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REPORT UPON IMPROVEMENT OF

VALLEY OF ROCK CREEK

FROM MASSACHUSETTS AVENUE TO MOUTH OF THE CREEK

LETTER FROM THE PRESIDENT OF THE BOARD OF COMMISSIONERS OF THE DISTRICT OF COLUMBIA SUBMITTING, PURSUANT TO LAW, A REPORT UPON THE IMPROVEMENT OF THE VALLEY OF ROCK CREEK, FROM MASSACHUSETTS AVENUE TO THE MOUTH OF THE CREEK

MAY 2, 1908.—Referred to the Committee on the District of Columbia and ordered to be printed

MAY 21, 1908.—Ordered reprinted with maps and illustrations

WASHINGTON
GOVERNMENT PRINTING OFFICE

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OFFICE COMMISSIONERS OF THE DISTRICT OF COLUMBIA,
Washington, April 30, 1908.

SIR: The Commissioners of the District of Columbia have the honor to submit the following report upon the improvement of the Valley of Rock Creek, from Massachusetts avenue to the mouth of the creek, in pursuance of the following provision contained in the act providing appropriations for the District of Columbia, for the fiscal year 1908:

For preparation of plans and estimates for the treatment of the Valley of Rock Creek from Massachusetts avenue to the mouth of the creek, both by open-valley method and by conduit, including necessary surveys, borings, test pits, plan, and estimates of cost, four thousand dollars.

Very respectfully,

HENRY B. F. MACFARLAND,
President Board of Commissioners, District of Columbia.

Hon. CHARLES W. FAIRBANKS,
President of the Senate, Washington, D. C.

OFFICE ENGINEER COMMISSIONER
OF THE DISTRICT OF COLUMBIA,
Washington, April 25, 1908.

Respectfully forwarded to the Board of Commissioners.

The inclosed report is submitted in pursuance of an item contained in the District appropriation act for the fiscal year 1908, as follows:

For preparation of plans and estimates for the treatment of the Valley of Rock Creek from Massachusetts avenue to the mouth of the creek, both by the open-valley method and by conduit, including necessary surveys, borings, test pits, plan, and estimates of cost, four thousand dollars.

The work of this survey and the preparation of plans have been carried out in this office under the direction of the assistant to the engineer commissioner in charge of the surface division, by the engineer of bridges, has been very exhaustive and is fully covered in the report of the engineer of bridges and the supplemental report thereon by Capt. E. M. Markham, all herewith.

Studies have been made looking to four possible solutions in which all variations occur between L street and the Massachusetts avenue crossing of Rock Creek.

The first solution studied provides for filling Rock Creek valley from Massachusetts avenue to L street by the construction of a conduit for the waters of Rock Creek and the subsequent construction on the fill over this conduit of a boulevard 160 feet in width.

The second solution involves the same treatment of the valley, excepting the subsequent construction of the boulevard 400 feet in width.

The third solution involves the construction of the conduit from L street to O street with a 160-foot boulevard subsequently overlying it, and the open treatment of the valley from O street to Massachusetts avenue.

The fourth solution involves treating the entire valley from Massachusetts avenue to L street, preserving it as a valley, with the proper arrangement of high-level and low-level roads and paths throughout the entire distance.

Below L street all solutions involve the same treatment, namely, an elevated boulevard to the connection with Potomac Park. Above Massachusetts avenue the same treatment is proposed in all solutions, namely, the acquisition of a portion of Rock Creek valley for park purposes and its preservation in its present natural condition.

The estimates of cost are as follows:

For the treatment between L street and Potomac Park under all projects, $1,100,000.

For the treatment between L street and Massachusetts avenue under the various plans considered, as follows:

For the closed treatment throughout, with a boulevard 160 feet in width, $7,350,000, and as against this cost a credit for 1,247,000 square feet of land to be resold, which would reduce the cost to an aggregate of $5,900,000.

For the closed treatment throughout, with a boulevard 400 feet in width, $7,850,000, against which a credit for 526,349 square feet of land to be resold, which would reduce the cost to an aggregate of $7,230,000.

For the closed treatment with a 160-foot boulevard between L and O streets and open treatment between O street and Massachusetts avenue, $5,100,000.

For the open treatment throughout, $1,750,000.

After this study, I would recommend that the open-valley method be adopted, and that appropriations be asked for in the near future looking to the gradual carrying out of this project.

Briefly outlined this project involves the following work:

A main road to be constructed in the valley of the park extending from Massachusetts avenue to the river. A main path extending the same distance, in a general way paralled to the main road—all in the

paths are provided. It is planned to develop the entire area as a city park, with the exception of the section between L street and Potomac Park, which will be treated as a more or less formal parkway and park connection. The section north of O street could easily be developed into a beautiful informal city park having a maximum width of 600 feet and a minimum width of 400 feet. At Massachusetts avenue the main drive is planned to be carried through the embankment now crossing the valley at that point, a subway being provided with a width of 35 feet and a height of 24 feet, having the form of a single arch.

In addition to the main drive in the bottom of the valley, bordering roadways are contemplated on both sides, with a view to having the park almost entirely surrounded by streets, so that the backs of buildings could not be presented to view from the park. Main driveway entrances to the park are provided from Massachusetts avenue just south of the valley by the road now known as Waterside drive, and from Q street by the same road; also from Twenty-fifth street just north of N street and from Twenty-sixth and L streets, and from the formal driveway which leads from Potomac Park along the banks of the Potomac River and Rock Creek to this last-mentioned entrance. Entrances from the west are provided at a point near Twenty-sixth and P streets and from a point near Twenty-sixth and Q streets and by way of the old Lovers Lane valley, and from T street as far as that street will ultimately be completed. In addition to these carriageway entrances, pathway entrances are provided at nearly every point where the bounding streets are intersected by lateral streets.

Crossings are provided as follows:

A bridge is proposed from the intersection of Twenty-eighth and R streets to the intersection of Massachusetts avenue and S street. A bridge is provided at Q street, a new bridge at P street, a bridge at N street, a new bridge at M street, and a new bridge at Pennsylvania avenue. The K street bridge, proposed to be maintained at its present grade, will be crossed above grade by the elevated driveway along the quay. The low driveway crosses the creek at four points, by small bridges, namely, just south of Pennsylvania avenue, just south of P street, also at a point near the old Lyon's Mill, and at a point near the pumping station south of Massachusetts avenue.

The plan involves the condemnation of about 3,750,000 square feet of land, including improvements, and involves a considerable amount of grading in the section between M and O streets and from the point of the hill near the present P street bridge.

It is believed that authority to purchase or condemn this land, which it is estimated will, with the improvements, cost about $1,920,000, should be granted by Congress at as early a date as possible, for the double reason of making the ultimate development of this park connection an assured fact, and also to prevent the perpetuation of the dumping nuisance, which has already assumed such large proportions, and which is largely beyond the control of the District officials as the dumping is not on public space. The passage of time and the continuance of these conditions necessarily adds to the cost and difficulty of the construction work. It is believed that the purchase of this land will be of sufficient local benefit to justify assessments for benefits, but it is not believed advisable to suggest any definite

amount that the assessments should reach, nor any proportion of the total cost, unless the completion of the work could be guaranteed within a reasonable period after the commencement.

In closing, it should be stated that the report also covers an estimate of the cost of the scheme of improvement suggested by Mr. Samuel Parsons, as nearly as that cost could be estimated with definiteness from the rather indefinite suggestions made in his report.

JAY J. MORROW,
Major, Corps Engineers, U. S. Army,
Engineer Commissioner, District of Columbia.

MARCH 11, 1908.

Respectfully forwarded to the Engineer Commissioner, District of Columbia.

The accompanying report and estimates of cost pertaining to the improvement of Rock Creek have been carefully prepared, and the relative merits of the various possibilities outlined in detail by the engineer of bridges, whose views are concurred in. These possibilities are four: First. The closed treatment of Rock Creek valley from Massachusetts avenue to L street and the subsequent construction of a 160-foot boulevard. Second. The same, with a 400 foot boulevard. Third. The open treatment from Massachusetts avenue to O street, and the closed treatment below that point, with a 160 foot boulevard over the covered portion. Fourth. The open treatment from Massachusetts avenue to L street with a proper arrangement of high-level and low-level roads and paths over the entire distance.

Below L street and to the connection with Potomac Park an elevated boulevard is proposed with any method of treatment that might be adopted for that portion north of L street. The various costs of these several methods are given in the accompanying table of costs.

A park effect of one kind or another is unquestionably the essence of any possible treatment of Rock Creek between Massachusetts avenue and L street, and it is thought that the vast majority of those who in either a public or private capacity have had to do with or thought about the project have had the park question more strongly in mind than the mere elimination of the barrier that now exists in Rock Creek Valley between the city of Washington and Georgetown. It is thought that the park question should be given far the greater weight in determining upon any method of procedure.

Under any form of closed treatment there would be secured over the length so closed a continuous physical connection between the city of Washington and Georgetown, but at great cost, of doubtful useful value, and available for building purposes only in a very remote future. Assuming the closed treatment for either a part or for the entire length, a 160-foot so-called boulevard would be but little better than an ordinary street. A 400-foot boulevard over the closed portion would doubtless effect a somewhat better park condition, but would probably never be flanked by a class of private construction in keeping with such improvement, for it is doubtful if substantial residential construction would be attracted to a new fill of 50 or 60 feet, such as would exist in this case, in a less period than ten to twenty years after the completion of such fill. Certainly it would be

doubtful to attempt substantial building in a lesser period than ten years. Hence, since the filled ground, once disposed of to private interests, would certainly not be allowed to lie idle, it is probable that a cheap character of building would ensue along this boulevard, rather than that it would become the fine residential avenue that its cost and character should warrant.

The closed-conduit method of improvement, which would doubtless involve in its mere fill from eight to ten years, could therefore hardly meet the expectations of its supporters for a period of at least twenty to thirty years, if ever.

It is the apparent expectation of those interested in the closed treatment that the business interests of Georgetown would be vastly bettered thereby, and that a good class of residential construction would spread westward from Washington across the present site of the valley and, invading Georgetown, would finally eliminate the squalid settlements along the west side of Rock Creek below P street. This is very seriously doubted. Theoretically it might seem desirable to absolutely eliminate this Rock Creek barrier, but it is certain that in a utilitarian way Georgetown's needs can be abundantly subserved by its present and a few additional bridges, namely, at N street, Q street, and possibly later at R–S street.

Attention is invited to the point raised by the engineer of bridges, and which has been touched upon in past reports, as to the propriety of the District's securing by condemnation the necessary land for this closed method of improvement and, after said improvement, selling the excess over public needs to private interests. Such a procedure is probably of very doubtful legal color. It is stated in the accompanying report that the purchase of the necessary land in open market would increase the cost of closed treatment by as much as a million dollars, which makes the matter one for serious consideration.

The open treatment of Rock Creek (eliminating from present consideration the R–S street bridge) is less costly than the least expensive of the closed or partially closed treatments by nearly a million dollars and less costly than the most expensive of the closed treatments by about $3,000,000. Both of these comparisons are based upon the assumption that the necessary land shall be secured by condemnation and that the excess over public needs shall subsequently be disposed of to private interests. Such is, of course, the most favorable condition of comparison.

The open treatment would give a real and beautiful park throughout a great length of the city, with very easy access to many thousands of people; would have the advantage of unobstructed park travel, free from the disagreeable interference of cross-street traffic that would be involved in any form of closed treatment, and would seem to have, in a park sense, every possible consideration in its favor. It would unquestionably afford the most desirable kind of connection between the Potomac Park and the upper Zoological and Rock Creek parks, which connection in the future development of the park system of Washington is greatly to be desired.

With the open treatment of Rock Creek valley within the limits named it is not difficult to see in the not very remote future its limiting streets lined by a handsome class of residences in keeping with the improvement, and it is thought that there is far more probability of the elimination of the squalid conditions on the Georgetown bank of the stream under the open treatment than under the closed.

Therefore, on the grounds of costs, time of completion, and the character of results to be anticipated, the open treatment of Rock Creek valley is strongly recommended. It is proper to note that if any improvement of Rock Creek valley is to be undertaken the same should be done promptly, for the dumping of earth, ashes, manure, etc., which has already assumed such unlooked-for proportions will continue and even increase, since available dumping spaces within the District have already been reduced to a very small number. Every load of material that is now dumped upon the banks of the creek will have to be removed under the open treatment, and if Congress seriously proposes an improvement, such improvement, at least to the extent of securing control of the necessary land, should be appropriated for without delay.

It is evident that material benefit would result from the proposed improvement to a considerable section of the city and of Georgetown in proximity thereto, and the recommendation of the engineer of bridges, that 20 per cent of the total cost of the improvement should be assessed as benefits against property for three squares on either side of the completed project, is thought to be reasonable and proper.

E. M. MARKHAM,
Captain, Corps of Engineers, U. S. Army,
Assistant to Engineer Commissioner, D. C.

WASHINGTON, D. C., *February 29, 1908.*

SIR: Pursuant to your instructions, and as required by act of Congress (Public, 169), I herewith submit plans and estimates for the treatment of the valley of Rock Creek from Massachusetts avenue to the mouth of the creek (or to Potomac River), both by the open-valley method and by conduit.

Congress appropriated $4,000 for making surveys, borings, test pits, plans, and estimates, and in preparing this report, submitted herewith, practically this entire appropriation has been expended.

After a careful consideration of the several plans submitted, I have to recommend that the open-valley method be adopted, because:

1. It is the cheaper.
2. It is the safer and therefore the better from an engineering standpoint.
3. The improvement can be executed in one-half the time.
4. It gives a better improvement for the abutters.
5. It gives a better improvement for the city considered as a whole.
6. It gives a parkway between Potomac and Zoological parks, which is most desirable.
7. It offers the very best parkway, because the highway travel will not intersect the park travel at grade. This is a material advantage not only to the highway travel, but also to the park travel.
8. It gives a park for the abutting section of Washington which is without proper park facilities.
9. The open space which will result under the open-valley method will be a health asset when the abutting property becomes closely built upon.
10. During the execution of the open-valley plan the unsightly conditions will not exist which would obtain in the making of the necessary fill under the conduit plan. It would take about six years

to make the fill, which means that the conditions for ten years after the beginning of the project under the conduit plan would be even more unsightly than at present.

11. It is not believed that the taking of this land for park purposes will decrease the taxation in the District of Columbia, first, because the open-valley method will increase the value of the abutting land to a large extent; and, second, those who would build upon the reclaimed land if the conduit plan were adopted will build elsewhere if the open-valley plan were adopted. Therefore, on this account there will be no decrease in the revenues of the District of Columbia by following the plans recommended.

The total cost of the open-valley project from Massachusetts avenue to Potomac Park is $5,800,000, divided as follows: Between Massachusetts avenue and P street, $2,800,000; between P street and L street, $1,900,000; between L street and Potomac Park, $1,100,000.

It is believed that at this time the improvement below L street should not be executed, as there is no immediate need for the park connection between Pennsylvania avenue and Potomac Park, nor is there any other need for the immediate improvement of this lower section. Therefore, in recommending the open-valley plan I have to recommend only the improvement from Massachusetts avenue to L street at this time, at an estimated cost of $4,700,000. I would suggest that an appropriation of $2,000,000 be asked for, so that the necessary land may be purchased at an early date. This appropriation of $2,000,000 should include the necessary authority for the making of detail surveys and working drawings for the complete project. After the land is purchased and the contract plans made I would suggest an annual appropriation of $1,000,000 to complete the work, which would take six years, including the time necessary to purchase the right of way.

It is my judgment that it would not be practicable to omit any of the construction items enumerated under the open-valley plan excepting the construction of the R-S street bridge, which is estimated to cost about $450,000 plus about $50,000 for the ground, making a total of $500,000. While it is believed that this connection is a most desirable one, it might temporarily be omitted, thus decreasing the cost of the work from $4,700,000 to $4,200,000.

In regard to a comparison of the cost of the open-valley plan and the conduit plan I wish to state that I used the same general values for land and improvement in these two estimates. There is a grave question, however, whether or not under the conduit plan it would be possible to acquire the necessary land under condemnation proceedings, because it is the manifest intention of the District of Columbia, under this plan, to enter into a real estate business. Therefore, it appears that the only equitable and legal way to acquire this land is by purchase in open market. If such method of purchase is mandatory, the actual cost of the conduit plan would unquestionably be a million or two million dollars higher than estimated.

The accompanying report considers the various improvements of Rock Creek in detail and includes an estimate of cost for each plan.

It is believed that 20 per cent of the total cost of the improvement should be assessed as benefits against the abutting property. It is thought that the improvement of the valley of Rock Creek will materially increase the real estate values for at least three squares on either side of the completed project. This assessment for benefits

would average something less than 5 per cent of the assessed value of the property regarded as benefited.

Very respectfully,

W. J. DOUGLAS,
Engineer of Bridges, District of Columbia.

Capt. E. M. MARKHAM,
Assistant Engineer Commissioner.

(Through C. B. Hunt, Engineer of Highways.)

Estimates for the improvement of Rock Creek Valley, open valley plan.

MASSACHUSETTS AVENUE TO P STREET.

2,410,733 square feet land (including improvements)	$1,081,386
492,000 cubic yards grading, at 30 cents	147,600
300 linear feet tunnel (Massachusetts avenue), at $350	105,000
7,500 square feet bridge (Montrose), at $6.50	48,750
8,750 square feet bridge (pumping station), at $4	35,000
9,000 square feet bridge (Lyons's mill), at $5	45,000
50,000 square feet bridge (R and S streets) at $9	450,000
21,056 square feet bridge (Q street) at $8.50	178,976
20,915 square feet bridge (P street), at $8.50	177,778
Removing P Street Bridge and temporary bridge	8,000
4,792 linear feet retaining walls	239,600
2,100 linear feet parapet walls, at $6.75	14,175
1,000 linear feet railing, at $5	5,000
2,400 linear feet cemetery walls, at $7	16,800
17,989 linear feet roads	82,750
18,200 linear feet paths, at 50 cents	9,100
38 acres of cultivation, at $1,200	45,600
6,000 linear feet 4-inch water pipe, with laterals, at $1.50	9,000
3,933 linear feet, west side Rock Creek intercepting sewer, at $15	59,000
5,000 linear feet 12-inch sewer, at $2	10,000
33 catch basins, with connections, at $100	3,300
130 traps, with connections, at $40	5,200
250 graves to be removed	50,000
Restoring Lyons's mill	3,500
Total cost Massachusetts avenue to P street	2,810,515

FROM P TO L STREET.

1,261,827 square feet land (including improvements)	$809,351
308,000 cubic yards grading, at 30 cents	92,400
9,333 square feet bridge (P street low level), at $3.75	35,000
20,700 square feet bridge (N street), at $8	165,600
16,200 linear feet bridge (M street), at $8	129,600
19,285 square feet bridge (Pennsylvania avenue), at $8	154,280
7,000 square feet bridge (Chesapeake and Ohio Canal), at $5.70	40,000
Removing M Street Bridge	8,000
Removing Pennsylvania Avenue Bridge	6,000
2,730 linear feet retaining walls	245,950
1,200 linear feet parapet walls, at $6.75	8,100
5,000 linear feet railing, at $5	25,000
9,538 linear feet roads	53,010
15,000 linear feet paths, at 50 cents	7,500
6,000 linear feet 4-inch water pipe (with laterals), at $1.50	9,000
3,900 linear feet intercepting sewer (west side Rock Creek), at $15	58,500
7,250 linear feet 12-inch sewer, at $2	14,500
15 catch basins, with connections, at $100	1,500
15 traps, with connections, at $40	600
12 acres of cultivation, at $1,200	14,400
Total cost P to L street	1,929,291
	2,810,515
Total cost Massachusetts avenue to L street	4,739,806

Estimates for the improvement of Rock Creek Valley, semiconduit plan.

MASSACHUSETTS AVENUE TO P STREET.

2,490,733 square feet of land (including improvements)	$1,061,386
492,000 cubic yards of grading, at 30 cents	147,600
300 linear feet of tunnel (Massachusetts avenue), at $350	105,000
7,500 square feet of bridge (Montrose), at $6.50	48,750
8,750 square feet of bridge (pumping station), at $4	35,000
9,000 square feet of bridge (Lyons mill), at $5	45,000
50,000 square feet of bridge (R and S street), at $9	450,000
21,056 square feet of bridge (Q street), at $8.50	178,976
20,915 square feet of bridge (P street), at $8.50	177,778
Removing P street bridge and temporary bridge	8,000
4,792 linear feet retaining walls	239,600
2,100 linear feet parapet walls, at $6.75	14,175
1,000 linear feet railing, at $5	5,000
2,400 linear feet cemetery wall, at $7	16,800
17,989 linear feet roads	82,750
18,200 linear feet paths, at 50 cents	9,100
38 acres of cultivation, at $1,200	45,600
6,000 linear feet 4-inch water pipe, with laterals, at $1.50	9,000
3,933 linear feet west side Rock Creek intercepting sewer, at $15	59,000
5,000 linear feet 12-inch sewer, at $2	10,000
33 catch basins, with connections, at $100	3,300
130 traps, with connections, at $40	5,200
250 graves to remove, at $200	50,000
Restoring Lyons mill	3,500
Total cost, Massachusetts avenue to P street	2,810,515

NOTE.—10 per cent for engineering and contingencies has been added to construction items.

FROM P TO L STREET.

905,196 square feet land (including improvements)	$581,623
526,000 cubic yards grading, at 60 cents	315,600
2,000 linear feet conduit, at $500	1,000,000
Removing M Street Bridge	8,000
Removing Pennsylvania Avenue Bridge	6,000
1,484 linear feet retaining walls	115,720
1,200 linear feet parapet walls, at $6.75	8,100
3,200 linear feet railing, at $5	16,000
10,300 linear feet roads	125,500
5,000 linear feet paths, at 50 cents	2,500
9 acres of cultivation, at $1,200	10,800
6,000 linear feet 4-inch water pipe, with laterals, at $1.50	9,000
2,733 linear feet west side Rock Creek intercepting sewer, at $15	41,000
1,425 linear feet sewer, at $2	2,850
33 catch basins, with connections, at $100	3,300
5 traps, with connections, at $40	200
1,500 linear feet sewer extensions	25,650
Total cost, P to L street	2,271,843
	2,810,515
Total cost, Massachusetts avenue to L street	5,082,358

NOTE.—Engineering and contingencies included in total.

Estimates for the improvement of Rock Creek Valley, full conduit plan No. 1.

MASSACHUSETTS AVENUE TO L STREET.

3,057,315 square feet of land (including improvements)	$1,625,480
3,776,000 cubic yards grading, at 60 cents	2,265,600
5,650 linear feet conduit, at $400, $450, and $500	2,489,000
250 graves to be removed	50,000
Changing aqueduct pumping station (Major Cosby)	66,000

Removing bridge (P street)	$8,000
Removing bridge (M street)	8,000
Removing bridge (Pennsylvania avenue)	6,000
1,180 linear feet retaining walls	129,500
26,620 linear feet roads	282,700
8½ acres of cultivation, at $1,200	10,000
7,833 linear feet west side Rock Creek intercepting sewer	117,500
1,800 linear feet 12-inch sewer, at $2	36,000
60 catch basins with connections, at $90	5,400
3,250 linear feet sewer extensions	53,000
	7,152,180
30 per cent on investment for land and improvements	198,900
Total gross cost	7,351,080
1,247,000 square feet of land to be sold	1,450,000
Total net cost	5,901,080

NOTE.—Engineering and contingencies included in total.

Estimates for the improvement of Rock Creek Valley, full conduit plan No. 2.

MASSACHUSETTS AVENUE TO L STREET.

3,343,020 square feet of land (including improvements)	$1,758,926
3,776,000 cubic yards grading, at 60 cents	2,265,600
6,000 linear feet conduit, at $450 and $500	2,800,000
250 graves to be removed	50,000
Changing aqueduct pumping station (Major Cosby)	66,000
Removing bridge (P street)	8,000
Removing bridge (M street)	8,000
Removing bridge (Pennsylvania avenue)	6,000
1,180 linear feet retaining walls	129,500
23,220 linear feet roads	413,950
26 acres of cultivation, at $1,200	31,200
7,833 linear feet west side Rock Creek intercepting sewer, at $15	117,500
1,800 linear feet 12-inch sewer, at $2	36,000
60 catch basins, with connections, at $90	5,400
3,250 linear feet sewer extensions	53,000
	7,749,076
30 per cent on investment for land and improvements	97,860
Total gross cost	7,846,936
526,349 square feet of land to be sold	620,000
Total net cost	7,226,936

NOTE.—Engineering and contingencies included in total.

Estimates for the improvement of Rock Creek Valley, all plans (except Parsons's).

L STREET TO POTOMAC PARK.

377,009 square feet of land (including improvements)	$409,472
86,000 cubic yards grading, at 30 cents	25,800
3,400 linear feet viaduct, at $100	340,000
1,900 linear feet sea wall, at $100	190,000
2,740 linear feet paving (streets and area inside sea wall)	106,300
1,000 linear feet 12-inch sewer, at $2	2,000
4 catch basins with connections, at $100	400
Total cost	1,073,972

NOTE.—Engineering and contingencies included in total.

Estimates for the improvement of Rock Creek Valley, Parsons's plans.

MASSACHUSETTS AVENUE TO POTOMAC PARK.

[Including conduit and filling between L and N streets.]

10,389,274 square feet of land and improvements	$14,859,912
2,000 linear feet conduit	1,000,000
240 acres of cultivation	288,000
1,026,000 cubic yards grading, at 30 and 60 cents	465,600
42,700 linear feet roads and paths	256,180
7,833 linear feet west side Rock Creek intercepting sewer	117,500
3,250 linear feet sewer extensions	53,000
15,000 linear feet 12-inch sewer, at $2	30,000
5,500 linear feet retaining walls	255,320
Total cost	[a] 17,325,512

NOTE.—Engineering and contingencies included in total.

Estimated cost of project for Rock Creek improvement from Massachusetts avenue to Zoological Park.

42.7 acres of land, at $10,890, or about 25 cents per foot	$465,000
400,000 cubic yards of grading, at 40 cents	160,000
16,850 linear feet roads	87,100
16,000 linear feet paths	4,800
Cathedral avenue culvert	4,000
1,200 linear feet retaining walls	75,000
10 acres of cultivation, at $1,200	12,000
7,500 square feet bridge (low level), at $5.33	40,000
5,500 linear feet fence, at $5	27,500
4,000 linear feet parapet walls, at $6.75	27,000
10,000 linear feet 4-inch water pipe, with laterals, at $1.50	15,000
9,00 linear feet 12-inch sewer, at $2	18,000
Total cost	935,400

NOTE.—Engineering and contingencies included in total.

Estimated cost for making changes at Rock Creek shaft pumping station of the Washington Aqueduct.

[By. Maj. Spencer Cosby.]

For raising watchman's house	$3,500
For new pumping station building, including foundation for walls	10,000
For foundation for engines, compressors and boilers	3,000
For extension of working shaft, construction of shaft to valve vault, etc.	3,500
For installation of new machinery	40,000
	60,000
Contingencies, 10 per cent	6,000
Total	66,000

Estimated total cost of each plan for the improvement of Rock Creek Valley.

Open-valley plan (Massachusetts avenue to L street)	$4,739,806
Semiconduit plan (Massachusetts avenue to L street)	5,082,358
Full conduit plan No. 1 (Massachusetts avenue to L street)	5,901,080
Full conduit plan No. 2 (Massachusetts avenue to L street)	7,226,936
L street to Potomac Park	1,073,972
Parsons (Massachusetts avenue to L street and Potomac Park to N street)	17,325,512
Zoological Park to Massachusetts avenue	935,400

[a] $1,456,000 has been added to this estimate, for improvements not contemplated by Mr. Parsons.

Report Upon the Improvement of Rock Creek.

Rock Creek drains a basin having an area of 77 square miles. The length of this basin is about 22 miles, and the average longitudinal slope per mile is 16 feet, and the average transverse slope per mile is 230 feet. About 8 per cent of the area drained is agricultural and about 12 per cent is woodland. The balance of the land is urban or suburban, and for the purposes of this report it may be assumed as urban, because in twenty-five or thirty years it will so develop. The freshet discharge between Q street and the river is slow. Between Q street and the District line, rapid, and the balance, extending for a distance of 13 miles, having an area of about 60 square miles, may be called medium.

The highest recorded discharge, taken at the mouth of the creek, was 10,000 cubic feet per second. The discharge was unquestionably greater in 1889, but as no gaugings were taken at that time it is impossible to state how much greater.

I have to quote as follows from the Engineer Commissioners' report of 1893: "From a consideration of the features of the question which bear upon the possible extreme discharge to be expected from the basin I am led to place this at from 20,000 to 25,0000 cubic feet per second. I do not believe that so great a discharge can be anticipated from the watershed in its present condition or in the future, unless exceptional circumstances prevail, but owing to the vast interests involved remote contingencies must be provided for."

In the Appendixes G and H of the report of 1893 there are a number of calculations showing the probable maximum run-off for Rock Creek valley. The minimum estimated amount of run-off in accordance with the O'Connell formula is 4,707 cubic feet per second, whereas by a combination of the Burkli-Zeigler formula, McMaths formula, and the curve of the board of sanitary engineers on the sewerage of the District of Columbia, we find a maximum discharge of 25,606 cubic feet per second. A careful study of the results of the application of the several formulas given in Appendixes G and H will determine the run-off at probably between 15,000 and 26,000 cubic feet per second.

When the Massachusetts avenue culvert was designed in 1900 a similar calculation was made by the engineer of bridges on the basis of a 9-inch rainfall over the entire area, uniformly distributed in twenty-four hours. On this basis, using the Burkli-Zeigler formula, the maximum discharge was estimated at 20,000 cubic feet per second.

Two methods of improving the valley of Rock Creek between Massachusetts avenue and the river have been considered in the past. First, the method was to improve the valley by carrying the water in a conduit, and after the construction of the conduit the valley was to be filled to the grade of the adjacent streets. After the necessary connecting streets were laid out the balance of the land was to be sold for building purposes. The second method was for the development of the valley as a park or parkway of a more or less formal type, which parkway was intended to connect Potomac Park with the Zoological Park. In addition to this, a park was to be afforded for the abutting sections of the city and the limiting streets were to be so laid out as to develop the adjacent land in the

east and west streets are carried over the creek upon bridges and the north and south streets are noncontinuous, travel along these streets being effected by slight detour.

Under the act of Congress authorizing the making of these plans we are only authorized to make plans between Massachusetts avenue and the river. However, as the treatment for the portion of Rock Creek below Massachusetts avenue can not be properly executed without considering the treatment above Massachusetts avenue and extending as far as the Zoological Park, I have also submitted for your consideration a sketch showing the proposed treatment of Rock Creek valley from Massachusetts avenue to the Zoological Park. The sketch indicates a treatment similar to that recommended in this report as the proper one above Massachusetts avenue. Eventually similar conditions will exist above Massachusetts avenue to those now existing below it.

HISTORY OF THE CONDUIT PROJECT.

In 1893 Capt. William T. Rossell, then Engineer Commissioner of the District of Columbia (assisted by the late Capt. J. L. Lusk and Capt. G. J. Fiebeger and Mr. D. E. McComb, superintendent of sewers), prepared plans and estimates for converting Rock Creek valley, below the north line of Massachusetts avenue, into a sewer, filling in the valley between the banks This report was made pursuant to a resolution of the United States Senate dated July 22, 1892. The following excerpts (somewhat curtailed) are taken from this report, which may be found in the Engineer Commissioner's report of 1893, and which report will be referred to hereinafter as the report of 1893.

"Rock Creek, however, must always remain a drainage line for the large area from which it now carries the water, and no plans of sewage disposal would be prepared looking to its abandonment. The creek is not in any sense a menace to health if it merely carries storm water uncontaminated with sewage, whether it remains an open conduit or is arched over."

"The next question which arose was the cross section necessary to carry off, without injury, the largest volume of water that may be expected from the area drained. A careful study of the problem has been made, and it is believed that a solution has been found sufficiently accurate for a preliminary estimate. It will require an arch with a span of 50 feet and a height from the bottom to crown of the arch of 32.5 feet, giving an area of cross section equal to 1,250.5 square feet. This cross section, with a slope of 1 to 1,000, may be expected to carry off about 18,000 cubic feet per second, and under a head of 6½ feet, 25,000 cubic feet. It is proper to say, however, that further examination should be made before the work is done." Examination was made in 1900, and the calculations made in the report of 1893 were verified.

"After the construction of this sewer there remains the filling in between the banks, making useful land now so situated as to be comparatively useless and obliterating the creek as a barrier between Washington and Georgetown."

"Again, the rights of the Chesapeake and Ohio Canal Company in the lower part of the creek must be bought." Captain Rossell, in making this statement, was governed by the fact that under his plans

the closed treatment was to be carried to the river, which treatment would, of course, cut off the terminus of the Chesapeake and Ohio Canal, which is in the lower portion of Rock Creek.

In order that the next excerpts may be understood, I wish to state that in the report of 1893 it was contemplated to purchase about 4,200,000 feet of land before beginning the construction of the conduit. After the construction work and after the valley had been filled to grade a certain portion of the land purchased was to be retained for streets and the balance was to be sold; therefore Captain Rossell had not only to consider the estimated cost of buying the land, but also what he would receive for the portions of the reclaimed land to be sold. He assumed that the sale of land would not be made until after the fill had settled and formed a suitable foundation for the construction of a good class of houses.

The report of 1893 states: "What will be the condemned value of any piece of land it is impossible to say, and I only attempt to make a very rough approximation. To say what will be the selling value of the land after the improvement is also a matter of speculation, but I believe above Pennsylvania avenue that double the condemnation value is conservative."

"Though not required by the resolution, I have given the cost of this work between the different limits, so that full information on the subject might be had. It will be noticed that the largest item in each estimate is the condemnation value of the land; it is also the most uncertain one. No allowance has been made for interest on sums expended from the time of each expenditure to the time when the reclaimed land will be sold. This time will be long and will add materially to the cost."

"In closing I will only add a few words as to the advantages to the District of this work. As a means of sewage disposal it would be wrong in principle and enormously expensive. From a sanitary standpoint I can see no necessity for covering the creek at all if the sewage is kept out of it."

"This improvement, reclaiming a large body of land between Washington and Georgetown and making them one, will increase the revenues of the District of Columbia by the increased taxation and will add to the beauty of the city."

"The proposition to arch over the lower part of Rock Creek means that a dam of unusual thickness, with its top at the elevation of about 70 feet, is to be thrown across the valley of the creek, from its mouth to its intersection with Massachusetts avenue extended, thus converting the valley above the dam, to the height of the contour of 70 feet, into reservior. This reservior must be prevented from filling up with water to any marked extent by an outlet having sufficient capacity to provide a free discharge for the stream during the heaviest and most prolonged rainfall that may be expected to occur throughout the basin. With the project carried to completion, the gap between Washington and Georgetown will cease to exist, and a densely populated area will be subject to flooding and possible disaster if the dam be overtopped. The outlet once built, its discharging capacity will become practically a fixed quantity, while the ability of the basin to produce higher and higher floods at the head of the outlet will constantly increase as its surface passes from a rural toward an urban character.

"A further danger which must not be overlooked lies in the fact that a great freshet in Rock Creek may be expected to bring down large trees, portions of iron and wooden bridges, and other débris in large quantity. Unless the covered channel be made of ample dimensions its mouth would be subject to stoppage by drift of the kind described. Whether a flood in the city would follow or not would depend on the period required to fill the reservoir formed by the embankment over the covered channel, and the possibility, which is by no means apparent, of clearing away the drift within a reasonable time. The contents of the reservoir are estimated at 177,000,000 cubic feet. With water entering at the rate of 20,000 cubic feet per second, and none leaving it, the reservoir would be filled in about two hours and a half." (On account of the fact that the dam at Massachusetts avenue is considerably higher than was contemplated by Captain Rossell, it is estimated that this reservoir would require about four hours to fill under the assumptions made in his report.)

It may be stated that this report of 1893 is adverse to the using of Rock Creek for sewage purposes excepting for storm water. Since this report was made the construction of a separate system of sewers has been definitely settled, and therefore Rock Creek will never carry any sewage excepting during a short period between this writing and the completion of the separate system of sewers.

In 1902 the Massachusetts avenue culvert or bridge was built of the size recommended in the report of 1893. Since the completion of the Massachusetts avenue culvert and fill the greatest freshet has only filled the conduit or culvert to about one-third its full capacity. It is thought that the feasibility of this type of construction has been amply demonstrated by this fact. The only force of nature which might so seriously damage this culvert as to cause the filling up of the valley would be an earthquake which would separate the conduit at some point so as to dam off the entire flow. It is impossible to forecast what the damage would be should the conduit meet with such a disaster.

It is not thought that a cyclone accompanied by a heavy downpour of rain would do serious damage, although the portion of the valley above Massachusetts avenue might be flooded to a level 5 or 10 feet above the existing banks of the creek. It is thought that the amount of débris which would come down the creek would be sufficient only to retard the flow, but would not stop it.

PARK COMMISSION REPORT.

In 1906 the Park Commission, consisting of Mr. Daniel H. Burnham, Mr. Charles F. McKim, Mr. Augustus Saint Gaudens, and Mr. Frederick Law Olmstead, jr., presented a report to the Senate Committee of the District of Columbia upon the improvement of the park system of the District of Columbia, which Commission considered the improvement of Rock Creek valley both under an open-valley treatment and a conduit treatment. This Commission advocates the open-valley treatment, giving considerable collateral data and reasons for their views pertaining to the development of this section of the District of Columbia. I have to quote as follows from their report:

"Two radically different plans have been suggested as alternatives in the treatment of Rock Creek and its accompanying park way between Pennsylvania avenue and Massachusetts avenue.

"The Massachusetts avenue crossing over Rock Creek has been designed and is under construction as a culvert and fill upon the assumption that the first plan will be carried out, but although this fill will interfere with the perfect execution of the open valley plan, we feel compelled to recommend the definite adoption of the latter on grounds of economy, convenience, and beauty. We may point out, however, that the park drives and paths under the open-valley plan would be separated by grade from conflict with the commercial traffic of a busy district. The sights of the inland region between Pennsylvania avenue and Q street are for the most part merely shabby, sordid, and disagreeable. It is, therefore, a very fortunate opportunity that permits the seclusion of the park way in a valley the immediate sides of which can be controlled and can be made to limit the view to a self-contained landscape, which may be beautiful even though restricted. In so far as it was practicable, without essential injury to the park way, we have followed lines already fixed for streets on the highway plans and elsewhere have provided for new boundary streets."

"The argument for and against each of these plans (open valley and conduit) may be divided into consideration of expense and consideration of direct benefit to the community." The Park Commission, after going into the figures very carefully (see Appendix D), state as follows:

"It is evident after all due allowance is made for the imperfect data upon which comparison is based, that the first plan (the conduit plan) would, under any circumstances, be far more costly than the second plan with its open valley.

"The parkway provided under either plan would be in itself agreeable and dignified. Under the first or culvert plan there would be a broad, central roadway, flanked by four rows of trees in turf parkings, with promenades. Outside of these parkings would be wide streets for house frontage and for traffic, with the usual sidewalks and narrow parkings, and the general effect, regardless of the quality of the abutting private property, would be similar to that of many of the notable boulevards of European capitals. But it is impossible to so disregard the appearance of the surrounding and inclosing buildings, for in boulevards of this formal urban type it is the buildings that fix the character, while the trees are merely a decorative adjunct.

"The portion of Georgetown and Washington through which the line passes is now given over partly to manufacturing and partly to a poor class of residences. It is very far from agreeable in appearance, and it is hardly to be expected that it will become a first-class part of the city, because natural growth exerts no pressure in that direction. The tide of development can often be deflected by park and street improvements, but it can very seldom be reversed. A parkway, therefore, built according to the first plan would probably be lined by factories, tenement houses, and the like, on a level with the drive and separated from it only by the width of a street and four rows of tree trunks.

"Under the second or open-valley plan the broad main drive ac-

what as does the new drive through Rock Creek Park. The present valley, which has been narrowed by the constant dumping of earth over its edge, would be widened by excavation at the restricted points to a semblance of its original form and clothed with turf and trees. Along these border roads the same factories, tenements, and the like, would doubtless be built as in the other case, but with the traffic roadways from 30 to 40 feet above the park drive such occupation would not intrude itself forcibly upon the attention, even if it were not entirely cut off from view. For the driver of a spirited horse, for the wheelman, even for one strolling afoot along the parkway, the necessity for crossing a busy thoroughfare at every block, together with several electric car lines, would seriously mar the ease and comfort of a pleasure excursion, while the obstruction to business traffic by grade crossings of a thronged parkway is not to be ignored.

But there are still other points to be taken into consideration, of which the most important is perhaps that the culvert plan would add a considerable area to the building land of the city, from which in time a large income would be derived in taxes. The same argument may be raised against the withdrawal of any park land from commercial occupancy, and it is merely a question whether in this case the value of the park-like borders to the drive and its partial seclusion from disagreeable surroundings would be worth the loss in taxes. In our opinion it would be, especially when it is considered that the potential purchasers of this land are not likely to be lost to the District as taxpayers, but will simply purchase other private land, increasing its value by improvements and paying the same taxes upon it. This raises the question, too, whether it is a wise policy and in accordance with our principles of government for the public authorities to go into the real estate business in competition with the citizens. If the Government is not to go heavily into real estate speculation in competition with the landowners of the District, the cost of the culvert project becomes so enormous as to be utterly out of the question.

EXISTING CONDITIONS WITH REFERENCE TO THE TWO PROPOSED TREATMENTS.

Beginning at the north end of the project we have Massachusetts avenue culvert crossing the valley at an elevation of about 85 feet above the water level. This avenue between the valley banks has a width of 80 feet, including the sidewalks. At the grade of the creek the fill is pierced by a culvert 50 feet wide and 220 feet long. On the right bank of the creek, beginning at Masachusetts avenue and extending down the creek to Lovers Lane branch, a distance of 700 feet, is a beautiful hill rising to an elevation of 165 feet above the creek. This hill is partly covered with grass, shrubs, and large trees. The Lovers Lane valley is a beautiful woodland offering one of the most picturesque spots within our reach. The portion of this valley included between Rock Creek and Lovers Lane must be given careful consideration, whatever type of treatment is finally decided upon. If the open-valley treatment of Rock Creek is selected, then this section of the Lovers Lane valley must become part of that park. If the Rock Creek valley is to be filled, then this portion of the Lovers

Lane valley must also be filled at that time. The right bank of this portion of the Lovers Lane valley, extending to U street, is known as the Montross property and has already been considered as a desirable park by the public and by the Commissioners. The right bank of Rock Creek, extending from Lovers Lane valley to Q street, is covered by Oak Hill Cemetery and Mount Zion Cemetery. The total frontage of these two cemeteries on Rock Creek is 1,800 feet. It will be well at this point of the report to call your attention to the fact that these two cemeteries form a formidable barrier, greater, as a matter of fact, than any physical barrier that separates the city of Washington from Georgetown. The left bank of Rock Creek, beginning at Massachusetts avenue, is practically unimproved as far as Q street, with the exception that between Decatur place and L street, fronting on Massachusetts avenue, there are 12 expensive houses. The upper portion of the bank at the level of Massachusetts avenue consists of a gradually increasing fill of excellent material, excepting in the lower portion, from Q street to P street, where the fill has already been carried out as far as the water of Rock Creek. In general, this upper valley presents an attractive landscape with meadows and wooded areas.

In the upper portion of the valley, near the Massachusetts avenue fill, is located the Rock Creek shaft pumping station of the Washington Aqueduct. This plant must be given careful consideration whatever plan is decided upon.

Beginning at a point on Massachusetts avenue near Decatur Place and extending to L street we have the 12 expensive houses mentioned above. The backs of these houses are toward the Rock Creek valley, but the houses are of an excellent type, and therefore the back view will not be particularly unattractive.

Lyons mill, a historic landmark of rustic beauty, with its fine sycamores, is a treasure in the memory of many of the citizens of Washington who, in their youth, have enjoyed the generous hospitality of the Lyons family, and should not be removed, at least under the open treatment.

At P street on the right bank is located the expensive car barn of the Washington Railway and Electric Company. This large plant, consisting of a series of buildings, is a barrier to the successful development of Rock Creek under either plan. Fortunately, however, it appears that the railroad company may find it advantageous to abandon this site for one of less monetary value and better situated for the uses of the company. The lay-out of the streets in this section should be such as to best develop this site for residential purposes, so as to make it advantageous to the company to abandon this site. However, the plans should be made so elastic that, if the company does not abandon this plant, the property in the immediate vicinity may be developed on the general approved lines without the necessity of purchasing this plant at an unreasonable figure.

Under the conduit plan for the extension of Q street it will be necessary to take all of the small houses in square 1287, although there will be a small park area left after these houses are taken. Under the park plan for the extension of Q street it will be necessary to take those houses on the north side of Q street and east of Mill street in square 1287. At present we have no continuous streets between Massachusetts avenue and P street, and in this section there

is only one street (Mill street) connecting the creek level with the high level streets. Under both plans it will be necessary to remove the large brick house which lies in Q street at its intersection with Twenty-seventh street extended.

Continuing down the creek on the right bank, we first encounter a row of small houses at the old grade of P street, or old Paper Mill road, whose eventual demolition can not be prevented under either of the proposed plans. Higher up on the right bank, south of P street and extending to North street (all of square 1263), we find a group of 38 small houses, which, under the park plan, it will be necessary to take. Under the conduit plan it will be necessary to take about half of this group, and also all of the small houses on the north side of P street, just west of the car barn.

On the right bank, after the group of houses on the south side of P street, between Rock Creek and North street, are passed, we have an ash and refuse bank, 1,800 feet in length, extending to the M Street Bridge. Under either project this bank must be carefully excavated. It would not be practicable to build an ordinary class of houses upon such an unstable foundation. Under the open-valley plan it will be necessary, of course, to excavate this portion of the valley to a greater width, so as to permit of the building of the necessary roads and paths. Under the latter plan about 20 houses within this area would have to be purchased. Under the conduit plan there would be only 1 house, or rather a shed, that would have to be purchased.

On the left bank and on the south side of P street there is located a large structure, which has been a riding academy, market, storage house, and is now an automobile garage. The foundations of this huge structure, under the tunnel plan, must be reinforced. Under the park plan it would be necessary to acquire and demolish a strip of this building on its west face and extending along its entire length.

Continuing down the left bank of Rock Creek we find that it will be necessary to take only 1 house, or rather shed, under the conduit plan. Under the open-valley plan we have to purchase a few small brick buildings just south of O street, also 2 brick houses facing on Twenty-third street and 7 small apartment houses facing on Twenty-fourth street. After this group of houses is passed there still remains only the shed referred to above as purchased under the conduit plan. Under the conduit plan, between M street and Pennsylvania avenue, we find it necessary to purchase only part of the Rock Creek Auto and Carriage Works, in addition, of course, to the unimproved land needed. In the case of the open-valley plan it will be necessary to purchase the very expensive square known as "west 14," also the Lawton factory on the right bank of the creek. Under the conduit plan, however, it will only be necessary to reenforce the foundation walls of the Lawton factory.

Upon square west 14 referred to we find 12 brick structures and 4 frame ones. The Lawton factory referred to is a very large brick structure, covering something over 7,000 feet of ground.

Below Pennsylvania avenue on the right bank is square 1194, a portion of which is a Government reservation, and which is now used for the Washington Aqueduct office. Under both plans it is desirable to take the balance of this square, which, in addition to the Government buildings, has only one other building, a large brick shed. On the left bank of Rock Creek, under the open-valley plan, we will

take 1 brick building in addition to the necessary ground, whereas under the conduit plan it will not be necessary to include any buildings at all.

Below L street both the open-valley treatment and the conduit treatment merge into the same plan, which consists of a park-way viaduct paralleling the creek and the river and connecting at its other terminus with Potomac Park. On either side of Rock Creek, between L street and the river, within the desired right of way, we find about 25 inexpensive frame structures, used mostly for business purposes. The country here is, as a rule, flat and uninteresting, but it is thought that when improved as a park it would be very interesting and the cost of improvement would be small. At L street the Chesapeake and Ohio Canal enters the creek, and under any plan this fact must be given due consideration. At H street the creek flows over a dam into the river. From H street south to Potomac Park, a viaduct will parallel the river, under our new plan, over ground which is believed to belong to the United States, but which is now occupied, with the consent of the Government, by commercial plants. There is one exception, however, between G and H streets, where there is a small strip of the Washington Gas Light Company's plant, which it will be necessary to take, in order to carry out the existing plans for this section. It is thought, however, that this taking will not materially interfere with the plant of the Washington Gas Light Company. The view from this viaduct, between Potomac Park and I street, will be a very interesting one. The river industries will afford much pleasure to the public using the elevated park-way.

In the estimate of the third section, between L street and Potomac Park, we have assumed that all of squares 1193, 1171, and 1172 will be purchased and improved eventually for park purposes. Of course, as long as the Chesapeake and Ohio Canal is in operation, these squares will be used in part for commerce and storage incidental thereto.

The following existing widths of valley will be of interest in considering the development of the two projects. All of these widths are measured at right angles to the thread of the valley. At Massachusetts avenue, at the grade of the avenue, the valley has a width of 700 feet; at the north end of Oak Hill Cemetery, at the grade of Masachusetts avenue, 800 feet; at the south end of Oak Hill Cemetery, at the grade of Massachusetts avenue, 900 feet; at Q street, 330 feet. The minimum width at the bottom of the slope at this point is 45 feet. At P street the maximum width at the top is 600 feet, and at the bottom the minimum width is 90 feet. At Twenty-fourth street on the line of Twenty-fourth street and at the grade of same, the width is 500 feet. At N street the maximum width at the top is 210 feet, and the maximum width at the bottom is 55 feet. At M street the maximum width at the top is 230 feet, and the minimum width at the bottom is 80 feet.

The following land within the limits of the projected improvements is now vested in the United States. This land amounts to about 8 acres:

Rock Creek shaft pumping station, Washington Aqueduct.

Washington Aqueduct office.

Potomac River frontage.

Good foundations can be obtained throughout the entire project sufficiently strong for carrying the necessary conduit and bridges. Above P street it is thought that the foundations may be economically carried to rock. Below P street the foundation will be carried on piles driven about 30 feet into sand. Along the river the foundations will be in part on piles and in part on rock.

There are no parks in the immediate vicinity, excepting small ones such as Sheridan and Dupont circles. There are no parks in Georgetown.

The buildings in the immediate vicinity of the project and above P street are sightly, although their backs are toward the creek. Below P street the surrounding buildings are all unsightly, and the present ash banks present a particularly undesirable landscape. Photograph No. 1 shows the attractive valley from Q street looking north. The top of the level right bank is at the grade of Massachusetts avenue, and the encroaching fill is indicated in this part of the photograph by the trees which are being forced by the fill toward the creek. Photograph No. 2 shows the old Lyons Mill, and in the rear shows the grade of Massachusetts avenue. The houses in the extreme right of the photograph, also the one in the extreme left of the photograph, are facing on Massachusetts avenue. You will note in this photograph that the fill at the grade of Massachusetts avenue is encroaching upon the valley to a slight extent, as indicated by the condition of the trees. Photograph No. 3 shows the deplorable ash banks south of P street. This is a most unsightly section, between P street and M street, which we have to deal with. Photograph No. 4 shows the ash bank on the left bank of Rock Creek, about at the line of O street, and shows the fine possibilities we have of treating this valley. Photograph No. 5 shows the same portion of the valley, taken from the other side. Photograph No. 6 shows the ash banks between P street and M street in their most unattractive portion.

It has been proposed to purchase the entire Montrose tract for park purposes. This, of course, should not be done if the open-valley plan is carried out, because under this plan Georgetown and the adjacent portion of Washington would have an ample park for all purposes. Under the open-valley plan, however, it is most desirable to purchase the low level ground of the Montrose tract, as it can not logically be developed for any other purpose.

If, however, the valley is developed by conduit, with only a 160-foot boulevard over it, then it would be quite desirable to purchase the entire Montrose tract in order to give the citizens of Georgetown a suitable park. However, if conduit plan No. 2 were adopted, a 400-foot level park boulevard would be constructed between Massachusetts avenue and Pennsylvania avenue, and this park boulevard would afford all the park area necessary, and under this plan the purchase of the high level ground of Montrose tract would not be necessary.

Under the park plan the upper portion of this tract would afford most excellent building sites and its value would at least be doubled. It seems a poor policy to purchase high ground at high cost when there is plenty of low ground which would answer the purpose and which can now be purchased at a low cost.

It has further been proposed to purchase the entire Thompson tract.. This tract will afford a most excellent park, but it lies out-

side the immediate scope of this inquiry, being one of the collateral valleys in the Rock Creek basin, beside which fact it is north of Massachusetts avenue.

The improvement of Rock Creek between Massachusetts avenue and L street is a thing that must be done at once in justice to the abutters and because any further delay will greatly increase the cost of the work and seriously curtail an efficient solution of the problem.

Before taking up the general consideration of the two methods of treatment it might be well to call your attention to the fact that conduit project may not be extended further south than L street because of the riparian rights of the Chesapeake and Ohio Canal Company, which canal is a material factor in the commercial development of Washington. In addition to this the roof of the conduit would be above the grade of the adjacent streets, involving an expense without commensurate return. At K street the top of the conduit would be 17 feet above the grade of the surrounding streets. The necessary expenditure to eliminate the canal below Pennsylvania avenue, giving an outlet west of Rock Creek, would be so enormous as to be unworthy of consideration. This section of the city is not desirable for residential purposes and the business interests would not be benefited by this unnecessary change in grade.

In the plans of Mr. Samuel Parsons, of New York, made under the direction of the Secretary of War and approved by the Secretary of War, a parkway between the Potomac and Zoological parks was provided for by acquiring all the land between Twenty-second and Twenty-fourth streets and extending from the old Naval Observatory to Massachusetts avenue. At N street his plan widened out very rapidly and at P street his taking line extended only a few hundred feet from Wisconsin avenue.

A parkway between the two parks is almost mandatory, and its precise location must be determined on the grounds of economy and practicability. As will be presented later in this report, I have to state that the most practical and economical park connection will be over the land to be reclaimed in the improvement of Rock Creek, whether at high level under the conduit plan or at low level under the park plan. Therefore in considering the several plans reported upon herein we must consider each of these plans, not only for the obliteration of the unsightly conditions, but also for the making of a park connection between our two main parks. Again, it is not only necessary to consider the alleviation of the existing conditions in so far as the abutters are concerned, but also which plan is better for the general improvement of the city. After a careful consideration I am of the opinion that if the conduit plan were carried out a boulevard having a width of about 400 feet should be provided as a park connection, as a park for Georgetown and the adjacent portion of Washington, and as a general improvement for the city. However, a high-level boulevard of this type would be much less beautiful than the open valley, and very much more expensive. If a high-level boulevard were provided it would not be practicable to carry the north and south streets through the boulevard because of the unsightly patchy lay out which would result.

It may be well here to call your attention to the fact that only main east and west streets can ever be carried across the Zoological

either side of these expensive parks. The great cost of carrying lines of communication across this park area will in itself prevent any large number of cross streets. To carry the streets at grade would be most undesirable, because heavy commercial travel would interfere with the park travel and, conversely, the park travel would interfere with the commercial travel. Further, many high-level cross streets would not only be impracticable because of the great cost of necessary bridges as well as the enormous cost of grading, but in addition to this the high-level drives would materially detract from the park effects.

OPEN-VALLEY PLAN.

For the details of this plan see sheets 2 to 6, inclusive. We have considered this plan in three sections. First, from Massachusetts avenue to P street; second, from P street to L street, and, third, from L street to Potomac Park.

It is proposed to have a main road extending from Massachusetts avenue to the river and a main path extending the same distance, in a general way parallel to the main road. Where it is practical additional driveways and paths are provided, and the entire area is developed as a city park with the exception of section three, which is developed only as a parkway or park connection. The development of the banks of Rock Creek Valley between Massachusetts avenue and L street should be as an informal city park, because eventually the entire area will be in the heart of the city and therefore will be accessible to a large percentage of our population.

Section one could easily be developed into a very beautiful park, having a maximum width of 600 feet and a minimum width of 400 feet at Q street. For all practical purposes, as far as park effects are concerned, we will make the total width include the Oak Hill Cemetery, in which case the total width would be 1,200 feet. At Massachusetts avenue the main drive will be carried through the fill in a tunnel having a width of 35 feet and a height of 24 feet. A single arch is recommended for this tunnel, rather than two small arches, because the natural lighting and ventilation of this tunnel is considered of greater import than the small saving which would result by using a twin tunnel. The tunnel should be constructed of a light-colored concrete faced with a white cement, so that it would not have to be lighted excepting after twilight. One roadway and one main path will pass through the tunnel, and a second path will be carried on steel brackets at an elevation of about 20 feet through the existing water-course tunnel or culvert. The level of the roadway of the tunnel is placed at 38 feet. It is thought that it will never be flooded excepting in the case of a flood very much greater than the so-called Johnstown flood of 1889.

The upper level road on the left bank of the creek, which may be used as a bridle path, rises to the grade of Massachusetts avenue almost at the intersection of this avenue with Waterside drive. This is so arranged that anyone using this high-level drive may continue along Rock Creek on the high-level road after Massachusetts avenue is crossed. Furthermore, the upper portion of this high-level driveway may be used temporarily as a connection across Massachusetts avenue until such time as it may be necessary to construct the tunnel

hereinbefore described. By this high-level driveway a park connection is provided with Massachusetts avenue on the east side of Rock Creek. A similar connection would be made at some future time on the west side of Rock Creek.

Before leaving this section of the improvement I wish to call your attention again to the Rock Creek valley between Massachusetts avenue and Connecticut avenue. This valley is a particularly beautiful one and must eventually be developed for park purposes. In fact there seems to be no other solution of the problem, because it would cost too much to carry the water in conduit and fill the valley to such a great width and to be level with the surrounding streets. Therefore is is assumed that this portion of Rock Creek valley will unquestionably be developed as a park and sheet No. 13 indicates, in a general way, what the development of this section should be. While not required under the act to give an estimate for this work, it has been appended with the other estimates.

In the upper part of section 1 a park entrance is made through Lovers Lane and Lovers Lane valley. In addition to this, at some future date it will be practicable to get a very good entrance with easy grades through the extension of T street to Wisconsin avenue. The connection of Rock Creek drive with T street will also make an excellent connection between Georgetown and Washington.

Starting from Massachusetts avenue, the main low-level drive is on the east side of the creek and parallels it in a general way until it reaches Lyons mill, at which point it crosses on a masonry bridge, and from there on it continues down Rock Creek on the right bank until just below Pennsylvania avenue, where it recrosses the creek on a second low-level bridge. From there on this low-level drive continues along the left bank of Rock Creek until it reaches a point where the creek runs into the river, and from there on this roadway and low-main path parallel the left bank of the river until they reach Potomac Park. As stated before, this lower roadway and its accompanying path from L street south is carried upon a concrete steel viaduct at an elevation of about 20 feet above the existing ground. The bridge at Lyons mill should have a face of gneiss ashlar, and the superstructure should be of brick to comport in general with the old Lyons mill, which historic structure should be maintained. This low-level Lyons mill bridge is to be built on a heavy skew, so as to offer the best transition possible between the main low level on the left bank and the continuation of the same road on the right bank. The old mill road is too steep for a connection, and therefore it has been subordinated in this plan.

The main low-level road branches out into a second road about 250 feet south of Massachusetts avenue. This latter road crosses the creek upon a one-span concrete bridge and continues approximately parallel to the creek, passing through Oak Hill Cemetery at an elevation of about 15 feet above the creek bed. Where this road crosses the Lovers' Lane branch there will be a rustic bridge having a length of about 130 feet. The taking of land for the low-level road which passes through Oak Hill Cemetery will not interfere with the operation of the cemetery, as the ground taken is at low grade. Neither will it interfere with any existing graves. The taking line for this road is placed at some distance from the neat line of the road, so that in the future there will be no encroachment upon this road by any

operations in the cemetery. A path parallels this road, winding in and out among the trees, and a vine-covered concrete wall will be built along the taking line so as to protect the cemetery and further to screen the view of the cemetery from those using this low-level roadway. When this is done, this road and path will be among the most attractive ones within the park area. Just before the Lovers Lane rustic bridge is reached, the main road on the right bank branches into a second road, which passes up Lovers Lane Valley, connecting with Lovers Lane and also T street, as hereinbefore mentioned, in a general way. Both the T street and Lovers Lane connections are excellent ones, although Lovers Lane will have a maximum grade of about 10 per cent, which is 2½ per cent less than the existing grade of the lane. T street, however, will connect with Wisconsin avenue at easy grades.

For a number of years there has been more or less talk of the purchase of the entire Montrose tract for the purpose of affording Georgetown with a park. As stated hereinbefore, if Rock Creek Valley is developed on the lines laid down in this report, the purchase of the high ground of the Montrose property would manifestly be unnecessary. Therefore we have located a curved street which limits the high ground of this estate and which street will afford most excellent building sites, which will not, in any sense, detract from our general park plans. The treatment of the balance of the Montrose tract with the proper footpaths is clearly indicated on sheet No. 2.

The upper road on the east side of Rock Creek, which was previously referred to as intersecting Massachusetts avenue at Waterside drive, parallels in a general way the existing creek at an elevation of about 45 feet above it. Its lowest level will be just back of Lyons mill, where it connects, by a back-switch road, with the main low-level driveway. From this point the upper-level roadway should rise until it reaches Q street at the grade of the high-level boundary streets. Thus at Q street we will have a park entrance to the low-level driveways.

A bridge is proposed between Massachusetts avenue and S street in Washington and Twenty-eighth and R streets in Georgetown. The plans and elevation of this bridge are shown on sheets No. 2 and No. 4. The bridge proposed for this location is a steel arch with piers of concrete. This connection is regarded as a very important one. It will, however, be necessary in order to build this bridge to remove about 250 graves. It is hoped that this will be effected at an early date, while there is yet time for reinterment in Oak Hill Cemetery. It appears that this bridge should not be built if opposed by the people of Georgetown, who have relatives buried in Oak Hill Cemetery. The construction of this bridge would be manifestly a benefit to Georgetown and almost solely to Georgetown, and if they do not desire the building of this structure it should be omitted from the plans.

In locating the taking lines for this open-valley plan (see sheets 2 and 3) they were made to cover all the low ground and the side slopes between high and low ground. Between the Massachusetts avenue culvert and S street, on the left side of the valley, careful consideration was given to the practicability of not taking the land between Waterside drive and the alley which parallels Massachusetts avenue. While this land is not very expensive, it seems not de-

sirable to take more ground than was absolutely necessary. It appeared at first that it might be better to have the houses between R street and the Massachusetts avenue culvert face the park, which would have been the case if Waterside drive were raised to the grade of Massachusetts avenue. However, after a careful consideration of this matter it was decided that if this drive were raised, the filling would present a very unsightly condition for many years, and it is believed that the class of houses which will be built along Massachusetts avenue will not have unsightly backs, and if the builders of new houses be advised that a park will unquestionably be placed as recommended in this report, it is thought that they will take care to make the backs of their houses presentable. Again, it is believed that if Waterside drive were raised to the grade of Massachusetts avenue the class of houses that would be built on this new fill would be very unsightly, and of course very much closer than the backs of the houses on Massachusetts avenue.

The lay out of paths in the entire project will not be described, except to say that 6 per cent has been regarded as the maximum for main paths. Where this grade would have been exceeded on minor paths, steps have been introduced at intervals to keep the maximum grade at 6 per cent. It may also be interesting to state here that none of the roadway grades exceed 6 per cent, excepting the old Mill road and Lovers lane. The paths have been so located, in so far as it was found practicable, so that one path will not be seen from another, neither will one road be seen from another, nor will a path be seen from a road. Where steep slopes are necessary, it is not intended that the slopes shall be laid out with mathematical precision, but hills and hollows will be formed so as to present a natural and pleasing appearance. Upon boundary streets, on the park side of the sidewalks, a steel railing will be provided with stone posts at intervals of 10 or 12 feet. The reason this open railing has been selected rather than a stone parapet was that people using the upper level driveways and sidewalks will be able to see into the park.

It is provided under this plan that the Washington Aqueduct pumping plant will be maintained in its present position, and provision is made for the hauling of material to this plant along easy grades. A direct path is also provided between the pumping plant and Massachusetts avenue.

The lowest elevation of all roads and paths is 15 feet and the ruling elevation is 20 feet. These elevations were decided upon after a careful consideration of freshet records.

The creek has been confined within retaining walls wherever scour is probable. In estimating the cost of the wall a pile foundation was assumed in the lower portion of the project and a spread footing in the upper. In the design of other retaining walls necessary for the construction of roads and paths due consideration was given to the cost of all foundations. The river or sea wall is regarded as founded on rock.

Where fences are necessary in the park, a rustic concrete or stone parapet has been figured upon. Approximate designs of all bridges were made so as to get an accurate basis of estimate. All bridges were designed to carry a uniform load of 125 pounds per square foot. A concentrated wagon load of 30 tons on four wheels, 10 feet centers

between axles, or a concentrated load of a 70-ton car on two trucks, distance between trucks being assumed at 40 feet.

From Q street down to Pennsylvania avenue there are two high-level boundary streets which are so located that all of the houses in this section of the project will face the park. The difference in level between the streets on the opposite sides of the park is small, as a rule, have a difference of elevation of about 5 feet with a maximum difference of 10 feet.

As stated before, we have in this portion of the park a main low-level driveway and two main low-level walks which approximately parallel the creek. Near the intersection of P street with North street we have a park connection between P street and the low-level park road. On the other side of the valley we have a similar connection between the prolongation of Twenty-fifth street near its intersection with N street. This entrance to the park crosses over a concrete bridge and connects with the main low-level park drive. The valley in this section is widened to a minimum width between building lines of 500 feet.

The two high-level streets referred to will have roadways 30 feet in width and two sidewalks, the one next to the park having a width of 10 feet and the one on the opposite side having a width of 7 feet. On the building side of the street there will also be a narrow parking and a narrow tree space. The sidewalks on the park side will be shaded by trees, planted on the park side of the railing. Numerous observation bays will be provided in this section, and at nearly all street intersections there will be paths leading down into the valley.

As the result of the confluence of streets, there will be five small triangular parks at the high level and in addition to this there will be a small triangular park near the intersection of P street with North street. As shown on sheet No. 2, the old quarry south of O street and between Twenty-third and Twenty-fourth streets will be uncovered.

Main thoroughfares connecting Washington and Georgetown are provided in this section. Q street, P street, N street, M street, and Pennsylvania avenue are carried across the creek. The only cross street of any value which is made noncontinuous, is O street, but this street is noncontinuous at several other points in the city of Washington. However, the necessary detour on account of this lack of continuity is very small. If, at any future time it was deemed desirable, O street, Georgetown, might be connected with the curved park street on the east bank, which takes the place of O street. If at any time it were deemed advantageous and desirable to extend Olive street across the creek, this of course might be done at a comparatively small expense. This, however, seems highly improbable at this time.

North and south streets are not carried across the valley because the travel along these streets is light and the necessary detour under the park plan is small and the benefits which would derive from the continuity of these streets would not be commensurate with the necessary cost. In addition to the triangular high level parks described, there will be a small high-level park in square 35, which might be used advantageously for a playground. It is thought that the portion of the park between N and P streets could be developed as the most beautiful urban park in the world. The opportunities for attractive development are great. A street on the west

side of Rock Creek is shown connecting P street with Q street. It is believed that the car barn has almost reached the end of its usefulness and that the railroad company would welcome the lay out of streets which would develop this property best for residential purposes. This street, however, is regarded as desirable rather than mandatory.

As stated hereinbefore a small portion of the low ground of Oak Hill Cemetery will be taken as a road. In extending this road below Lyons mill it will be necessary to take a small portion of the low, level ground of the Mount Zion Cemetery. There are no graves in this section of the cemetery. A triangular space, included between Q street, Rock Creek, and Mount Zion Cemetery is shown as taken, and it will be used for park purposes. Q street is widened on the Georgetown side and a curved connection with Q street is suggested for East place, so that that street will not have a blind end.

It is also suggested, but is not deemed essential to the park plans, to extend Cambridge street to Twenty-eighth street, thence by curved street to Q street. The construction of this street would develop considerable residential property. The extension of Twenty-seventh street to meet the curved street is also suggested. The construction of a street west of the car barn, connecting P street with Q street, is suggested, but not included in the estimates of this report.

It may be well here to call attention to the ash and street-sweeping dump which lies almost in the extension of O street and between Twenty-third and Twenty-fifth streets. This bank is constantly sloughing into the creek during heavy rains and it is thought it would be totally impracticable to develop this section of Rock Creek for park purposes without taking out nearly all of this undesirable refuse.

The narrowest portion of the park in this section, in fact in the entire park between Massachusetts avenue and Pennsylvania avenue, is nearly as wide between parapet walls as Lafayette Park. You will notice that below Q street on the high-level street sections, that practically none of the houses will face the park excepting those on the north side of P street between the end of the P Street Bridge and North street. The garage at Twenty-second and P streets and a few small houses on Twenty-seventh street will unquestionably disappear when this work of reclamation is executed.

The expensive property which must be taken between M street and Pennsylvania avenue has been referred to before in this report. This will be clearly seen by examining sheets 1 and 2, which show the area taken and the necessity for same.

The existing P street bridge is in fair condition and would last, under ordinary conditions, about twenty years. The existing M street bridge is also in fair condition and will last about the same number of years. The Pennsylvania avenue bridge is in fair condition, but is too weak to carry heavy travel. The War Department has deemed it necessary, on account of its weakness, to require that all horses crossing this bridge should be kept at a walk. Further, this bridge is too narrow, and on account of its narrowness and weakness, it is necessary for the cars on Pennsylvania avenue to make an unsightly and dangerous detour in order to get to Georgetown. This bridge should be rebuilt at an early date to accommodate existing travel, and the street cars should cross this new bridge instead of M

street. All of the three bridges mentioned have wooden floors, and it is thought that they are of such permanent type that asphalt floors should never be placed upon them.

K street bridge has just been rebuilt and need not be replaced.

The only street connection between Georgetown and the city proper below L street (this portion of the project is known as section 3) is at K street. At present there is no reason for carrying any other street across the creek in this section of the work, nor is it thought that additional cross streets will ever be needed. Only the low park road and one parallel path is extended into this lower section. This road and path cross the creek just above the Chesapeake and Ohio Canal, and from this point to Potomac Park the road and path (or sidewalk) is carried on a concrete steel viaduct about a half mile in length. The low-level bridge at the Chesapeake and Ohio Canal will be at about the same level as L street, at such grade so that canal craft using this portion of the creek will not be interfered with.

The object of carrying the road and sidewalk on a viaduct in this section was so as not to interfere with commerce and yet have the road and path near the water's edge, where a fine view may be had of the river, the shore of Virginia, and the immediate shipping. Such connections from this viaduct to the street system may be made from time to time as may be necessary.

The viaduct will cross K street at an elevation of 20 feet above the present grade of the street. From L street to G street it is intended to purchase all of the ground from the east line of the viaduct to the west line of Rock Creek and also squares 1171, 1172, and 1193 and develop this ground partly for park purposes and partly for commercial purposes. The viaduct will cross the Chesapeake and Ohio Canal, or Rock Creek, on a steel bridge at the bend of the creek, just before the creek empties into the river. This is not really a crossing of the creek, but really a crossing of the bend of the creek.

From the mouth of Rock Creek to Potomac Park it is intended to build a new sea wall. It is assumed that the average depth of this sea wall will be below mean low tide 25 feet, and the top of the wall above mean low tide 9 feet. It is assumed that the foundations of this wall will be on rock, and at the foundation the wall will have a width of 18 feet.

It is believed that all of the existing land lying west of the east building line of Twenty-seventh street belongs to the United States, and it is recommended that the Department of Justice be requested to determine as to the ownership so that possession may be taken, if the land is owned by the United States. It is intended, under the existing plan, that this land be developed on its present commercial lines. The location of the concrete steel viaduct has been given careful consideration, and the location has been made so as to interfere as little as possible with the maintenance and operation of existing plants. It is further recommended that all of squares 1171, 1172, and 1193 be purchased at such time as the viaduct is constructed and this ground be developed on definite commercial and park lines so as to present an attractive view when seen from the viaduct. The view from the viaduct will be a very interesting one, and the park effect will be found more beautiful in this section than the upper section because of the view of the river and the shore and hills of

Virginia. The viaduct has been so located as not to interfere materially with the operation of the Washington Gaslight Company's plant.

The quay along the river front will have a minimum width of 150 feet, including that portion of the quay beneath the viaduct, which may be used for storage purposes. In the estimates it is assumed that the whole quay is paved with granite block and also that all intersecting streets are made to connect with the quay at grade. These connections are included in the estimates.

It is recommended that the improvement of Rock Creek, from Massachusetts avenue to L street, be executed as early as possible, as the existing conditions are unsightly, insanitary, retard the proper development of the abutting sections, and are a reflection upon the entire city of Washington. The improvement of the lower section need not be executed until there is an actual demand for a park connection between the Zoological and Potomac parks. Delay in carrying out this lower project will not add anything to its cost, whereas delay in the upper section will not only add materially to the final cost, but such delay will materially interfere with the proper execution of the plans. The improvement of the section between L street and Pennsylvania avenue can not be effectively executed piecemeal. The money should be appropriated to purchase all the land necessary, and the work should then proceed systematically for the attainment of the completed project. A cursory study of the building construction in the vicinity of the proposed park will show at once the necessity for fixing, as soon as possible, the final location of the streets in this vicinity.

SEMICONDUIT.

In this design the open-valley treatment is carried from Massachusetts avenue to O street. In this upper section the open valley and the semiconduit are practically identical. Under the semiconduit plan the section from O street to L street is developed by conduit and fill. From L street to Potomac Park the treatment is exactly the same as for the open valley.

The idea of working up the semiconduit project was to determine whether or not the conduit or open-valley treatment from O street to Pennsylvania avenue would be the more economical or otherwise a desirable one. In the design submitted herewith the conduit is built upon the existing bed of the creek. All of the poor class of bank filling (about 200,000 cubic yards) in the adjacent banks must be removed because it will not make suitable foundation material for first-class houses. East, west, north, and south streets are made continuous between O street and Pennsylvania avenue. The grades are so worked out that in case the conduit should become stopped up the water would be confined, practically, to the new boulevard street which is provided. This boulevard would have two roadways and would be directly over the conduit extending from Pennsylvania avenue to O street. At O street one roadway connects with the low level, and the other continues to P street, making a through connection. The cost of this semiconduit plan over the open valley is about $340,000. It offers some small advantages, in having the continuity of one north and south street, also one east and west street, which are noncontinuous in the open-valley plan, but as an improvement

to the abutting section it is almost useless. The conditions that exist to-day will be the conditions that will exist for an indefinite time if this plan be adopted. It not only offers no advantage to the abutters, but none to the entire city, nor does it give a park connection worthy of the name.

FULL CONDUIT PLAN NO. 1.

Under the full-conduit plan, sheet No. 9, the conduit will start at the present Massachusetts avenue culvert, which supports the existing fill of that avenue, and from this point it will follow down the creek in a general way until Lyons mill is reached. At this point it turns rather abruptly to the right, crosses the creek, and passes in tunnel under the camel back or ridge which extends from Q street to P street. After it pierces this small ridge it continues down the bed of the creek until L street is reached. This is the terminus of the semiconduit plan. From L street down to Potomac Park the treatment will be identical with that of the open-valley and semiconduit plan.

The foundations of the conduit are carried to rock in the upper section, extending almost to O street, whereas below this street the structure will be supported on piles driven into sand. The conduit should be constructed of concrete, reenforced with steel. A cunette should be provided in the bottom to carry the dry-weather flow. The cunette, the bottom of the conduit, and the sides up to 6 or 7 feet above the bottom, should be paved with vitrified block laid in cement.

Following the conduit there will be a boulevard 160 feet in width. The center line of the conduit and street do not agree throughout the entire course, but everywhere the conduit lies within the building lines of this boulevard, excepting near Massachusetts avenue, where the center line of the conduit passes under an area reserved for park purposes. It is thought advisable to have this conduit located within the street lines, so that repairs can be made without injury to the abutting property. In this plan, north, south, east, and west streets are carried across the creek, excepting above Q street, where two cemeteries interfere with the continuity of the streets. R street, Georgetown, however, connects with Q street by slight detour, and T street is made continuous across the creek. The grades have been so studied that should the conduit become stopped up in any way the overflow would be confined to the boulevard described hereinbefore. Above Sheridan circle the boulevard parallels Massachusetts avenue, and the houses on the west side of the street will be built with their backs toward the cemetery. Only eighty graves are interfered with in the extension of this boulevard through Oak Hill Cemetery, and a less number will be disturbed in Mount Zion Cemetery. A small park is provided between the boulevard, T street, and Massachusetts avenue. The land at this point is cheap, the fill is heavy, and it was found more economical not to fill the land, but to develop it as a park. As no other park is provided for Georgetown under this plan, it is highly desirable that the Montrose tract should be purchased and developed as a park. This estimate has not been included in the general estimates submitted herewith, but it would be well to consider the necessity for a park in considering this plan.

The advantages of the open-valley plan over the full conduit have been stated in my letter to Captain Markham and need not be repeated here. In the estimates it is assumed that the valley (in the full conduit plans) will be filled immediately upon the construction of the conduit or construction of part of the conduit. The valley never can be filled by cellar excavations and ashes, as has been assumed for many years. The material taken from the tunnel section of the conduit will only give about 2.8 per cent of the fill necessary. The excavations from the tunnel would be just about enough to fill up the bed of the creek from one end to the other, but it would not noticeably add toward the filling of the valley. Below O street it has been assumed in the estimates that it will be necessary to excavate about 200,000 cubic yards of poor material which has been dumped along the creek from time to time. This material consists of ashes and other refuse, which is not fit to build upon. In this report it is assumed that the fill will be brought from Virginia, as there is not sufficient fill to waste in the hills immediately adjacent to the creek. If the Thompson tract is sold to the United States and developed for park purposes, a considerable amount of the fill can be gotten west of Rock Creek, because this tract of land referred to comprises an enormous low area, which was considered in figuring the cuts and fills under approved highway grades. In the estimates will be found a statement of the cost of raising the Washington Aqueduct house and appurtenances to grade.

It is thought desirable, but not mandatory, to carry Twenty-fourth street through to Q street in a location of about 150 feet west of the present location of Twenty-fourth street. Unfortunately this street would pass through the expensive property of the Washington Railway and Electric Company, therefore between P and Q streets it may be necessary to abandon the idea of the Twenty-fourth street extension.

Under the plans, such streets as have asphalt on either side of the creek, are connected with an asphalt roadway under the new plans. The balance of the streets will have first-class macadam roadways with cobble gutters and curbing. Cement sidewalks are provided throughout.

In order not to have unsightly conditions between the completion of the fill and the time when the property is sold, 6 inches of top soil is provided and the area is sown with grass seed, which is to be cut to present a pleasing appearance. Trees are also assumed as being planted along new streets. The extensions of storm sewers to connect with the conduit and the construction of the west side interceptor are included in the estimates.

FULL CONDUIT PLAN NO. 2.

In the second project it is contemplated that the conduit would be located as in conduit plan No. 1. The second conduit plan differs from the first in that it has a 400-foot boulevard between Pennsylvania avenue and Massachusetts avenue. This park, or parkway, has two flanking or boundary streets and a park drive, bridle path, and pedestrian paths on either side of the main park drive. On either side of these roads and paths and between the flanking streets will be a

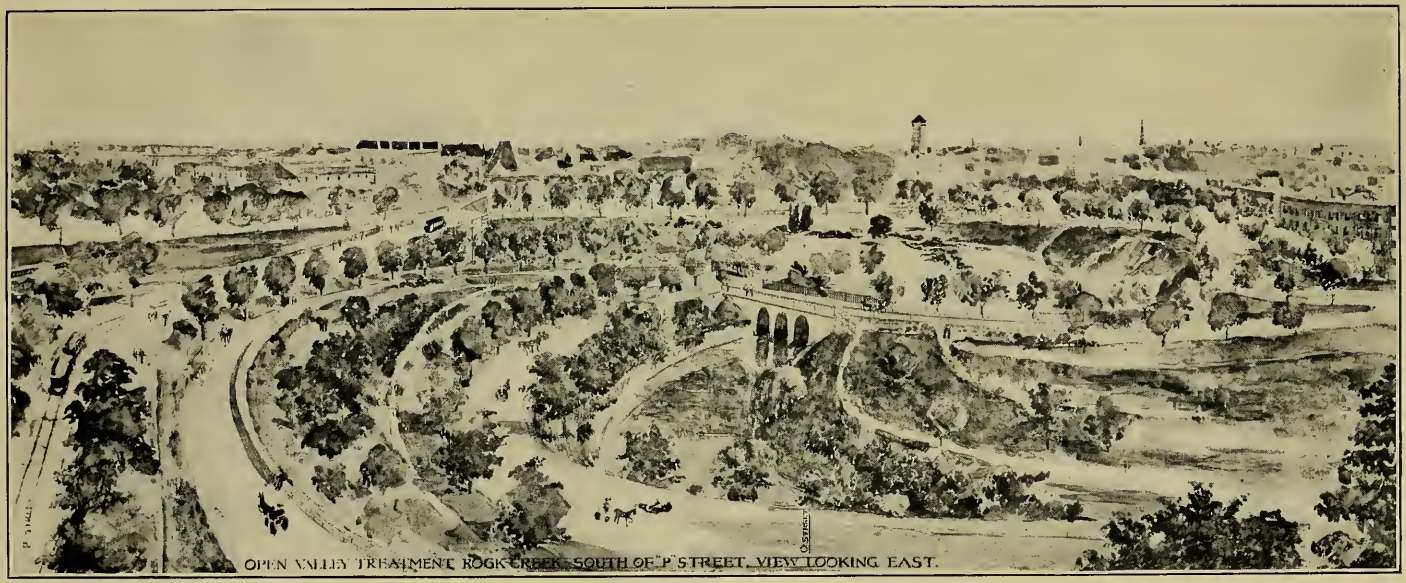
park area having a width of about 80 feet. This area will be developed, in a general way similar to that shown on sheet 11 on the west side of the park boulevard and between N and O streets. North and south streets are made noncontinuous, north and south travel being made through boundary streets. In addition to the east and west streets made continuous under the open-valley plan, we have O street under the conduit plant No. 2. The grades of the parkway are so arranged that in case of overflow the water will be confined to the park area and not scattered over the adjacent section of the city. The connection with Potomac Park, below Pennsylvania avenue, will be the same as in the three preceding projects.

This plan is impracticable on account of the great cost, therefore in writing this portion of the report I have not attempted to go into detail.

O

P STREET LOOKING SOUTHWARD.

BETWEEN O AND P STREETS LOOKING WEST.



OPEN VALLEY TREATMENT, ROCK CREEK, SOUTH OF "P" STREET, VIEW LOOKING EAST.

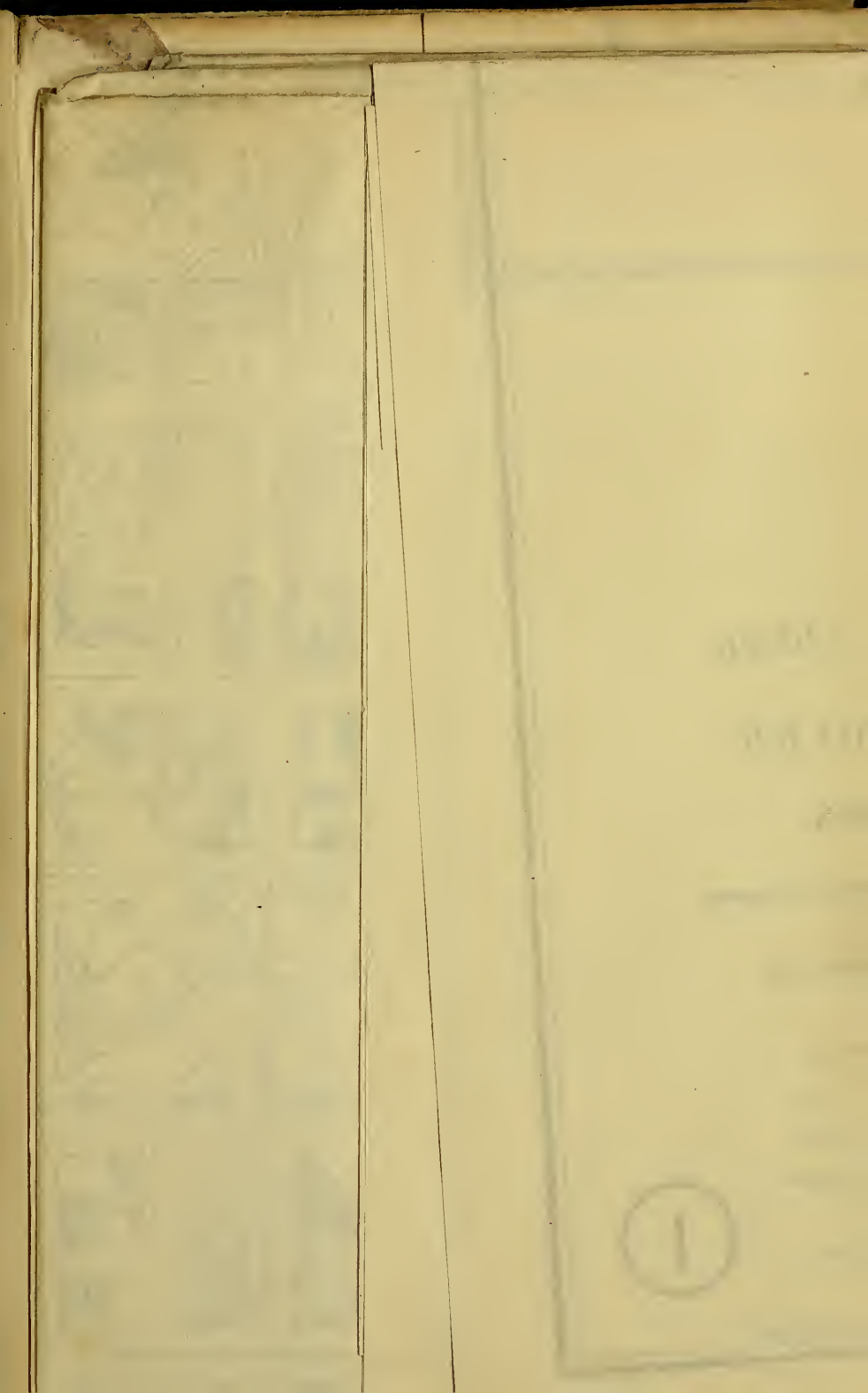
BETWEEN O AND P STREETS LOOKING EAST.

REAR OF METROPOLITAN CAR BARN LOOKING NORTHWARD.

LYON'S MILL.

N STREET LOOKING NORTHEAST.

TREATMENT OF ROCK CREEK
FROM MASS AVE TO RIVER
OPEN VALLEY PLAN
OFFICE OF THE ENGINEER COMMISSIONER D C




BENTON ST.
PROPOSED PARK
28TH ST
DRIVE
W ST.
U ST.
T ST
PUBLIC PARK
WATER SIDE DRIVE
ROCK CREEK
OAK HILL CEMETERY
MASS. AVE
BELMONT
TRACY
KALORAMA
ROAD
2503 (4)
2504 (3)
2505 (2)
PLACE
CALIFORNIA T ST.
2508
(15) 2519
BANCROFT PLACE
(13) 2518
S ST.
(12) 2517
DECATUR PLACE
(11) 2516
R ST.
SHERIDAN CIRCLE
(7) 2512
MASS. AVE.
Q ST.
FLORIDA AVE
VALLEY ST.
AVON PLACE
IRVING PLACE
CAMBRIDGE PLACE
(113) 1283
(114) 1284
(115) 1283
30TH
29TH
28TH
MT. ZION CEMETERY
EAST PLACE
MILL
NORTH ST.
POPLAR PLACE
OLD PAPER MILL ROAD
O ST
DUMBARTON ST.
N ST.
OLIVE
27
M ST.
U S WEATHER BUREAU

LEGEND

FRAME STRUCTURES.....
BRICK OR STONE STRUCTURES.....
SEWERS.....
WATER MAINS.....
TAKING LINE, OPEN VALLEY PLAN

NOTE

Block numbers in brackets thus: (23) are original numbers

TREATMENT OF ROCK CREEK FROM MASS. AVE. TO RIVER

EXISTING CONDITIONS

Scale in feet

OFFICE OF THE ENGINEER COMMISSIONER D.C.

RECOMMENDED FOR APPROVAL

APPROVED

ASST ENGINEER

ENGR OF BRIDGES

ENGR OF HIGHWAYS

ASST TO ENGR COMR'S

COMMISSIONERS D.C.

FEB 1, 1908

1


30TH ST.
DRIVE
W ST.
SIDE
WATER
ROAD
DRIVE
ROAD
KALORAMA
2503
U ST.
BELMONT
MASS
TRACY
PLACE
2504
2505
U ST.
ROCK CREEK
T ST.
(CALIFORNIA) T ST.
2500
2506
2519
BANCROFT PLACE
2518
S ST.
MONTROSE
OAK HILL CEMETERY
ROCK CREEK
AVE.
2517
DECATUR PLACE
2507
2516
R ST.
SHERIDAN CIRCLE
2512
2511
Q ST.
2510
IRVING PLACE
AVON PLACE
CAMBRIDGE PLACE
1283
1284
1285
MT. ZION CEMETERY
HILL ROAD
LYONS
1287
1286
EAST PLACE
1266
1265
1264
47
1261
POPLAR PLACE
1262
NORTH PARK

LEGEND

FRAME STRUCTURES
BRICK OR STONE STRUCTURES
TAKING LINE
STREETS SUGGESTED

NOTE

Existing grade thus 35
Proposed grade thus 35

TREATMENT OF ROCK CREEK FROM MASS. AVE. TO RIVER

OPEN VALLEY PLAN

OFFICE OF THE ENGINEER COMMISSIONER D.C.

RECOMMENDED FOR APPROVAL

APPROVED

FEB 1 1909

(2)

LEGEND

FRAME STRUCTURES.
BRICK OR STONE STRUCTURES.
TAKING LINE
STREETS SUGGESTED
D.C. OR U.S. PROPERTY.

TREATMENT OF ROCK CREEK FROM MASS. AVE. TO RIVER

OPEN VALLEY PLAN

TAKING MAP

OFFICE OF THE ENGINEER COMMISSIONER, D.C.

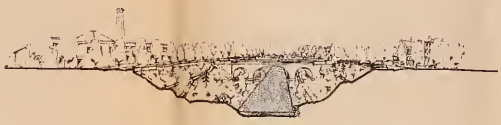
RECOMMENDED FOR APPROVAL

APPROVED

FEB. 1908

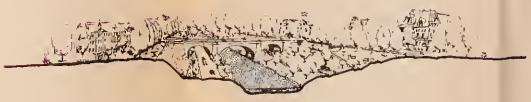
(3)

SECTION-A- LYON'S MILL LOOKING NORTHWARD



SECTION-B- SOUTH OF Q STREET LOOKING NORTHWARD

SECTION-C- SOUTH OF P STREET LOOKING EASTWARD



SECTION-D- SOUTH OF N STREET LOOKING NORTHWARD

RECOMMENDED FOR APPROVAL

CHIEF ENGINEER

CHIEF OF DIVISION

CHIEF OF BUREAU

DIRECTOR OF ENGINEERING

APPROVED

ASSOCIATES

FEB 1 1908

FOR LOCATION OF SECTIONS SEE SHEETS NOS. 1 AND 2

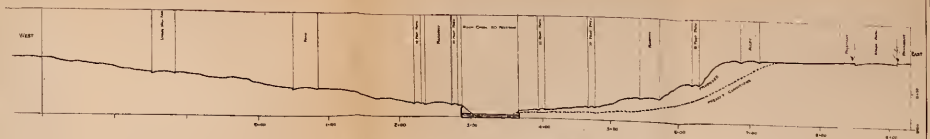
TREATMENT OF ROCK CREEK
FROM
MASS. AVE. TO RIVER

OFFICE OF THE ENGINEER COMMISSIONER D.C.

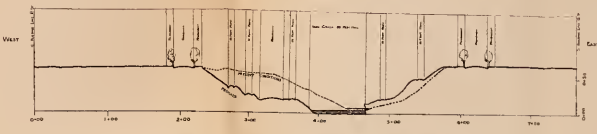
OPEN VALLEY PLAN
PROPOSED SECTIONS

FEB 1 1908

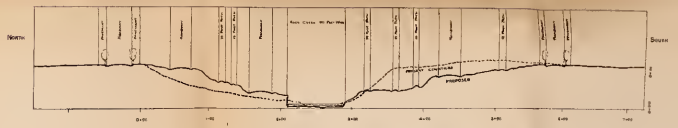
4



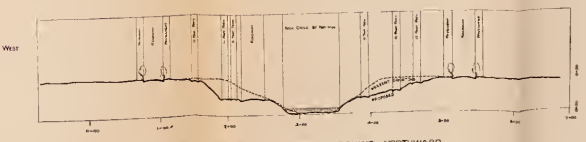
SECTION-A- LYON'S MILL LOOKING NORTHWARD



SECTION-B- SOUTH OF Q STREET LOOKING NORTHWARD



SECTION-C- SOUTH OF P STREET LOOKING EASTWARD



SECTION-D- SOUTH OF N STREET LOOKING NORTHWARD

RECOMMENDED FOR APPROVAL

APPROVED

ASST ENGINEER

CHIEF OF BRIDGES

ASSTS TO ENGR COMRS

COMMISSIONERS D.C.

TREATMENT OF ROCK CREEK
FROM
MASS. AVE. TO RIVER

OFFICE OF THE ENGINEER COMMISSIONER D.C.

PRESENT AND PROPOSED SECTIONS

Scale in Feet

FEB 1 1908

4A

FOR LOCATION OF SECTIONS SEE SHEETS NOS 1 AND 2

TREATMENT OF ROCK CREEK
FROM
MASS. AVE. TO RIVER

OFFICE OF THE ENGINEER COMMISSIONER D.C.

SEMI-CONDUIT PLAN

RECOMMENDED FOR EXAMINATION
- ASST. ENGINEER
- ENG'R. OF BRIDGES
- ENG'R. OF HIGHWAYS
- ASS'T TO ENG'R. COM'S'R.

EXAMINED
- COMMISSIONERS D.C.

FEB. 1. 1908

7

LEGEND

FRAME STRUCTURES

BRICK OR STONE STRUCTURES

TAKING LINE

STREETS SUGGESTED

NOTE

TREATMENT OF ROCK CREEK
FROM
MASS. AVE. TO RIVER

OFFICE OF THE ENGINEER COMMISSIONER D.C.

SEMI-CONDUIT PLAN

RECOMMENDED FOR EXAMINATION

ASST ENGINEER

ENGR OF BRIDGES

ENGR OF HIGHWAYS

ASST TO ENG'R COMR.

EXAMINED

COMMISSIONERS D.C.

FEB 1908

7

FROM

MASS. AVE. TO RIVER

OFFICE OF THE ENGINEER COMMISSIONER D.C.

SEMI-CONDUIT PLAN

TAKING MAP

Scale in feet

1 60 0 100 200 300 500

RECOMMENDED FOR EXAMINATION

L. Glover ..... ASS'T. ENGINEER

W. J. Douglas ..... ENG'R. OF BRIDGES

C. W. Trump ..... ENG'R. OF HIGHWAYS

E. W. Markham ..... ASS'T. TO ENG'R. COM'S'R.

EXAMINED.

Chas. W. Ellicott

Henry L. West

Jay Morrow

COMMISSIONERS D.C.

FEB. 1, 1908

8

LEGEND

FRAME STRUCTURES
BRICK OR STONE STRUCTURES
TAKING LINE
STREETS SUGGESTED
D.C. OR U.S. PROPERTY

TREATMENT OF ROCK CREEK
FROM
MASS. AVE. TO RIVER
OFFICE OF THE ENGINEER COMMISSIONER D.C.
SEMI-CONDUIT PLAN
TAKING MAP

Drawn in Feet

RECOMMENDED FOR EXAMINATION
C. Moore ..... ASST ENGINEER
W. J. Douglas ..... SUPT OF SCHOOLS
C. W. Fox ..... SUPT OF PUBLIC BUILDINGS
Ed. Clark ..... ASST TO ENGR. COMR'R

EXAMINED
Geo. Gillespie
Henry L. West ..... COMMISSIONERS D.C.
Jay J. Morrow

FEB 1, 1908

8

South of this point the Full Conduit No.1 and Open Valley plans are identical SEE SHEET 2

TREATMENT OF ROCK CREEK FROM MASS. AVE. TO RIVER

FULL CONDUIT PLAN No.1

Scale in Feet

OFFICE OF THE ENGINEER COMMISSIONER D.C.

RECOMMENDED FOR EXAMINATION

EXAMINED

FEB 1 1904

LEGEND

FRAME STRUCTURES
BRICK OR STONE STRUCTURES
TAKING LINE
STREETS SUGGESTED
D.C. OR U.S. PROPERTY

NOTE

Existing grade thus ....
Proposed grade thus

9

South of this point the Full Conduit No. I and Open Valley plans are identical
SEE SHEET 3

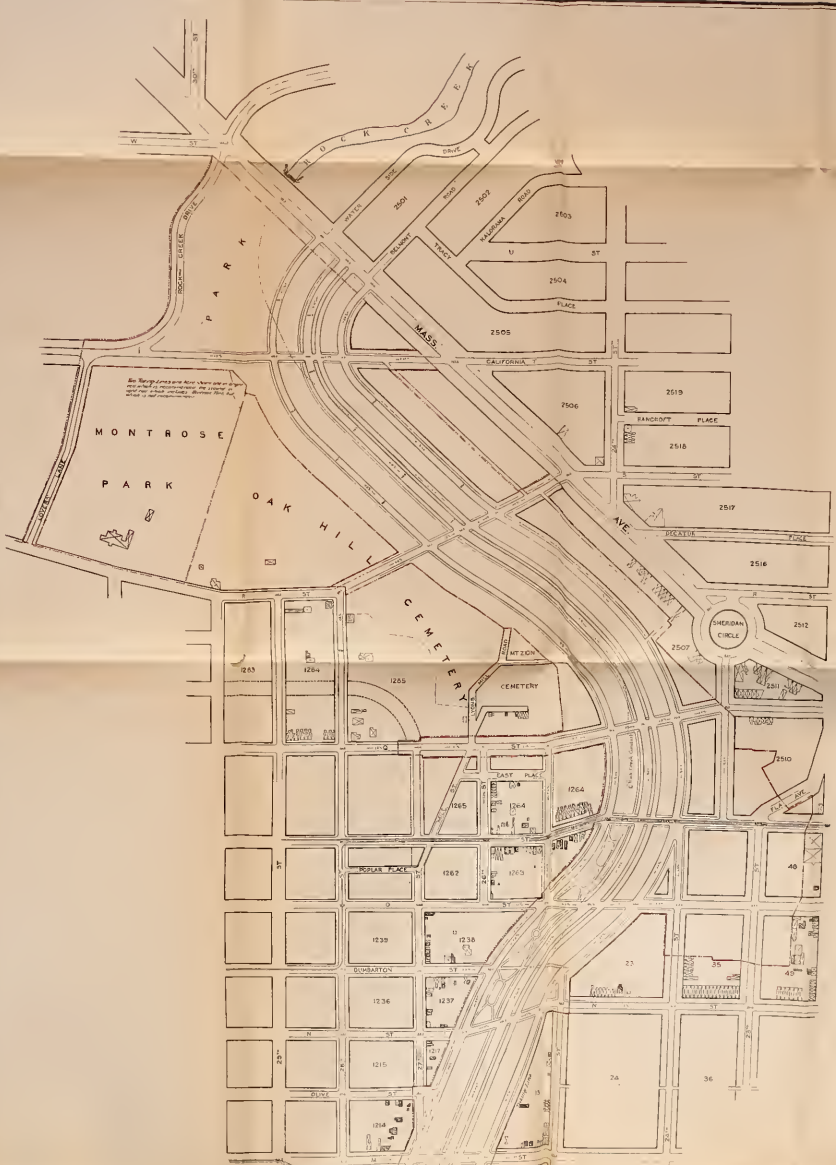
TREATMENT OF ROCK CREEK
FROM
MASS. AVE. TO RIVER
FULL CONDUIT PLAN No. I
TAKING MAP

OFFICE OF THE ENGINEER COMMISSIONER D.C

RECOMMENDED FOR EXAMINATION — ASST. ENGINEER; ENGR. OF BRIDGES; ENGR. OF HIGHWAYS; ASST. TO ENGR. SEWERS

EXAMINED — COMMISSIONERS D.C

LEGEND
FRAME STRUCTURES
BRICK OR STONE STRUCTURES
TAKING LINE
STREETS SUGGESTED
D.C OR U.S PROPERTY



South of this point the Full Conduit No.2 and Open Valley plans are identical SEE SHEET 2

LEGEND

FRAME STRUCTURES
BRICK OR STONE STRUCTURES
TAKING LINE
STREETS SUGGESTED

NOTE

Existing grade thus
Proposed grade thus

TREATMENT OF ROCK CREEK FROM MASS. AVE. TO RIVER

FULL CONDUIT PLAN No. 2

Scale 1 inch

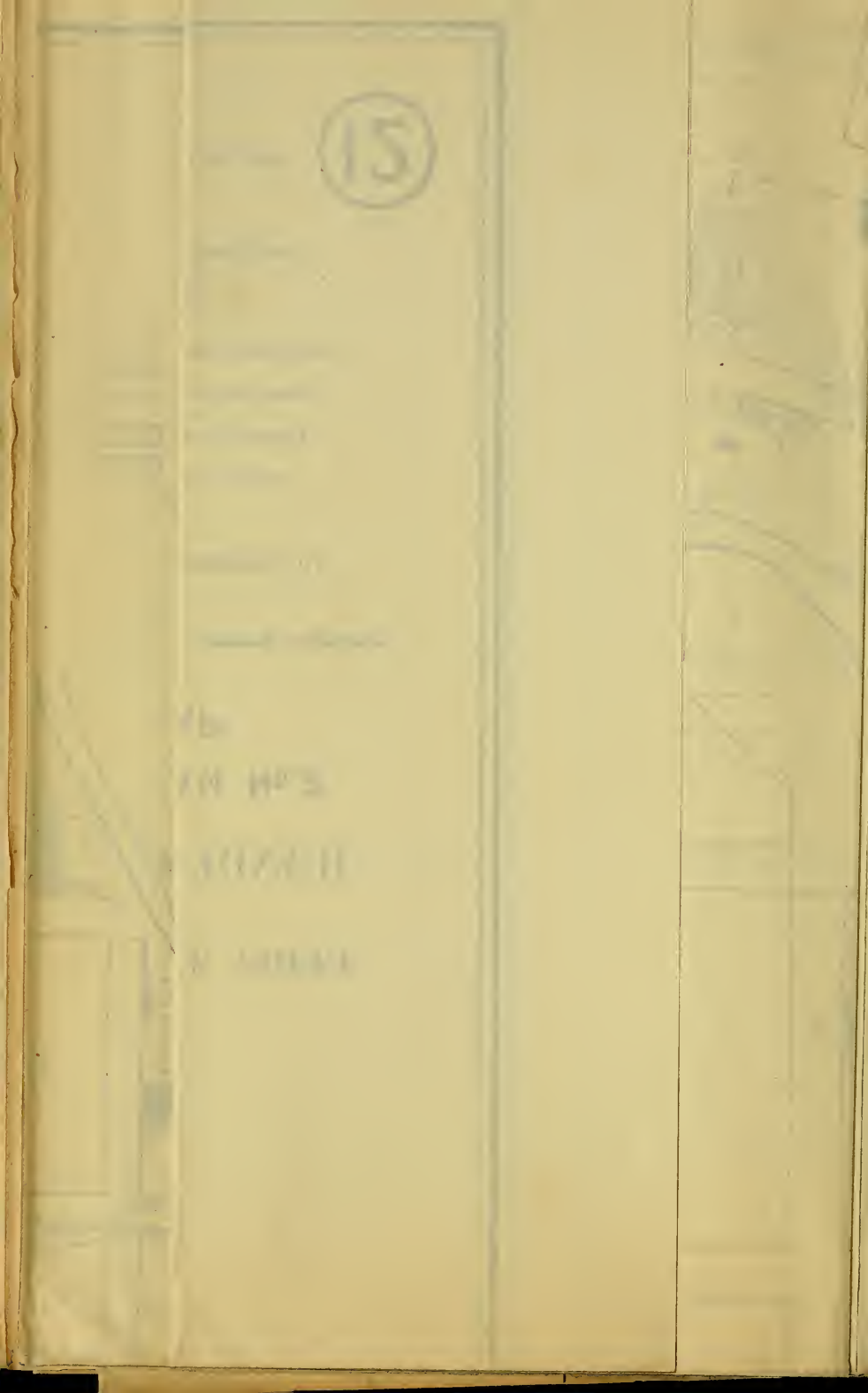
OFFICE OF THE ENGINEER COMMISSIONER D.C.

RECOMMENDED
EXAMINED

EXAMINED

FEB 1908

11



South of this point the Full Conduit No 2
and Open Valley plans are identical
SEE SHEET 3

LEGEND

FRAME STRUCTURES
BRICK OR STONE STRUCTURES
TAKING LINE
STREETS SUGGESTED
D C OR U.S PROPERTY

TREATMENT OF ROCK CREEK
FROM
MASS. AVE. TO RIVER

FULL CONDUIT PLAN No. 2
TAKING MAP

OFFICE OF THE ENGINEER COMMISSIONER D.C.

RECOMMENDED FOR EXAMINATION

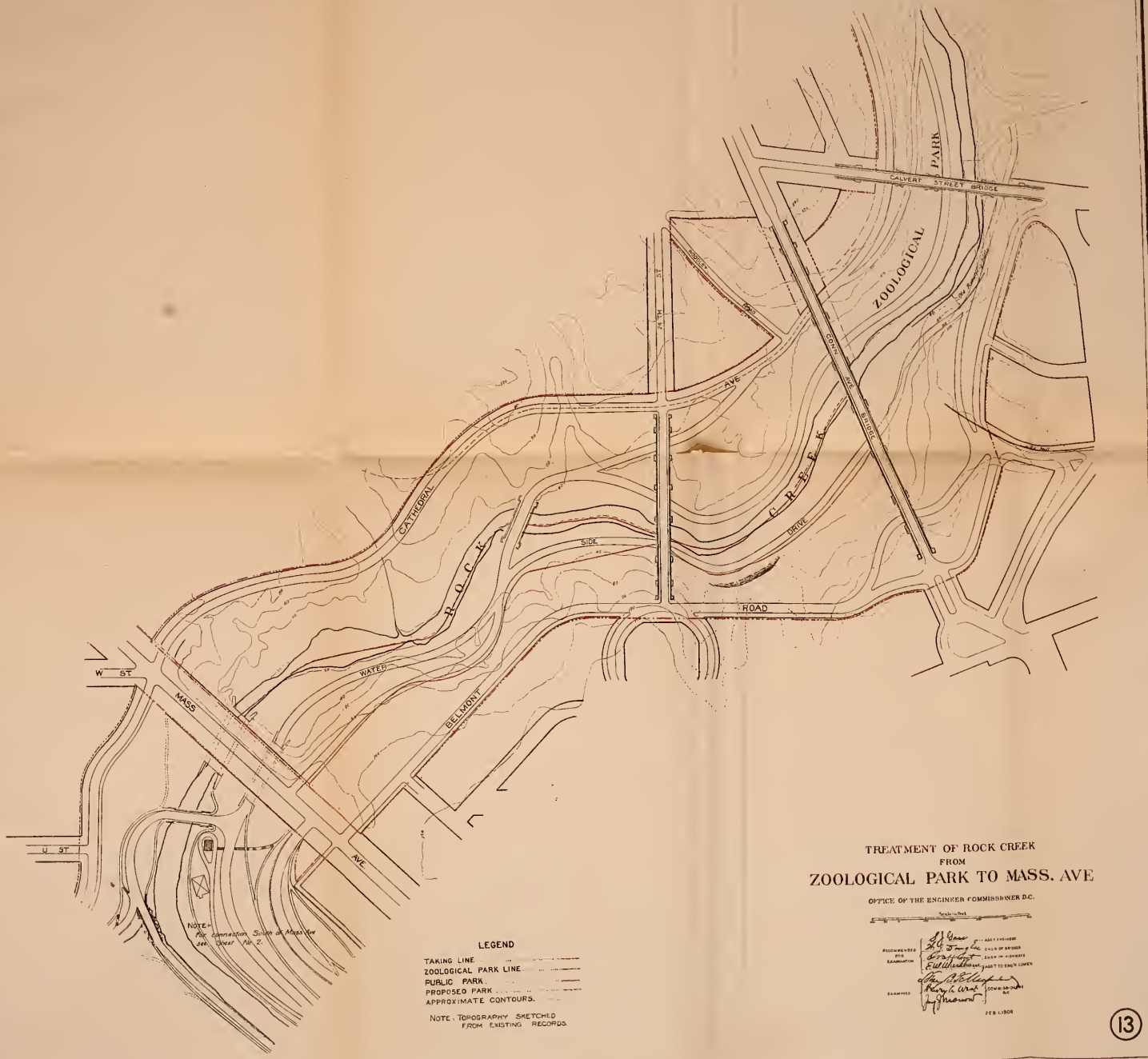
ASST ENGINEER
ENGR OF BRIDGES
ENGR OF HIGHWAYS
ASST TO ENGR COMMR

EXAMINED

COMMISSIONERS D.C.

FEB 1 1906

12



LEGEND

TAKING LINE
ZOOLOGICAL PARK LINE
PUBLIC PARK
PROPOSED PARK
APPROXIMATE CONTOURS.

NOTE: TOPOGRAPHY SKETCHED FROM EXISTING RECORDS.

TREATMENT OF ROCK CREEK
FROM
ZOOLOGICAL PARK TO MASS. AVE

OFFICE OF THE ENGINEER COMMISSIONER D.C.

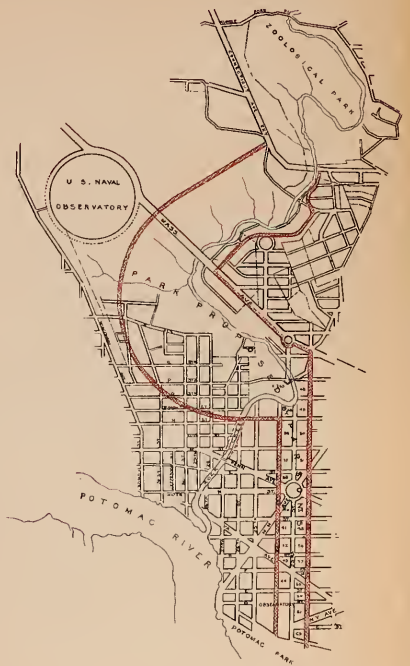
Scale in Feet

RECOMMENDED FOR EXAMINATION

EXAMINED

FEB 1 1908

13



NOTE.

The Conduit Improvement for Rock Creek from Pennsylvania Ave. to M St. was not recommended by the Secy. of War, but is necessary for the elimination of existing conditions between Georgetown & Washington.

The accompanying estimate includes area taken between Potomac Park and Mass. Ave.

TREATMENT OF ROCK CREEK

FROM

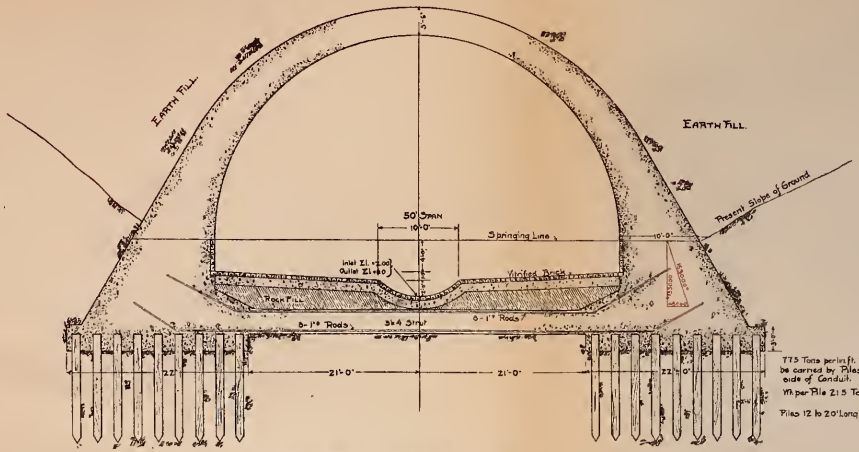
MASS. AVE. TO RIVER.

OFFICE OF THE ENGINEER COMMISSIONER D. C.

Connection between Potomac and Zoological Parks Recommended by The Secretary of War Dec 15th 1902.

Scale 100 Ft. to In. Feb 1st 1908

14

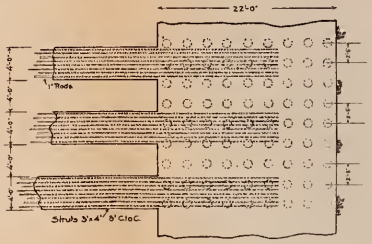


SECTIONAL ELEVATION OF CONDUIT.

Scale 3/8"=1'

COST PER LINEAL FOOT OF CONDUIT CONSTRUCTION.

17.5	Cu Yds	Concrete Arch Ring above Spring L.	@	9.00	157.50
17.5	"	" Foundation below " "		6.50	113.75
2.3	"	" Strut	@	8.00	18.40
1.0	"	Excavation	"	1.50	2.00
6.5	"	Rock Fill	"	3.00	13.50
6.0	Sq Yds	Vitrified Brick	"	2.50	15.00
4.0	Piles			8.50	34.00
375	Lbs	Steel		.04	15.00
			Total		$ 400.00



PLAN OF STRUTS & PILE FOUNDATION

TREATMENT OF ROCK CREEK
MASS. AVE. TO RIVER

OFFICE OF THE ENGINEER COMMISSIONER D.C.

Section and Estimate of Proposed Conduit from Penn. Ave to O St

ENGINEER OF BRIDGES D.C.

Made by W.J. Knight
Traced by
Date Nov 1907
Scale 3/8"=1'

15