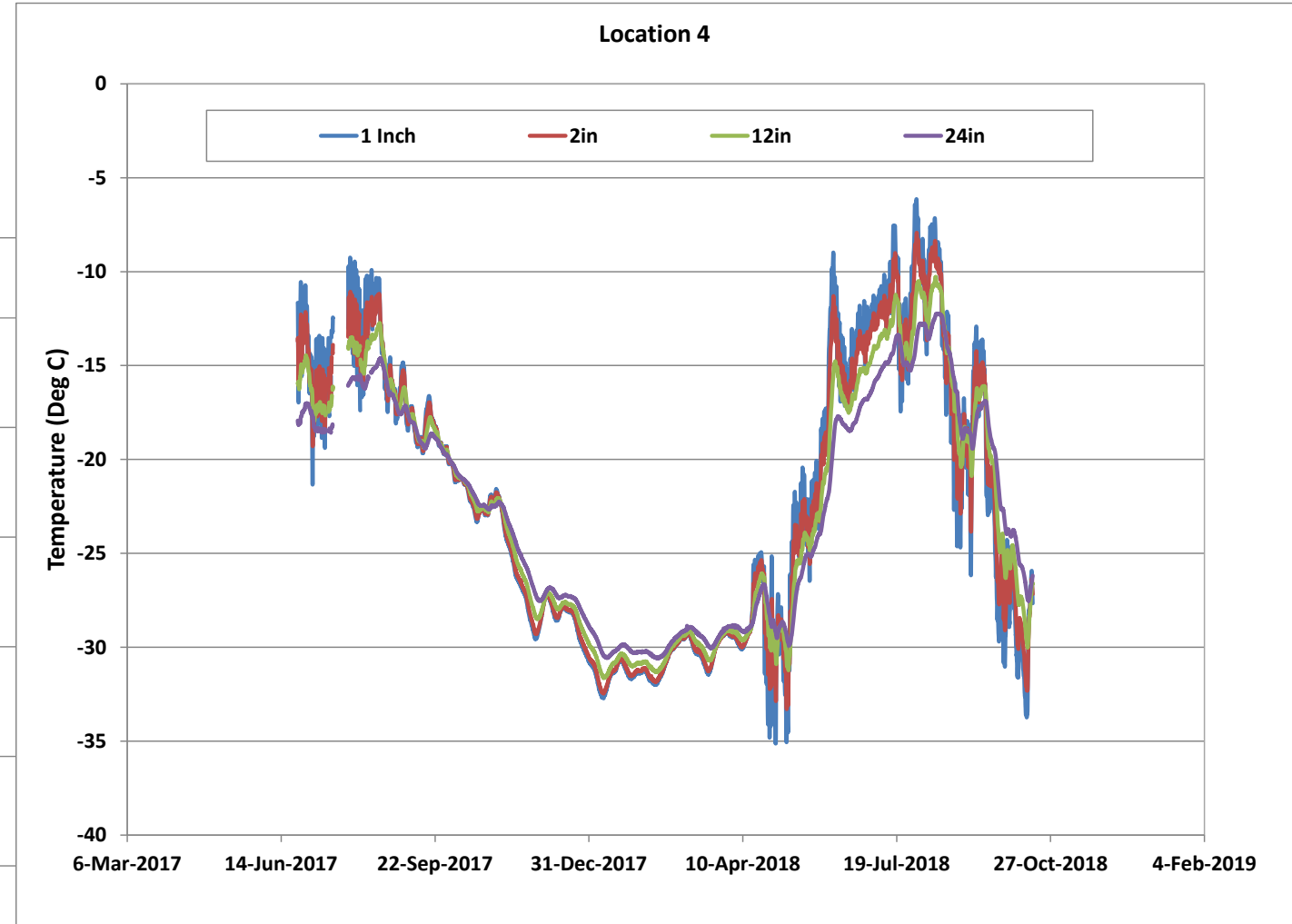
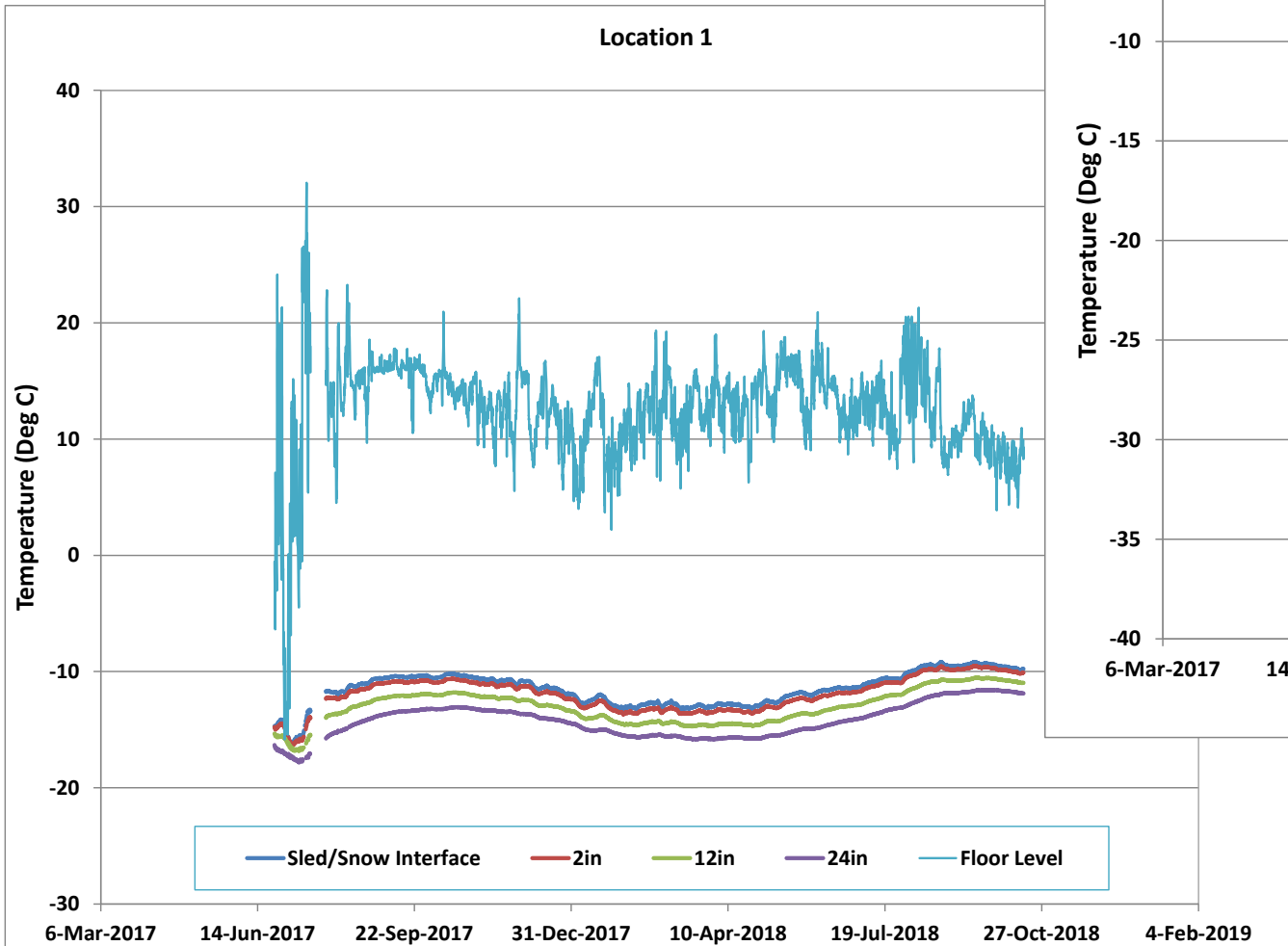
Issue: Thermal Integrity of Floor



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Example 2b: Summit Mobile Garage

Issue: Thermal Integrity of Floor

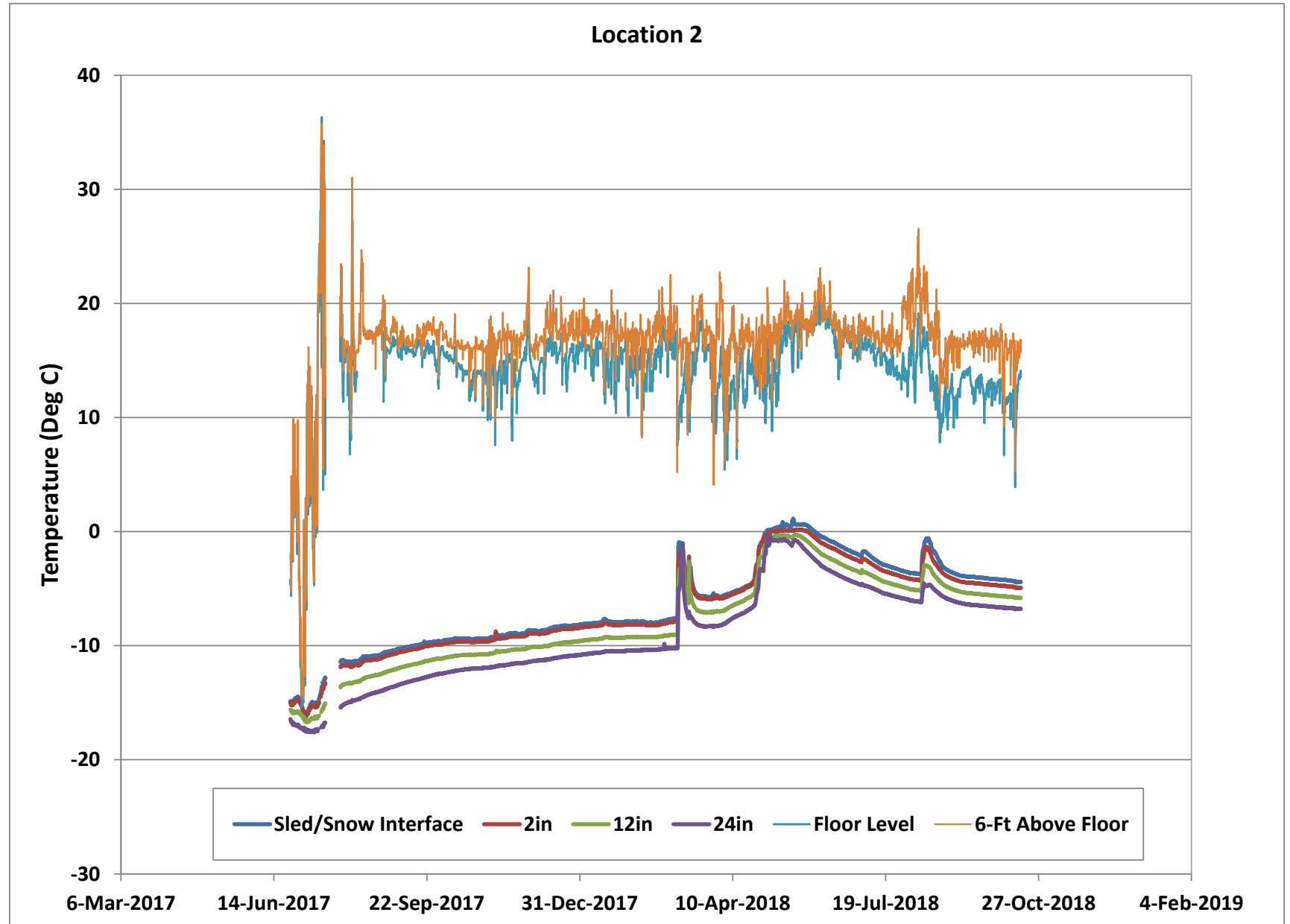


Example 2b: Summit Mobile Garage

Issue: Thermal Integrity of Floor

Events Noted

- 8 March 2018
- 3 May 2018
- 12 August 2018

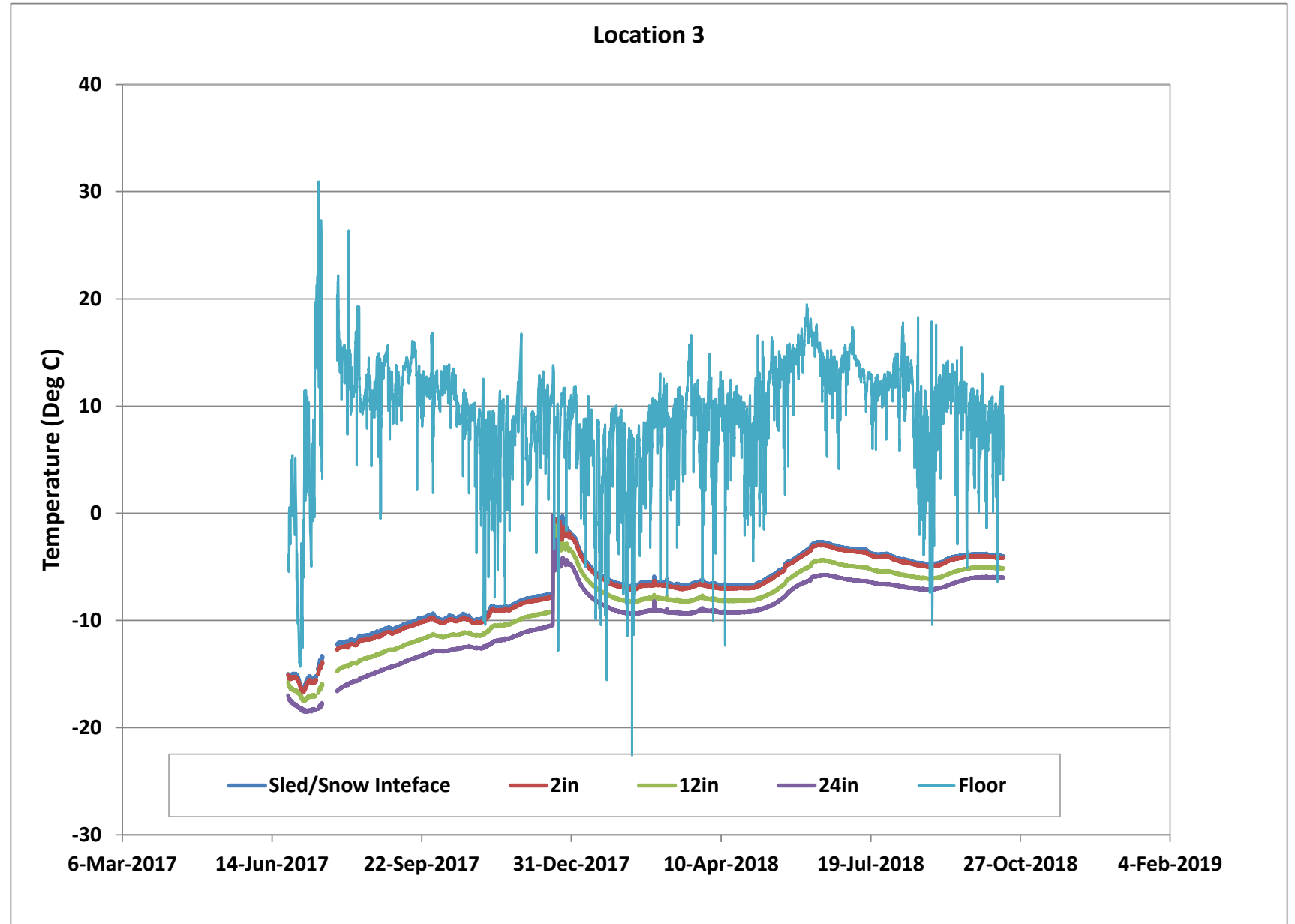


Example 2b: Summit Mobile Garage

Issue: Thermal Integrity of Floor

Events Noted

- 22 December 2017
- 13 June 2018



Example 3: McMurdo Buildings

Issue: Thermal Integrity of Facilities



Example 3: McMurdo Buildings

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Example 3: McMurdo Buildings

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Example 3: McMurdo Buildings

Issue: Thermal Integrity of Facilities

Building	Surface Area (ft²)	HDD	Fuel Use (gal)	Energy Use (MBTU)	R (Calc)
GYM	6,800	24,877	4,618	494	8.2
MEDICAL	7,978	24,877	6,517	697	6.8
DINING FACILITY/ADMINISTRATION/LIBRARY/LAUNDRY	72,200	24,877	59,313	6,347	6.8
WASTE MANGEMENT	5,366	24,877	4,519	484	6.6
AEROBIC FACILITY	3,440	24,877	2,925	313	6.6
DORMITORY	14,225	7,519	3,718	398	6.5
DORMITORY	14,225	7,519	3,878	415	6.2
BERG FIELD CENTER (BFC)	9,440	24,877	10,081	1,079	5.2
FOOD ROOM/CARGO WAREHOUSE FOR BFC	8,330	24,877	9,532	1,020	4.9
FIREHOUSE	6,260	24,877	7,650	819	4.6
ATO/POSTOFFICE/CENTRAL SUPPLY/LOGISTICS	15,140	24,877	20,061	2,147	4.2
SUPPLY WAREHOUSE (IT/FOOD)	9,440	24,877	13,812	1,478	3.8
SUPPLY WAREHOUSE (ELECTRICAL/BEVERAGE)	9,440	24,877	13,812	1,478	3.8
FUELS	9,440	24,877	16,076	1,720	3.3
CARPENTRY SHOP (TOW AWAY)	1,200	7,519	690	74	2.9
SUPPLY WAREHOUSE	9,440	7,519	5,487	587	2.9
DORMITORY	10,171	7,519	6,541	700	2.6
DORMITORY	10,171	7,519	6,541	700	2.6
COFFEE HOUSE	5,356	7,519	4,162	445	2.2
DORMITORY	21,024	7,519	18,275	1,956	1.9
HELO HANGER	9,954	7,519	9,051	969	1.9
VEHICLE MAINTENANCE FACILITY	33,217	24,877	102,450	10,964	1.8
EQUIPMENT OPERATIONS	1,184	7,519	2,001	214	1.0

