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COAL RESOURCE OCCURRENCE AND COAL DEVELOPMENT POTENTIAL MAPS OF THE STANDARDVILLE QUADRANGLE, CARBON COUNTY, UTAH

(Report includes 27 plates)

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INTRODUCTION

Purpose

This text is to be used in conjunction with the Coal Resource Occurrence and Coal Development Potential maps of the Standardville quadrangle, Carbon County, Utah (27 plates; U.S. Geological Survey Open-File Report 79-147). This report was compiled to support the land planning work of the Bureau of Land Management, and to provide a systematic coal resource inventory of Federal coal lands in Known Recoverable Coal Resource Areas (KRCRA's) in the Western United States.

Location

The Standardville 7½-minute quadrangle (NW¼ of the Castle Gate 15-minute quadrangle) is located in northwestern Carbon County in Central Utah and on the western end of the Book Cliffs coal field. The city of Helper, Utah lies 1 mile (1.6 km) east of the quadrangle.

Accessibility

U.S. Highway 6-50 and the main line of the Denver and Rio Grande Western Railroad pass through the extreme northeast corner of the quadrangle. Light duty roads extend from the city of Helper up Hardscrabble and Spring Canyons; and Utah Route 139 crosses the southern part of the quadrangle. The Utah Railway Company operates and maintains a small railroad which passes from Helper across the southeast quarter of the Standardville quadrangle. A short branch of this railroad extends up Spring Canyon to Standardville.

Physiography

The Book Cliffs form a bold south facing escarpment of barren sandstone cliffs from 1,000 to 2,000 feet (305 to 610 m) high. These cliffs and the

steep-sided canyons associated with them form an east-west trending band extending eastward from the Standardville quadrangle to the Utah-Colorado state line. The parallel strata dip gently northward and erosion processes have sculptured cliffs and ledges on canyon walls typical of regions of flat-lying beds. The Standardville quadrangle lies at the extreme western end of the Book Cliffs where they intersect the Wasatch Plateau, a rugged north-south trending mountainous area which is physiographically and stratigraphically similar to the Book Cliffs.

Price River Canyon cuts across the far northeast corner of the quadrangle. That canyon and its tributaries constitute the principal drainage system in the area. Price River flows the year around, but nearly all other streams in the quadrangle are intermittent.

The elevation at the base of the mountain front is approximately 6,000 ft (1,829 m) in the eastern part of the quadrangle and 7,200 ft (2,195 m) in the western part. The mountains attain a high point on Ford Ridge at 9,025 ft (2,751 The topographic relief in the quadrangle area is approximately 3,265 ft (995 m).

Climate

The climate is semiarid with the annual precipitation ranging from 10 to 25 in (25 to 64 cm) (U.S. Dept. of Commerce, 1964). The greater rainfall and snowfall occur at the higher elevations. Temperature is also a function of altitude. In the high mountainous areas, the summer temperatures may reach a high of 85 degrees F (29 degrees C) and the winter temperatures may go as low as -30 degrees F (-34 degrees C). The mid-summer maximum temperature on the lowlands may exceed 95 degrees F (35 degrees C) and the mid-winter minimum may reach -20 degrees F (-29 degrees C).

Land Status

The Standardville quadrangle is located at the western end of the Book Cliffs Known Recoverable Coal Resource Area (KRCRA). The entire KRCRA covers a total of 129,338 acres of which approximately 16,350 acres lie within the Standardville quadrangle. About 8,890 acres, or 54%, of the KRCRA within the quadrangle are non-federal lands. The Federal Government owns the coal rights to approximately 7,460 acres, or 46%, of the KRCRA of which nearly 3,755 acres are covered by Federal coal leases (Sep. 1977) and about 3,705 acres are unleased Federal coal lands. See plate 2.

GENERAL GEOLOGY

Previous Work

Clark (1928) mapped the geology and coal outcrops in the western part of the Book Cliffs coal field and his work is the most detailed original work presently available. Spieker (1931) mapped the Wasatch Plateau coal field to the west, and the northern part of his mapping is a westward continuation of Clark's map. The stratigraphy is further described by Abbott and Liscomb (1956), Fisher, Erdmann, and Reeside (1960), Katich (1954), and Young (1955, 1957, and 1966). Doelling (1972) has summarized the geology and updated the coal data described by the earlier workers.

Stratigraphy

The coal beds of economic importance in the Book Cliffs field are Upper Cretaceous in age and are confined to the Blackhawk Formation of the Mesaverde Group. This group includes, in ascending order, the Star Point Sandstone, Blackhawk Formation, Castlegate Sandstone, and Price River Formation. The Upper Cretaceous Mancos Shale underlies the Mesaverde Group and consists of a sequence of alternating and interfingering shale and sandstone members.

The oldest rocks exposed in the quadrangle are beds of the Mancos Shale and are represented by some 800 ft (244 m) of the Masuk Tongue Member. This

unit consists of dark bluish-gray shale which is sandy in the upper part.

The lowest unit of the Mesaverde Group, the Star Point Sandstone, is barren of coal and consists of three sandstone tongues which extend eastward and which are separated by westward-projecting tongues of Mancos Shale. The eastward-thinning sandstone tongues are, in ascending order, the Panther, Storrs, and Spring Canyon. The Panther Tongue is 100 to 125 ft (30 to 38 m) thick along the west edge of the quadrangle. Some 150 ft (46 m) above the Panther are 15 to 30 ft (5 to 9 m) of sandstone assigned to the Storrs Tongue, and about 100 to 125 ft (30 to 38 m) higher is the Spring Canyon Tongue which is nearly 150 ft (46 m) thick in Spring Canyon.

The Blackhawk Formation overlies the Star Point Sandstone and contains the important coal beds. The main coal-bearing part of the Blackhawk consists of 900 to 1,300 ft (274 to 396 m) of massive gray to buff sandstone, sandy shale, shale, and coal beds. The coal beds occur in two main groups, the Spring Canyon and the Castlegate groups. The lower, or Spring Canyon Group, is underlain by the Spring Canyon Tongue of the Star Point Sandstone and is overlain by the Aberdeen Sandstone Member of the Blackhawk Formation. The Castlegate Coal Group overlies the Aberdeen Sandstone and is overlain by the Kenilworth Sandstone Member. Few significant coal beds occur in the upper part of the Blackhawk Formation which is mainly sandstone.

The Castlegate Sandstone is 450 to 500 ft (137 to 152 m) thick and disconformably overlies the Blackhawk Formation. The Castlegate consists of massive, gray to yellowish-gray, brown-weathering sandstone.

The Castlegate Sandstone is overlain by 900 to 1,000 ft (274 to 305 m) of Price River Formation. This formation consists of alternating resistant gray to yellowish-gray sandstone and non-resistant gray to olive-green shale.

The Tertiary North Horn Formation overlies the Price River Formation and consists of variegated shale, sandstone, and subordinate conglomerate and freshwater limestone. Thin remnants of this formation occur on the tops of a few high ridges in the northwest corner of the Standardville quadrangle.

Structure

The Book Cliffs of east central Utah lie on the gentle north-dipping south flank of the Uinta Basin. The Upper Cretaceous strata in the Standardville quadrangle display this regional north to northeastward-dip of from 4 to 6 degrees.

The structure contours of the main coal beds are shown on plates 5, 8, 12, 16, 20, and 24. The steeper dips are found on a gentle structural flexure in the Hardscrabble Canyon area. The few faults which occur within the quadrangle have small displacements of 25 ft (8 m) or less.

COAL GEOLOGY

Eight main coal beds have been mapped and described within the quadrangle (plates 1 and 3). These beds occur in two main groups and an upper bed. The Spring Canyon Group is overlain by the Castlegate Group and the Kenilworth bed. In ascending order, the Spring Canyon Group includes: the Spring Canyon Sub 3, Spring Canyon Sub 2, and Spring Canyon Sub 1 beds. The Castlegate Group includes: the Castlegate "A", Castlegate "B", Royal Blue, and Castlegate "C" beds. The Kenilworth, sometimes called the Castlegate "D" bed in the mines in this quadrangle, lies above the Castlegate Group.

The Spring Canyon Sub 3 and Spring Canyon Sub 2 beds are separated by a non-coal interval ranging from 7 to 75 ft (2 to 23 m) with an average separation of 24 ft (7 m). The Spring Canyon Sub 2 and Spring Canyon Sub 1 beds are

separated by a non-coal interval ranging from 15 to 40 ft (5 to 12 m) with an average of 27 ft (8 m).

The non-coal interval between the Spring Canyon Sub 1 and the Castlegate "A" coal beds ranges from 80 to 170 ft (24 to 52 m) and includes the Aberdeen Sandstone Member of the Blackhawk Formation.

The Castlegate "A" bed is successively overlain by: a non-coal interval approximately 25 ft (8 m) thick; the Castlegate "B" bed; a non-coal interval about 25 ft (8 m) thick; the Royal Blue bed; a non-coal interval about 60 ft (18 m) thick; the Castlegate "C" bed; a non-coal interval about 80 ft (24 m) thick and the Kenilworth bed.

Chemical Analyses of the Coal

Doelling (1972) reports more than 500 analyses of coal samples from the Standardville quadrangle. The coal samples were taken from numerous mines. Many of the samples came from tipples of mines operating in more than one coal bed, which makes it difficult to separate these analyses by coal seam. The values of the proximate analyses have been averaged together in the following table taken from Doelling (1972, p. 348). A few coal samples from the mined area in the adjoining Kyune quadrangle on the north may have been included in the following summary of coal analyses.

Table 1: Average proximate analysis of coals, Standardville Quadrangle.

	No. Analyses	Percent	
		Average	Range
Moisture	563	4.1	0.62-24.5
Volatile matter	514	43.2	31.4 -48.5
Fixed carbon	514	45.9	33.9--52.9
Ash	534	6.8	4.3 -13.2
Sulfur	498	0.59	0.2 - 2.1
Btu/lb*	551	12,863	7,045 -13,530

*To convert Btu/lb to Kj/Kg multiply by 2.326.

Based on the ASTM system of classification, the coal mined in the Standardville quadrangle is classified as bituminous high-volatile B rank.

Spring Canyon Sub 3 Coal Bed

In the western part of the quadrangle the interval containing the Spring Canyon Group of coal beds lies between two prominent sandstones, the Spring Canyon Sandstone below and the Aberdeen Sandstone above. These are approximately 80 to 124 ft (24 to 38 m) apart. The distance between the two Sandstones decreases eastward, and east of Price River the units merge and the coal beds pinch out. The Spring Canyon Sub 3 bed is the basal coal bed in the Spring Canyon Group and correlates with the Hiawatha bed in the northwest quarter of the Scofield 15-minute quadrangle immediately to the west.

The Spring Canyon Sub 3 bed ranges in thickness from less than 1 ft (0.3 m) to more than 7 ft (2 m) in surface exposures. The thickest surface section occurs in Sowbelly Gulch and, according to Doelling (1972), the bed thins eastward and westward from that area. The isopach map (plate 23) indicates that the thickest section encountered in a drill hole occurs in the north part of Sec. 4, T. 13 S., R. 9 E. where it is 14.8 ft (4.5 m) thick with a very thin rock parting. The bed has been mined out in the immediate area around the drill hole. Spieker (1931, p. 79) postulates that the Spring Canyon Sub 3 (Hiawatha) bed may disappear northward, but Doelling (1972) believes that the coal continues northward and the isopach map (plate 23) supports this view. The coal in this bed is bright, hard, and breaks into large oblong blocks. It burns to a bright red ash and does not clinker. It is softer than the Castlegate "A" coal, but is a premium domestic coal.

Spring Canyon Sub 2 Coal Beds

The Spring Canyon Sub 2 coal beds include those in the middle part of the Spring Canyon Group between the Spring Canyon Sub 1 and Sub 3 beds. The beds are typically thin and lenticular. The isopach map (plate 19) shows that the main development of the thickest bed is in the northwest and north central part of the quadrangle where the bed has been mined extensively. The isopach map also indicates a maximum thickness of over 6 ft (1.8 m) for this single bed. Doelling (1972) reports that individual seams occur up to 7 ft (2.1 m) thick. These may have once been present in the areas that are now extensively mined out. The Sub 2 coal is bright, hard, and breaks into large cubical blocks. It has been regarded as a fine domestic coal.

Spring Canyon Sub 1 Coal Bed

The Spring Canyon Sub 1 coal bed appears to attain its maximum thickness to the southeast of the area where the underlying Sub 2 bed is thickest (plate 15). The maximum thickness indicated is in Sec. 9, T. 13 S., R. 9 E. where two sections show a thickness of 8.8 ft (2.7 m). The bed has been considered to be irregular in value and usually marginal in most of the quadrangle area except at the west end of Spring Canyon where it averages a little over 5 ft (1.5 m) thick and attains a maximum thickness of over 6 ft (1.8 m). Other pockets of minable coal in the Sub 1 seam have been found elsewhere, but mining of any significance has only occurred in the northwest part of the quadrangle.

The Sub 1 coal breaks into large irregular blocks and contains abundant resinous material. Although the coal has been considered to be marginal in value, that which has been mined in the northwest part of the quadrangle is reported (Doelling, 1972) to have been an excellent domestic and railroad coal that burns to a light red ash leaving little clinker.

Castlegate "A" Coal Bed

Of the five coal beds that make up the Castlegate Group, only the "A" bed and the next overlying "B" bed attain sufficient thickness to be considered mineable. The isopach map (plate 11) shows that the maximum development of the bed roughly coincides with the thicker developments of the underlying Spring Canyon beds. This relationship is somewhat further borne out by the fact that the areas where the "A" bed has been most extensively mined are also in coincidence with the principal mined-out areas of the Spring Canyon Group.

The Castlegate "A" bed has been correlated with a bed extending far to the west in the Wasatch Plateau coal field. The bed continues eastward as well, and near the town of Kenilworth in the Helper quadrangle it attains a thickness of 19 ft (6 m). The thickest section measured in the Standardville quadrangle is 16.9 ft (5.2 m) in Spring Canyon. The available information suggests that the "A" bed continues northward from the mined-out areas on the north side of Spring Canyon.

The Castlegate "A" coal is massive, brittle, and bright but contains dull bands of coal and numerous partings of bone and shale. The bed shows few or no bedding marks, has prominent joints, and locally has streaks of resin and sulfur balls in it.

Castlegate "B" Coal Bed

The Castlegate "B" is generally thin in outcrop and is only locally thick enough to mine. Its maximum thickness occurs in the northeast corner of the quadrangle where 8.7 ft (2.7 m) have been measured in a drill hole. Like the other coal beds in the quadrangle, it apparently thickens northward. It is present to the east in the Helper quadrangle, but does not thicken in that direction. In physical characteristics, the "B" bed

is similar to the "A" bed but it may have a slightly higher Btu average.

Mining Operations

Active coal mining within the Standardville quadrangle began at least as early as 1896. Although numerous mines have produced coal since then, by 1969 only two were active, the Carbon Fuel mine in Hardscrabble Canyon and the Spring Canyon mine in Sowbelly Gulch. These mines eventually discontinued their operations. In the early part of 1979 there were two active mines in the quadrangle. The Braztah No. 3 and the Braztah No. 5 (combined with the No. 4) mines of American Electric Power and Service Company were being operated by the Braztah Corporation. The Spring Canyon Sub 3 coal bed is being mined in the Braztah No. 3 mine, and the Kenilworth (Castlegate "D") bed is being produced in the Braztah No. 5 mine.

An intricate maze of overlapping mined-out areas remains in the quadrangle. Most of the coal mined has come from the Castlegate and Spring Canyon groups of coal beds. Lesser quantities have been mined from the Kenilworth (Castlegate "D") bed.

Doelling (1972) reports that the total coal production from the quadrangle at that time amounted to approximately 53 million short tons (48 million metric tons) and that the overall recoverability had been about 50 percent.

COAL RESOURCES

The principal sources of data used in the construction of the coal isopach maps, structure contour maps, and the coal-data maps were Doelling (1972) and Clark (1928). Nearly all recent drilling in the area is classified as proprietary information and was not available to the present authors.

Coal resource tonnages were calculated for measured, indicated, and inferred categories in unleased areas of Federal coal land within the KRCRA boundary. Data obtained from the coal isopach maps (plates 7, 11, 15, 19, and 23) were used to calculate the reserve base values. The coal-bed acreage (measured by planimeter) multiplied by the average isopached thickness of the coal bed times a conversion factor of 1,800 short tons of coal per acre-foot of bituminous coal yields the coal resources in short tons of coal for each isopached coal bed. Reserve Base and Reserve values for the Castlegate "B", Castlegate "A", Spring Canyon Sub 1, Spring Canyon Sub 2, and Spring Canyon Sub 3 beds are shown on plates 10, 14, 18, 22, and 26, and are rounded to the nearest tenth of a million short tons. The "reserve" values are based on a subsurface mining recoverability factor of 50 percent.

The Castlegate "C" bed is reserve base thickness in some parts of the quadrangle, but none of those areas lie within unleased Federal coal land boundaries. Therefore, reserve base and reserve values were not calculated for the Castlegate "C" bed and an Areal Distribution and Identified Resources Map was not made for that bed.

"Measured resources are computed from dimensions revealed in outcrops, trenches, mine workings, and drill holes. The points of observation and measurement are so closely spaced and the thickness and extent of coals are so well defined that the tonnage is judged to be accurate within 20 percent of true tonnage. Although the spacing of the points of observation necessary to demonstrate continuity of the coal differs from region to region according to the character of the coal beds, the points of observation are no greater than ½ mile (0.8 km) apart. Measured coal is projected to extend as a ¼ mile (0.4 km) wide belt from the outcrop or points of observation or measurement.

"Indicated resources are computed partly from specified measurements and partly from projection of visible data for a reasonable distance on the basis of geologic evidence. The points of observation are 1/2 (0.8 km) to 1 1/2 miles (2.4 km) apart. Indicated coal is projected to extend as a 1/2-mile (0.8 km) wide belt that lies more than 1/4 mile (0.4 km) from the outcrop or points of observation or measurement.

Inferred quantitative estimates are based largely on broad knowledge of the geologic character of the bed or region and where few measurements of bed thickness are available. The estimates are based primarily on an assumed continuation from Demonstrated coal for which there is geologic evidence. The points of observation are 1 1/2 (2.4 km) to 6 miles (9.6 km) apart. Inferred coal is projected to extend as a 2 1/4-mile (3.6 km) wide belt that lies more than 3/4 mile (1.2 km) from the outcrop or points of observation or measurement." (U.S. Bureau of Mines and U.S. Geological Survey, 1976).

Coal Reserve Base tonnages per Federal section are shown on plate 2 and total approximately 27.5 million short tons (24.9 million metric tons) for the unleased Federal coal lands within the KRCRA boundary in the Standardville quadrangle.

Table 2: Coal Reserve Base data for underground mining methods for Federal coal lands (in short tons) in the Standardville quadrangle, Carbon County, Utah.

(To convert short tons to metric tons, multiply by 0.9072)

Coal Bed Name	High development potential	Moderate development potential	Low development potential	Total
Castlegate "B"	1,100,000	-0-	-0-	1,100,000
Castlegate "A"	10,600,000	-0-	-0-	10,600,000
Spring Canyon Sub 1	5,500,000	-0-	-0-	5,500,000
Spring Canyon Sub 2	3,900,000	-0-	-0-	3,900,000
Spring Canyon Sub 3	6,400,000	-0-	-0-	6,400,000
Total	27,500,000	-0-	-0-	27,500,000

COAL DEVELOPMENT POTENTIAL

Development Potential for Surface Mining Methods

No development potential for surface mining methods exists in the area of this quadrangle because of the rugged topography, steep-sided canyons, extreme relief, and thick overburden. There may be very small areas where some rim stripping could be done, but in general the area is not conducive to surface mining methods.

Development Potential for Underground Mining and In Situ Gasification

The coal development potential for the underground mining of coal is shown on plate 27. In this quadrangle the areas where coal beds 5 ft (1.5 m) or more in thickness are overlain by less than 1000 ft (305 m) of overburden are considered to have a high development potential for underground mining.

Areas where such beds are overlain by 1,000-2,000 ft (305-610 m) and 2,000-3,000 ft (610-914 m) of overburden are rated as having a moderate and a low development potential respectively. Areas that contain no known

coal in beds 5 ft (1.5 m) or more thick, but coal-bearing units are present at depths of less than 3,000 ft (914 m) are classified as areas of unknown coal development potential. Areas where no coal beds are known to occur or where coal beds are present at depths greater than 3,000 ft (914 m) have no coal-development potential. There are no areas of unleased Federal coal land within the KRCRA in the Standardville quadrangle that are known to fall within the "moderate", and "low", or "no" development potential classifications.

The designation of a coal development potential classification is based on the occurrence of the highest-rated coal-bearing area that may occur within any fractional part of a 40-acre BLM land grid area or lot area of unleased Federal coal land. For example, a certain 40-acre area is totally underlain by a coal bed with a "moderate" development potential. If a small corner of the same 40-acre area is also underlain by another coal bed with a "high" development potential, the entire 40-acre area is given a "high" development potential rating even though most of the area is rated "moderate" by the lower coal bed. Another possibility is a 40-acre area devoid of any coal except a small corner where a 5-ft (1.5 m) coal bed crops out. In this case the 40-acre area will have a "high" development potential rating.

In the Standardville quadrangle approximately 2,890 acres of unleased Federal land have a high development potential rating and 815 acres have and unknown development potential.

The in situ coal gasification methods of development potential classification are based on the dip and depth of coal beds having a minimum thickness of 5 ft (1.5 m). There are only two development potential classification -- moderate and low. The criteria for in situ classifications include coal bed dips of 15 to 90 degrees and coal bed depth of 200-3,000 ft (61-914 m).

Inasmuch as the coal beds dip less than 15 degrees in the Standardville quadrangle, the in situ coal gasification methods of development potential classification do not apply.

Table 3. -Sources of data used on plate 1.

Source	Plate 1 Index Number	Data Base Measured Section No.	Data Base Page No.
Doelling, H.H., 1972, Book Cliffs coal field, in Doelling, H.H., Central Utah coal fields: Utah Geol. and Min. Survey Mon. Ser. no. 3.	1	153c	345
	2	154b	345
	3	65	343
	4	66 and 155c	343
	5	42 and 67	343
	6	12	342
	7	157a	345
	8	43 and 68	343
	9	158b	345
	10	159a	345
	11	160c	345
	12	44 and 69	343
	13	161a	345
	14	162a	345
	15	163b	345
	16	45 and 70	343
	17	165b	345
	18	13	342
	19	23, 35, 46, and 71	343
	20	166c	345
	21	72	343
	22	167b	345
	23	14 and 24	342
	24	36, 47, and 73	343
	25	74 and 168c	343
	26	48 and 75	343
	27	25	342
	28	76	343
	29	39, 49, and 77	343
	30	26 and 171a	342 and 345
	31	172a	345
	32	173a	345
	33	175a	345
	34	176a	345
	35	178b	345
	36	179c	345
	37	181c	345
	38	50 and 78	343
	39	79	343
	40	183b	345

Source	Plate 1 Index Number	Data Base Measured Section No.	Page or Plate (pl.) No.
Doelling, H.H., 1972	41	185c	345
	42	15 and 80	342 and 343
	43	81 and 187b	343 and 345
	44	82 and 189a	343 and 345
	45	85	343
	46	86 and 191b	343 and 345
	47	193b	345
	48	195b	345
	49	196b	345
	50	88	343
	51	199b	346
	52	89	343
	53	90	343
	54	27	342
	55	28	342
	56	51 and 92	343
	57	94	343
	58	201a	346
	59	202b	346
	60	204c	346
	61	95	343
	62	38 and 52	343
	63	96	343
	64	205b	346
	65	206a	346
	66	207b	346
	67	97	343
	68	208b	346
	69	209b	346
	70	100 and 211c	344 and 346
	71	212a	346
	72	101	344
	73	213a	346
	74	214a	346
	75	216a	346
	76	109	344
	77	217a	346
	78	218a	346
	79	110	344
Clark, F.R., 1928, Economic geology of the Castlegate, Wellington, and Sunnyside quadrangles, Carbon County, Utah: U.S. Geol. Survey Bull. 793.	80	530	pl.5
Doelling, H.H., 1972	81	222c	346
	82	223a	346
	83	225c	346
	84	231c	346

Source	Plate 1 Index Number	Data Base	
		Measured Section No.	Page No.
Doelling, H.H., 1972	85	120	344
	86	235a	346
	87	121	344
	88	238b	346
	89	239b	346
	90	240b	346
	91	122	344
	92	241a	346
	93	243b	346
	94	245b	346
	95	128	344
	96	246b	346
	97	247a	346
	98	248a	346
	99	249b	346
	100	250b	347
	101	252b	347
	102	253b	347
	103	254a	347
	104	255a	347
	105	256c	347
	106	40, 55, and 129	343 and 344
	107	258b	347
	108	259a	347
	109	260a	347
	110	261b	347
	111	130 and 263a	344 and 347
	112	265a	347
	113	268a	347
	114	30 and 139	342 and 344
	115	17	342
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	117	269b	347
	118	142	344
	119	270b	347
	120	143	344
	121	271b	347
	122	272c	347
	123	145	344
	124	144	344
	125	32	343
	126	279c	347
	127	33, 62, and 152	343 and 344
	128	22, 61, 151, and 278c	342-347
	129	21, 60, 150, and 277c	342-347
	130	20, 59, 149, and 276c	342-347
	131	19, 58, 148, and 275c	342-347
	132	57, 147, and 274c	343-347
	133	56, 146, and 273c	343-347

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